The Impact of Preferential Tariff to the Environment: Input-Output Analysis

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Preface

Alhamdulillah, all the praises and thanks be to Allah, the learning process on the campus of Kitakyushu University has been completed. A long journey from 2016 to 2020. Started with an orientation period when entering the campus at the first time, study in class together with friends from Japan and other countries, practicing in writing manuscripts, participating international conferences as a speaker or poster presenter, send papers to publishers more rejected than accepted, review papers, consultations with supervisors, dissertation instalments, and finally first until the final defence, that quite tense.

The purpose of my dissertation is to invite attention from the Indonesian government, especially the Directorate General of Customs and Excise, that in carrying out its role as a trade facilitator, it must always be balanced with other roles as community and environmental protectors. Both of these roles are balanced, so handling traffic between countries aside from considering how to be smooth and fast, it must also be sure that they will not disturb and/ or damage the environment in the process of utilization by the importer and/ or next consumer.

In particular, the study conducted is looking at the impact of the implementation of import duty tariffs that are lower than the normal tariff (Most Favoured Nation-MFN), both within the framework of the FTA scheme and other schemes that have been carried out properly by customs administrations everywhere, on the environment.

An international trade scheme being analysed is the implementation of temporary import procedures that are likely to be extended to be applied to electronic products that currently, imported using general import procedures. In principle, the temporary import procedure is similar to the Extended Producer Responsibility (EPR) program initiated by the OECD and has been implemented domestically in several developed countries, namely returning the product to the party that made it for recycling.

The utilization of Input-Output Analyses as the main tool in this study with the consideration that the Input-Output Table is a complete picture of all economic sector activities in one country, so that the impact of any sector changes on other sectors, can be seen easily.

when there is a change in the agricultural sector, then the input output table will show the impact on the mining sector, industrial sector, banking services sector, and so on. Likewise, when supplies from imports change, there will be changes in previous demand. Furthermore, this will then also affect the activities of the economic sectors as mentioned above, including the waste management sector as one of the parameters in seeing the impact on the environment.

We realize that this study requires further research with the support of more complete data, or different methods to look at other phenomena that may arise from its application. However, of course there is hope that our study will become a new gateway for customs administration in making other contributions to the community, especially in supporting government programs in the context of protecting and preserving the environment.

Finally, as the author of the dissertation, we sincerely hope that the results of this study can provide good idea to policy makers relating to international trade and environmental issues, as well as input for future researchers interested in the same substance or methodology.

Kitakyushu, February 9th, 2020

List of Contents

List of Tables and Figures

List of Tables and Figures

Page

Chapter 1 Introduction

1.1 Introduction of Preferential Tariff

Each country applies a similar policy that every imported item will be imposed with a certain amount of import duty, depending on their national policy. Its function can be as an income for the state, or protection of industries.

Regarding the import duty, under Article 1 of the GATT, all countries are required to apply the principle of Most Favored Nation or MFN, which is the same tariff rate for every imported good, from the same or different countries. Since number of goods will increase in term of kind and type, then it will be difficult and troublesome if all products have to be given its own code because it requires a lot of number or codes.

This understanding has been agreed so that each country has a special guidebook which is often referred to as the Tariff Book or Classification Book, the classification system refers to the classification structure of goods developed by the World Customs Organization or WCO, in Brussels, Belgium, every 5 (five) years (the last version issued in 2017). The last version issued in 2017 and will be revised in 2022.

Table 1.1. Sample of MFN in Indonesia

NO	DESCRIPTION OF GOODS	HS CODE	TARIFF RATE
1	Cooling Tower	8419.50.10	5%
2	Storage Tank	7309.00.19	7,5%
3	Insulated cables not fitted with connectors, for a voltage exceeding 66 kV	8544.20.41	12,5%
4	Boilers with a steam production exceeding 15 t per hour	8402.12.11	10%
5	Line pipe of a kind used for oil or gas pipelines from stainless steel	7304.11.00	5%
6	Conveyor	8428.32.90	5%
7	Generator	8502.31.20	10%
8	Pump	8413.19.00	5%
9	Steam Turbine	8406.81.00	0%
10	Compressor	8414.30.90	5%

Source: Tariff Book of Indonesia (2017 version)

For example, all products in the world have been classified in a harmonized number code system structured by the WCO, which is then used by almost all countries. The name of this

classification then called as Harmonized System Code or HS Code. The WCO issued the classification code in six digits as a general classification and then implemented in each national in eight digits or more, depend on their need. Currently Indonesia uses 8-digit numbers in classifying goods for the imposition of import duty tariffs, as shown in table 1.1 above.

Based on the table 1.1, imported Cooling Tower items with HS Code 8419.50.10, a 5% import duty will be imposed. This rate will apply to every cooling tower product imported from any countries by any companies in Indonesia. This practice also applies in all countries in the world, within the framework of implementing the MFN principles, but may be different rate among each other. Another example is "Pump" with HS code 8413.19.00, tariff rate of 5% for Indonesia. Other countries may be the same, higher than 5%, or lower than.

This understanding does not apply absolutely because of the existence of proposals or cooperation initiatives between countries, known as economic integration. Interested countries will be binding in an agreement to promote trade in goods or services in a more liberal where one of the parameters is the reduction or even elimination of import duty tariffs. Therefore, the MFN principle experiences flexibility in terms of being applied within the framework of cooperation between these countries.

The idea is also accommodated in the GATT as mentioned in article 24 of the GATT, including in paragraph 4 which reads:

> The contracting parties recognize the desirability of increasing freedom of trade by the development, through voluntary agreements, of closer integration between the economies of the country's parties to such agreements. They also recognize that the purpose of a customs union or of a free-trade area should be to facilitate trade between the constituent territories and not to raise barriers to the trade of other contracting parties with such territories.

The provision informs us if there is an opportunity for countries that intend to provide more liberal facilities than those generally accepted, including lower import duty tariffs than the MFN tariff as stipulated in article 1 of the GATT, by forming voluntary agreements. This is what most countries are currently doing, which is to form preferential trade agreements, including the Free Trade Agreement (FTA) scheme. In term of FTA scheme, Indonesia is one

of the countries participating in utilizing the offer to liberalize import duty tariffs by signing several agreements, as in table 1.2 below.

Table 1.2. List of FTA Signed by Indonesia

NO	AGREEMENTS	SIGNING
1	ASEAN FTA (now is ASEAN Trade in Goods)	1992
2	ASEAN-China FTA	2004
3	ASEAN-Korea FTA	2006
4	Indonesia-Japan Economic Partnership Agreement	2008
5	ASEAN-India FTA	2009
6	ASEAN-Australia-New Zealand FTA	2009
7	Indonesia-Pakistan Preferential Trade Agreement	2012
8	ASEAN-Japan Comprehensive Economic Partnership	2008
9	MoU Indonesia-Palestine	2017
10	Indonesia-Chile Comprehensive Economic Partnership Agreement	2017

The main effect of Indonesia's participation in the FTA scheme is the appearance of a preference tariff that is lower than the MFN tariff. If we look at the Table 1.1, most of tariff rates are higher than 0%. However, by implementing the FTA scheme, we can see the difference between them as the example as the example in Table 1.3 follows:

Table 1.3. Impact of Tariff Preference under FTA Scheme

NO	DESCRIPTION OF GOODS	HS CODE	MFN	ORIGIN	PREFERENTIAL TARIFF	MARGIN OF PREFERENCE
1	Cooling Tower	8419.50.10.00	5%	China	0%	5%
				Japan	5%	0%
				Thailand	0%	5%
2	Storage Tank	7309.00.19.00	7,5%	China	0%	7,5%
				Viet Nam	0%	7,5%
				Australia	0%	7,5%
3	Insulated cables not fitted with connectors, for a voltage exceeding 66 kV	8544.20.41.00	12,5%	China	0%	12,5%
				Australia	0%	12,5%
4	Boilers with a steam production exceeding 15 t per hour	8402.12.11.00	10%	China	0%	10%
5	Line pipe of a kind used for oil or gas pipelines from stainless steel	7304.11.00.00	5%	China	0%	5%

6	Conveyor	8428.32.90.00	5%	China	0%	5%
7	Generator	8502.31.20.00	10%	China	0%	10%
				Jepang	0%	10%
8	Pump	8413.19.00.00	5%	China	0%	5%
9	Steam Turbine	8406.81.00.00	0%	China	0%	0%
10	Compressor	8414.30.90.00	5%	China	0%	5%

The cooling tower in the table 1.1 will be imposed 5% import duty. However, by utilizing the ASEAN-China FTA, the tariff rate will be 0% if imported from China, still 5% if imported from Japan, and 0% if imported from Thailand. The similar situation for pump, if imported from China will be replacing the original 5% tariff rate into 0%.

The FTA scheme has provided a stimulus to companies to find new sources for raw materials and also new markets for the disposal of their products. This is called trade creation and trade diversion, where producers are given the opportunity to search for raw materials from partner countries then sell them to other partner countries so they can enjoy preferential tariffs in the destination country. Economic integration that is built is expected to drive the rate of growth in international trade volume between members of each FTA scheme, so that in the end it is able to encourage economic growth between them.

That is what is expected from the emergence of the FTA scheme referred to in article 24 of the GATT above. This is a fact that international trade is able to encourage a country's economic growth and improve the welfare of the country's population.

If we check on Table 1.3, it can be seen that cooling tower products with MFN import duty tariff of 5%, can be imported from several countries. However, if this product will be imported from China by utilizing the ASEAN-China FTA scheme or from Thailand by utilizing the ASEAN Trade in Goods scheme, then that product has an opportunity to enjoy an import duty tariff of 0% (called preferential tariff). However, if imported from Japan, the import duty remains at 5%. In this case companies must be smart in finding sources of goods to be imported.

1.2 Review of Existing research

The ability of international trade to push economic growth has become the topic of experts in conducting research, including in relation to the implementation of the FTA scheme. Research in India(Abubakar and Shehu 2015) It has been shown that trade is closely related to economic growth and is even capable as one of the driving engines. Research in Nigeria(ATOYEBI et al. 2012) draw conclusions that exports and imports have a significant impact on economic growth. Research conducted in Pakistan(Hussain et al. 2012) shows a positive relationship between export and GDP growth. Other facts are presented in the study(Manni and Ibne 2002) in Bangladesh which also proves the addition of volume due to the enactment of trade liberalization.

The smaller import duty tariffs have proven to be effective in increasing the volume of international trade so that GDP also increases.

Another fact that has been carried out research by several experts is the impact of free trade schemes on other sectors, besides the economy. The Commission for Environmental Cooperation of North America conducted research as presented at the North American Symposium on Assessing the Linkages between Trade and Environment (Commission for Environmental Cooperation of North America 2002). The commission conducts research on the impact of the North American Free Trade Agreement (NAFTA) on the environment, including natural resources, pollution levels, policies, and others.

Learning from NAFTA, it seems that the countries involved have thought about all aspects related to the agreement. Specifically, for the environment, NAFTA has another agreement which is an inseparable part of the main agreement officially called the North American Agreement on Environmental Cooperation (NAAEC). This agreement is quite complete by regulating the unit of responsibility, the obligations and commitments of the parties, the level of protection, and others.

The information presented by experts and also examples of the NAFTA agreement should be addressed as an input for Indonesia, in particular, and all parties who apply preferential tariffs that the impact of the policy also affects the environment.

India has realized that in practice international trade must pay attention to environmental aspects (Pathak 1994) due to potential negative impact. This should be a good information for Indian negotiators to propose such concern into their agreement. However, these issues were not included in the ASEAN-India FTA agreement.

Under the free trade mechanism some experts see the phenomenon of the existence of economic goals as priority over protection of the environment, and very few consider the environment in the implementation of free trade (Margareta 1992). Analyzing to the Southern Common Market (MERCOSUR), North American Free Trade Agreement (NAFTA), and the Australia-United States Free Trade Agreement (AUSFTA) resulted positive impact to the increasing of Green House Gases emission if the trade between developing and developed countries. However, among developing countries are negative (Hu, Reed, and Nemati 2008). This is in line with other research that trade liberalization is more beneficial for developed countries in terms of environmental issue CO2 pollution, and vice versa for developing countries downward (Yao et al. 2019).

The impact of the ASEAN-China FTA scheme was also felt by the Great Mekong Sub-region (GMS) countries, namely: Cambodia, Myanmar, Viet Nam, Lao People's Democratic Republic, and Thailand, which saw significant transaction volume growth from the implementation of the FTA scheme between countries. The types of goods imported for the needs of the manufacturing industry have pushed greater levels of pollution (Vutha and Jalilian 2008).

1.3 Objectives

1.3.1 Objectives and scope of this study

Studies analysing the relationship between the implementation of special import tariffs prove the potential influence of free trade into environment. Therefore, as a country that also has a similar policy it is necessary to conduct an analysis of the application of the special tariff related to environmental issues.

Currently, Indonesia has implemented several tariff facilities either reduction or elimination, such FTA schemes, temporary admission programs, import of used goods/ products, import of granted goods and other program.

While researchers are mostly focus on the impact of trade into the economic matters, these studies try to analyse the impact of the implementation of special tariffs on environmental issues in Indonesia.

The special tariff used means the removal or reduction of the Most Favoured Nation (MFN) tariff as a result of the facilities implemented by the government of the Republic of Indonesia, particularly the temporary import scheme and the Free Trade Agreement (FTA) scheme.

Since the trade is connecting to the economic activities, these studies utilize the transaction among sectors in the Input-Output Table (IO table) of Indonesia issued by the Central Bureau Statistic in 2015. This table presents a detailed analysis of the process of production and the use of goods and services (products) and the income generated in that production, including import and export.

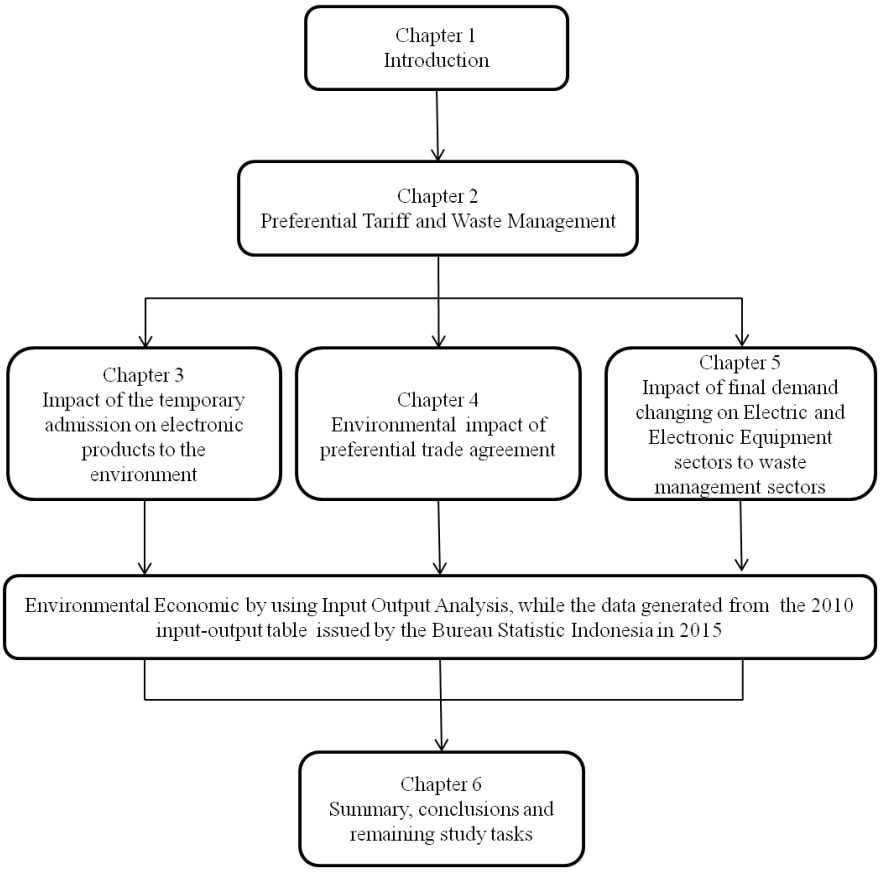
While the data is generated from the input-output table, these studies are also empowering import policy and regulations that apply in Indonesia but has an international character. This means the regulations is adopted from or initiated by international practices/ instruments and also apply in other countries, so indirectly the same research can be applied or become input for other countries.

The environmental issues will be analysed is dealing with CO2 emission and electronic waste or e-waste. The data is generated from the IO table, and then extended by empowering the Green House Gases (GHG) report of Indonesia. The IO table is using monetary unit (Indonesian rupiahs or IDR), while the GHG report is using physically unit (Tonnage). Combining both tables could find out the value of emitted CO2 from each sector in the current situation.

From the point of view of the IO table, environmental issues concern can be analysed through the waste management sector, that include recycling activities. The more imported products come to Indonesia and reach the End of Life (EoL) in Indonesia will increase the value of waste management, because government has to provide higher cost.

1.3.2 Structure of dissertation

Figure 1.1 Framework of research



This paper is divided into 6 chapters and focuses on the impact of the reduction and / or elimination of import duty tariffs that apply in Indonesia, especially temporary import procedures for imported electronic goods, and also the preferential tariffs that are applied based on the FTA scheme signed by Indonesia.

Chapter 1 is opened with an introduction to the notion of preferential tariffs, followed by the objectives and scope of the research conducted. This chapter closes with the structure of the preparation of the dissertation, starting from chapter 1 to chapter 6.

The temporary import procedure is an implementation of an international agreement initiated by the World Customs Organization (WCO), while the FTA scheme is a form of international agreement. In the presentation of this chapter, literature is presented about the concerns of the international agreement on the environment, in a way. This will be explained

in Chapter 2. Every article contained in the relevant agreements will be examined to determine its concern to the environment.

After examining each provision in the relevant agreement, the next chapter 3 will discuss the impact of implementing temporary import procedures on electronic products. In accordance with the principle of temporary imports, any imported goods must be returned to their home country after being used in the importing country within a certain period. The imposition of a lower import duty or even exemption is assumed to increase the volume of imports. Therefore, returning imported electronic products to exporting country is expected to reduce the increasing potential e-waste in Indonesia.

Like the previous chapter, chapter 4 will also discuss the impact of reducing import duty on the environment. It's just that the tariff reduction in this chapter is caused by the implementation of the FTA scheme signed by Indonesia. The impact measured in this chapter is seen from Carbon Dioxide (CO2) emissions discharged into the air due to economic transactions, so the data used is the latest version of the Indonesian input output table, which is processed using Input-Output Analysis (IO Analysis).

As stated above, as a result of the imposition of preferential tariffs, the volume of imported Electrical and Electronic Equipment (EEE) goods will increase. This addition will certainly change the final demand of the data contained in the Input-Output Table. Chapter 5 looks at the impact of changes in final demand on the EEE sector. In this section IO Analysis will also be used.

The results of all the above studies will be concluded in chapter 6. In addition to the conclusions, this chapter also provides recommendations based on all studies conducted in order to improve and complete the implementation of research in the future.

1.4. Methodology

This study is utilizing the Input-Output (IO) Analysis, a theoretical framework and an applied economic tool in a market economy was developed by Wassily Leontief, published in 1936, defined as an analysis of the interrelationship between various sectors and economic activities, both between the production sector and between the production sector and the final consumption sector (Suahasil 2005).

The basic principle of input-output analysis is to identify and disaggregate all expenditure flows between various economic activities (sectors/ industries), between economic and consumer activities, between economic activities and the supply of inputs present in the structure of economic trade. It aims to determine the multiplier and identify the economy as a whole and find out the impact of changes in the final demand of each economic activity on the economy as a whole (United Nations 1999).

Under the IO analysis there is an assumption that each input used in making a product is related to the industry's output in a linear and fixed coefficient production function. This is what causes the input-output relationships are transformed into a technical relationship. They produce only their characteristic products, no distinction will be made between industries and products (Ronald E. Miller and Peter D. Blair 2009).

The various elements of net final demand, which include final consumption expenditures and gross capital formation of the household sector, the government sector and the sector of non-profit institutions serving households and exports minus imports will be considered as a single column vector and elements of value added, which are also referred to in economic literature as primary inputs, will be considered as a single row vector. Therefore, the simple IO framework can be developed as follow:

Table 1.4. Simple input-output framework

	Industries/ Sectors	Final Demand	Total Output
Industries/ Sectors	F	Y	X
Value Added (primary input)	V		
Total Input	X		

An IO table focuses on the interrelationship on between industries in an economy with respect to the production and uses of their products and the imported products. From the table

1.4 can be understood each industry listed across the top as a consuming sector and down the side as a supplying sector.

This table is mostly in monetary units, or physically units. However, many experts have attempted to combine both physical and monetary units in IO table, particularly when calculate energy and mineral, or CO2 emission.

Under IO analysis, some matrices will be utilized. The first matrix needed is a transaction matrix that obtained from the IO table issued by one national. Based on this transaction matrix the tool has to develop coefficient matrix. This matrix is the ratio of input between those from sectors i to sector j (x_{ij}), and the total input of sector j (X_j), and only apply for the current matrix issued by the statistic agency of Indonesia.

This coefficient is also called a technical or technological coefficient because it illustrates how a combination of inputs is used to produce one unit of output. Besides that, it also illustrates the role of no sectors in the formation of a sector's output.

The third matrix is Identity matrix, or sometimes called the unit matrix for size n is the n x n rectangular matrix with numbers one on the main diagonal and zeros elsewhere, with the same order as the coefficient matrix. This identity matrix will be used to calculate Leontief Matrix, which is the reduction result between the identity matrix and the coefficient matrix.

By developing Leontief matrix as Inverse Matrix, it can be obtained Multiplier Output which is the centre of analysis of the IO table. By using this multiplier output, the impact of preferential tariff can be analysed.

Figure 1.2. IO table components

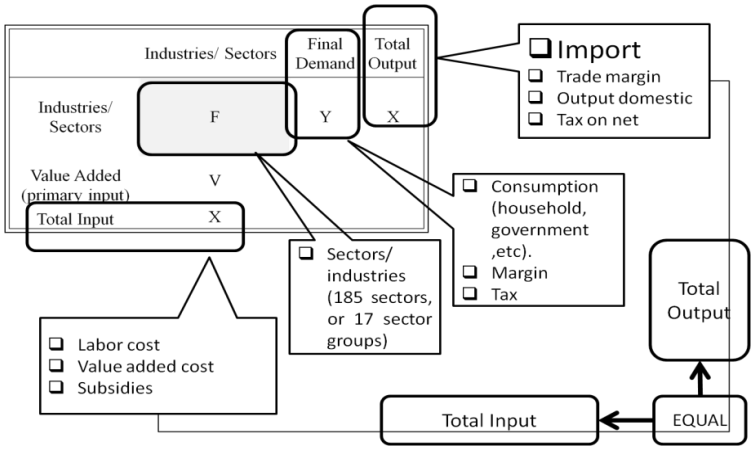


Figure 2 shows each component of each column in the IO table. Considering this study is related to international trade, the focus of this study is on the import column in as part of the total output column. This import column will be modified according to the assumptions applied in the study.

The general scenario would be, when the import value is changing what will happened to the final demand.

References

Abubakar, Attahir Babaji, and KAMAL KABIRU SHEHU Shehu. 2015. "Impact of International Trade on Economic Growth of India." *Annamalai Journal of Management* 6(3). https://www.researchgate.net/publication/332720298_Impact_of_international_trade_on_economic_growth_of_India.

ATOYEBI, KEHINDE, AKINDE JUBRIL, FELIX ADEKUNJO, and FEMI EDUN. 2012. "An Empirical Analysis of Tax Leakages and Economic Growth in Nigeria." *American Academic & Scholarly Research Journal* 4(48): 42–52. http://www.naturalspublishing.com/files/published/io5zg771k75w7h.pdf.

Commission for Environmental Cooperation of North America. 2002. Commission for Environmental Cooperation *The Environmental Effects of Free Trade*. Montreal, Canada. http://www.cec.org/islandora/en/item/1794-environmental-effects-free-trade-papers-presented-north-american-symposium-en.pdf.

Hu, Wuyang, Michael Reed, and Mehdi Nemati. 2008. "Are Free Trade Agreements Good for the Environment." *Ageconsearch*. http://ageconsearch.umn.edu/bitstream/235631/2/Nemati_AAEA_Are_Free_Trade_Agreements_Good_for_the_Environment.pdf.

Hussain, Zahoor et al. 2012. "Effects of International Trade On Economic Growth: The Case Study of Pakistan." *International Journal of Academic Research in Progressive Education and Development* 1(2): 2226–6348. www.hrmars.com.

Manni, Umme Humayara, and Munshi Naser Ibne. 2002. "EFFECT OF TRADE LIBERALIZATION ON ECONOMIC GROWTH OF DEVELOPING COUNTRIES: A CASE OF BANGLADESH ECONOMY." *Journal of Business, Economics and Finance* 1(2): 37–44. https://dergipark.org.tr/en/download/article-file/374620.

Margareta, E. 1992. "Www.Econstor.Eu." : 165–73. https://www.econstor.eu/bitstream/10419/140356/1/v27-i04-a04-BF02926373.pdf.

Pathak, R. 1994. "International Trade and Environmental Development: A View from India." *Indiana Journal of Global Legal Studies* 1(2): 3.

Ronald E. Miller and Peter D. Blair. 2009. *Input–Output Analysis: Foundations and Extensions*.

New York: Cambridge University Press.

Suahasil, Nazara. 2005. *Analisis Input Output*. 2nd ed. ed. Rahardja Prathama. Jakarta, Indonesia: Lembaga Penerbit Fakultas Economi Universitas indonesia.

United Nations. 1999. *Handbook of Input-Output Table Compilation and Analysis*. New York: United Nations publication. https://digitallibrary.un.org/record/370160/files/ST_ESA_STAT_SER.F_74-EN.pdf.

Vutha, Hing;, and Hossein Jalilian. 2008. "Environmental Impacts of the ASEAN-China Free Trade Agreement on the Greater Mekong." *International Institute for Sustainable Development* (September).

Yao, Xing et al. 2019. "Free Trade Agreements and Environment for Sustainable Development: A Gravity Model Analysis." *Sustainability (Switzerland)* 11(3): 1–17.

Chapter 2 Current situation of preferential tariff utilization and waste management in Indonesia

2.1 Introduction

Indonesia is an archipelago country with a population of more than 250 million people. This condition makes Indonesia a promising market for any country, especially developed countries that mastering technology and are able to create goods that are needed by the Indonesian market. However, on the other hand Indonesia also has the attraction of an abundance of raw materials which are needed by developed countries in producing more sophisticated products. So, in principle, Indonesia has potential to be an exporting country but in term of raw material.

Currently Indonesia's dependence on imported goods is very high, especially for finished goods, considering that Indonesia is still lagging the technology to produce the intended finished goods. Based on statistical data released by the Central Statistics Agency in 2015, Indonesia's foreign trade position can be seen as in Table 2.1 below:

Table 2.1. Indonesia Import Data – 2015

HS Code	Sector Name	2015
84	Machine and Mechanical Equipment	22,387.10
72	Steel and Iron	6,316.10
29	Organic Chemical Material	5,712.20
87	Vehicle and Parts	5,343.30
10	Cereal	3,153.40
23	Food industry	2,734.60
89	Boats and floating buildings	1,113.00
71	Jewellery/ gems	783.90
26	Ore, crust, and metal ash	447.80
93	Weapons / ammunition	291.80

Total 10 categories of goods	48,283.20
Other items	69,843.20
Total non-oil / gas imports	118,126.40

Based on the above data it can be seen that most imports are finished goods or consumer goods (high-end) which are not to be processed later. This means that Indonesia is the last market that will consume the products of developed countries. This will automatically result in an increase of used goods or even waste in Indonesia.

Realizing the importance of international trade as one of the drivers of economic growth, Indonesia took the attitude that being an importing country was not the best solution to participate in benefiting from the transaction. Therefore, the Indonesian government seeks to be able to take as much profit as possible by giving birth to policies that can encourage exports as well. Various policies were formulated to support this goal, including reducing import duty tariffs that refer to international best practice and participating in signing international agreements, which are reciprocal. This means that other countries are also required to implement the same thing, so that finished products from Indonesia can also be accepted by other countries with consideration of import duties that are also lower or eliminated.

2.2 Trade facilitation

In principle, trade facilitation is the establishment of systems and procedures for controlling traffic of goods between countries to reduce all forms of barriers so as to maximize the level of efficiency and effectiveness of international trade activities without ignoring the security as well as the purpose of the existence of regulations related to the traffic of goods.

In general, the function of trade facilitation will be aimed at reducing costs through information gathering, submission and notification of goods effectively, inspection of goods without disrupting the smooth flow of goods so that there is no delay, the application of sanctions and / or penalties in a fair and balanced manner so as not to disturb any business opportunity and increasing competitiveness.

The term trade facilitation sometimes has different interpretations among practitioners. However, this term is used more in the regulation of the way a country's government handles the flow of trade traffic entering its country. Whereas the World Trade Organization (WTO) defines trade facilitation as the simplification and harmonization of international trade activities, practices and formalities involved in collecting, presenting, communication and data processing required for the movement of goods in international trade (UN-CEFACT 2001).

Other interpretations are usually associated with trade finance and trade procedures, as stated by UN / CEFACT that trade facilitation is the simplification, standardization and harmonization of procedures and associated information flows required to move goods from seller to buyer and to make payment (UNECE 2015).

At present, the term trade facilitation is expanding even including the improvement of transportation infrastructure, modernization of customs administration, the elimination of non-tariff trade barriers, and also export marketing and transportation (UN-ESCAP 2015a).

The WTO then issued a Trade Facilitation Agreement (TFA) in 2013 which became the baseline for trade facilitation, with many countries trying to implement it in order to maintain competition in the global world. Most countries focus on efforts to facilitate trade by building electronic single windows and other paperless trade systems to further reduce trade costs (UN-ESCAP 2015b). From this it can be seen that TFA is actually more focused on accelerating the flow of goods, release and clearance of goods, including goods in transit. To anticipate other unregulated substances, TFA seems to provide communication space between institutions in the form of cooperation between government agencies, such as customs administration.

Unfortunately, this very important agreement does not include environmental elements as one of the sectors that are also affected by international trade. The acceleration of the process of clearance of goods in the destination country takes precedence over environmental problems, even though it is clear that most importing countries are likely to be developing countries with minimal recycling factories such as those in developed countries (Peterson 2007).

2.3 Implementation of preferential tariff

Preferential tariffs as special import tariffs that are different from normal tariffs are one of the strategies implemented by the Indonesian government through the Ministry of Finance, in this case the Directorate General of Customs and Excise as the assigned institution to compile and implement them in the field.

Customs law Number 10 of 1995 which has been amended by customs law number 17 of 2006 has specified several facilities for reducing and / or eliminating import duty as stipulated in article 10D for temporary imports and article 13 for preferential tariffs based on international agreements.

Each country has its own strategy to implement reduction and/ or elimination of import duty tariffs, depending on their respective national policies.

2.3.1. Temporary Import

Temporary import is one of the customs procedures that will make it easier for companies that only need imported goods for temporary use. That is, the goods are imported for a certain period and will be returned to the exporting country or outside the Indonesian customs territory. For example, a company needs some forklift for their one-year new project in Indonesia. In the absence of suitable forklift, they have to import from Japan. Since the forklift will not be used after the project, this company could utilize the temporary import procedure in providing such forklift. It means, the used forklift will not become the potential waste in Indonesia. Other goods such of excavator, oil drilling machine, etc. are possible to be imported under this mechanism.

This procedure is one of the best practices recommended by WCO and is widely used to facilitate the need for heavy equipment or machinery that will be empowered for a certain period by companies in the importing country. The agreement used is a convention issued by WCO in 1990 (World Customs Organization 1990).

According to the agreement, the definition of temporary admission is the Customs procedure under which certain goods (including means of transport) can be brought into a Customs territory conditionally relieved from payment of import duties and taxes and without

the application of import prohibitions or restrictions of economic character; such goods (including means of transport) must be imported for a specific purpose and must be intended for re-exportation within a specified period and without undergoing any change except normal depreciation due to the use made of them.

Types of goods that can use temporary import procedures have been specified in the annex to the convention, where almost all types of goods can in principle enjoy this facility as long as the requirements mentioned in the definition above can be fulfilled, namely:

- Specific purpose
- Intended for re-exportation
- Without having undergone any change except normal depreciation

The advantage of the temporary import procedure is that it does not impose import duties on all or part of the goods. Whereas from an environmental point of view, the advantage is that there are no used ex-imported goods thrown away in Indonesia but returned to the country of origin (exporting country). In the absence of recycling technology in a country, such as Indonesia, the returning of imported goods would be very helpful. In reality environmental issues are not the focus of temporary import procedures, but this paper would like to see the possibility of empowering such procedure.

In relation to environmental problems, the returning of used goods to the exporting country is at a glance similar to the Extended Producer Responsibility (EPR) program initiated by the Organization for Economic Cooperation and Development (OECD), where the goods maker is given the responsibility to take back the products produced from free circulation (Lindhqvist 2000) (OECD 2001) to be recycled. Now, it is becoming interesting because it could be that the two international programs are integrated so that they support one another.

With regards to the EPR program, in principle, Indonesia has accepted the EPR concept and has included the program in a national regulations (Minstry of Environment and Forectry 2008). One of them is as mentioned in the article 15 of Law Number 18 Year 2008 concerning Waste Management, issued by the Ministry of Environment and Forestry. However, this law has not been followed up with implementing regulations in the field (Tristiana, Koeswahyono,

and Fadli 2018) as mandated by the law itself. Various reasons have been identified, including limited funds, social conditions, lack of commitment of stakeholders, etc. Therefore, the Indonesian government still has to work hard to convince the public that EPR can be a good alternative in waste management.

On the other hand, the implementation of the EPR program is still implemented in the country where producers only focus on collecting the products which circulate in their own country, not including exported products. The implementation of EPR, currently, can be seen in some developed countries such as Japan and China (Bo and Yamamoto 2010) and European countries (Araceli and Dios 2015), but still limited to their respective countries.

2.3.2. Preferential Tariff

In every country, imported goods entering his country will be subjected to import duty and tax rates, although the percentage of rates are varying, even up to 0%. This depends on the policies of each national. The generally accepted rate is referred to as the MFN rate (World Trade Organization 1992).

In contrast to MFN rates, the notion of preferential tariffs can be interpreted as special rates. It referred to as special tariff because the amount is different from the normal tariff/ MFN, except if the normal tariff is considered to be the lowest in the same time period, so that the tariff may be the same between the MFN tariff and the preferential tariff.

The current preference tariff reflection is better known as one of the facilities negotiated by the FTA scheme member countries. Therefore, any discussion on preference rates will be directed to the issue of the FTA scheme.

In the framework of the FTA scheme, the WTO has provided guidance that preferential tariff facilities in the FTA scheme to be developed by member countries must meet the recommended Rules of Origin. This obligation as stated in the agreement issued (Wolrd Trade Organization 1994). In principle, for all goods exported from FTA partner countries to other FTA partner countries, preferential rates can be provided as long as they meet the Rules of Origin.

Rules of origin can be understood as the instrument to decide whether one product could enjoy preferential tariff or not. Mostly, the rules of origin focus on how to produce the questioned product.

2.4 Waste management

2.4.1 Policy

Population growth is one of the factors driving waste growth, so that from year to year the volume of circulating waste is also increasing (World Health Organization (WHO)-Europe 2007) (-, Pangkey, and Rompas 2014).

Waste is one of the national problems in any country. As a developing country, Indonesia is a country that has not been able to resolve this problem completely, even though it has been active in various forums or conducting comparative studies to several countries that are considered capable of solving it, such as Japan, in particular. However, up to now Indonesia still has not been able to control the waste problem, both at the regional and national levels (-, Pangkey, and Rompas 2014). However, at least the government has tried to provide a national policy related to waste management as stipulated in Law Number 18 of 2008 concerning Waste Management which is followed up with Government Regulation Number 81 of 2012 concerning Management of Household Waste and Household Solid Waste (Minstry of Environment and Forectry 2008) (Ministry of Environment and Forestry 2012).

Based on the national regulation, the Government of Indonesia divides waste into 1) Household waste, which is waste generated by daily household activities; 2) household-like waste, that is, household-like waste generated by commercial areas, industrial areas, special areas, social facilities, public facilities, and / or other facilities; and 3) Specific waste, consisting of rubbish containing hazardous and toxic materials, rubbish containing hazardous and toxic waste, rubbish arising from disasters, building debris and demolition, rubbish that is technologically unprocessed, and rubbish that does not arise periodic.

Household waste and household-like waste are handled using the same pattern because of the same characteristics, only the source is different. Management implemented by the government includes two activities, namely a) waste reduction; and b) waste management.

For waste reduction done by 1) limiting waste generation; 2) waste recycling; and / or 3) waste reuse. The central government will develop policies related to waste reduction, while the implementation is carried out by the regional government at the municipal / district level, under the provincial government coordinator and supervision.

For the two types of waste above, handling process is carried out by: a) sorting in the form of grouping and separation of waste according to the type, amount and / or nature of waste; b) collection in the form of collection and transfer of waste from the source of waste to temporary storage or integrated waste treatment facilities; c) transportation in the form of carrying rubbish from sources and / or from temporary rubbish dumps or from integrated waste treatment facilities to the final processing site; d) processing in the form of changing the characteristics, composition, and amount of waste; and / or e) the final processing of waste in the form of returning waste and / or residue from the previous processing to the environment media safely.

Different from the two types of waste above, specific management for specific waste has been regulated in a separate government regulation, number 101 of the year 2014 concerning Management of Hazardous and Toxic Waste.

In detail, the Indonesian government has developed a comprehensive hazardous waste handling formula by creating limits on the understanding of waste to be handled, as the beginning of the policy. This is very important so that the type of waste that will be handled becomes clear to all parties.

The main program after identification is the reduction of hazardous waste. This program focuses on the inhibition of waste addition (before becoming waste) and the existing waste (waste in field) , with the aim of limiting the increasing of circulating hazardous waste in the field, so that the handling of existing waste becomes easier. From this, the government will focus on hazardous waste that has been circulating, as well as a reference for hazardous waste that will emerge later.

For the hazardous waste that has been in field and will emerge later, the government begins with the collection process at the point that has been verified for the collection process. In this case the transportation process is an integral part of the collection activities. After that, the utilization or further processing of the waste, both by domestic companies and sent abroad.

In addition to handling waste that has been circulating, the Indonesian government has also made regulations on the prevention of environmental pollution and/ or environmental damage and the restoration of environmental functions, including emergency response systems in the management of hazardous waste.

In principle, the Indonesian government has sufficient instruments from a regulatory perspective, to deal with the problem of hazardous waste. However, regulations alone are apparently not enough because the real problem is the dynamic facts that occur in the field, that sometime not being covered by the said regulation. Therefore, the regulation will be tested by implementation in the field and then it will be assessed by the community by looking at the results of the implementation.

Reduce, Reuse, and Recycling or 3R programs have also been carried out and become an integral part of waste and waste management, where items collected from households and non-households will be sorted based on the type of waste/ waste. The rest of the waste/ waste that cannot be included in the 3R program will be sent to the landfill for the final process, namely landfilling.

Furthermore, in relation to the management of all forms of waste, the Indonesian government has also implemented incentive and disincentive schemes for the business sector, including the inclusion of waste management as an indicator in the Performance Report of Environmental Management (PROPER) which is a tool for the Ministry of Environment and Forestry in assessing the performance of companies in the environmental field (Ministry of Environmental and Forestry of 2002). This report is also used for financial purpose, such as for obtaining bank loan.

2.4.2 Facilities and infrastructures

Observing the government's enthusiasm in waste management, one important must be considered is the existence of supporting facilities and related infrastructure so that all instructions in the national regulation can be carried out according to government and society expectations.

In this case the government has also set up facilities and infrastructure that must be prepared, including encouragement to the public and the private sector to participate actively in handling waste.

For the transportation process, the government provides several types of transportation facilities, such as carts, and small and big waste trucks. In addition to the government, there are also transportation facilities provided by residents of a housing or private company, as a form of contribution and social responsibility from the community in order to protect their environment. Specifically, for the provision of transportation by the private sector, it is usually transportation of certain items that require special handling, such as hospital waste, used oil, and so on.

Land for the sorting process before entering into the 3R process is also provided by the government, both the central and regional governments, so is the place for final disposal or final processing provided by the government with a varied area. As for the 3R process, beside facility owned by government, also invite private sectors to involve.

Furthermore, a land area for the collection process the government provides transportation equipment, both for houses and offices. However, some industrial estates provide their own means of transportation from their production sites to temporary landfills.

References

-, Murdiningsih -, Masje Pangkey, and Welson Rompas. 2014. "Implementasi Kebijakan Pengelolaan Persampahan Di Dinas Kebersihan Kota Manado." *Jurnal Administrasi Publik* 2(3). https://media.neliti.com/media/publications/1215-ID-implementasi-kebijakan-pengelolaan-persampahan-di-dinas-kebersihan-kota-manado.pdf.

Araceli, Dolores Queiruga, and Queiruga Dios. 2015. "The Reuse of Waste Electrical and Electronic Equipment (WEEE). A Bibliometric Analysis." *International Journal of Waste Resources* 05(02). https://www.omicsonline.com/open-access/the-reuse-of-waste-electrical-and-electronic-equipment-weee-a-bibliometric-analysis-2252-5211-1000177.php?aid=55636.

Bo, Bi, and Kayoko Yamamoto. 2010. "Characteristics of E-Waste Recycling Systems in Japan and China." *World Academy of Science, Engineering and Technology, International Journal of Environmental, Chemical, Ecological, Geological and Geophysical Engineering* 4(2): 89–95. scholar.waset.org/1999.6/10336.

Lindhqvist, Thomas. 2000. PhD thesis Lund University *Extended Producer Responsibility in Cleaner Production: Policy Principle to Promote Environmental Improvements of*

Product Systems. http://swepub.kb.se/bib/swepub:oai:lup.lub.lu.se:19692?tab2=abs&language=en.

Ministry of Environment and Forestry. 2012. *Peraturan Pemerintah Nomor 81 Tahun 2012 Tentang Pengelolaan Sampah Rumah Tangga Dan Sampah Sejenis Sampah Rumah Tangga*. https://m.hukumonline.com/pusatdata/detail/lt50938db8deb96.

Ministry of Environmental and Forestry of. 2002. - *MENTERI NEGARA LINGKUNGAN HIDUP NOMOR : 127 TAHUN 2002 TENTANG PROGRAM PENILAIAN PERINGKAT KINERJA PERUSAHAAN DALAM PENGELOLAAN LINGKUNGAN HIDUP*. https://newberkeley.files.wordpress.com/2017/12/kepmen_lh_no_127_tahun_2002-tentang-proper-dalam-pengelolaan-lingkungan-hidup.pdf.

Minstry of Environment and Forectry. 2008. *UNDANG-UNDANG REPUBLIK INDONESIA NOMOR 18 TAHUN 2008 TENTANG PENGELOLAAN SAMPAH*. https://pelayanan.jakarta.go.id/download/regulasi/undang-undang-nomor-18-tahun-2008-tentang-pengelolaan-sampah.pdf.

OECD. 2001. Oecd *Extended Producer Responsibility A GUIDANCE MANUAL FOR GOVERNMENTS*. Paris: OECD of PUblication Service. http://www.wastenet.net.au/Assets/Documents/Content/Information/EPR-Guide_for_Govt-2001.pdf%5Cnhttp://www.oecd-ilibrary.org/environment/extended-producer-responsibility_9789264189867-en.

Peterson, Luke Eric. 2007. "Trade and Environment: A Resource Book." In IISD, ICTSD, the RING, 188–95. papers2://publication/uuid/807E9719-446D-4575-95D6-3FF233B040F0.

Tristiana, Enis, Imam Koeswahyono, and Moh Fadli. 2018. "Managing Policy of Extended Producer Responsibility (EPR) Implementation to Reduce Plastic Waste in Indonesia." 7(07): 25–32. http://www.ijhssi.org/papers/vol7(7)/Version-2/E0707022532.pdf.

UN-CEFACT. 2001. "Compendium of Trade Facilitation Recommendations." *Geneva: UN-CEFACT*. http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Compendium+of+Trade+Facilitation+Recommendations#0.

UN-ESCAP. 2015a. Asia-Pacific Trade and Investment Report 2015 *Asia-Pacific Trade and Investment Report 2013*. https://www.unescap.org/sites/default/files/Full Report - APTIR 2015.pdf.

———. 2015b. *Trade Facilitation and Paperless Trade Implementation Survey 2015 Global Report*. https://www.unescap.org/sites/default/files/Global Report Final 20151016.pdf.

UNECE. 2015. "Trade Facilitation Implementation Guide." http://tfig.unece.org/details.html.

Wolrd Trade Organization. 1994. *AGREEMENT ON RULES OF ORIGIN*. https://www.wto.org/english/docs_e/legal_e/22-roo.pdf.

World Customs Organization. 1990. *Istanbul Convention on Temporary Admission*. Brussels. http://www.wcoomd.org/-/media/wco/public/global/pdf/about-us/legal-instruments/conventions-and-agreements/istanbul/istanbul_legal_text_eng.pdf.

World Health Organization (WHO)- Europe. 2007. World Health Organization *Population Health and Waste Management: Scientific Data and Policy Options*. http://www.euro.who.int/__data/assets/pdf_file/0012/91101/E91021.pdf.

World Trade Organization. 1992. 1 Review of European Community & International Environmental Law *General Agreement on Tariffs and Trade*.

Chapter 3 Impact of the implementation of temporary import procedure on electronic products

3.1 Introduction

Currently, imported electronic products enter the Indonesian market utilizing general import procedures, where the importer has to pay the import duty and taxes in full rate. In the absence of proper recycling systems, the electronic products that have reached their end of life and those are no longer used, end up in the landfills. Some researchers found hazardous materials inside the electronic products that could contaminate water, soil and air. Therefore, another strategy is needed to avoid negative effects on the environment. The Temporary import policy is one of the import procedures under Customs administration control, which states that goods can only be imported for a specific period and should be re-exported afterwards. This paper tries to analyze the impact of the implementation of the temporary import policy on electronic products. By employing the Input-Output Analysis to the data from the Statistic Central Bureau and Indonesian Customs, this paper identified the impacts of the proposed procedure to some sectors in the Indonesian input-output table, namely: import activity, waste management and recycling system, transportation and storage, and final demand. The result shows increasing in quantity to be re-exported, and potential benefit from transportation and warehousing, leasing and rental services, and other business.

Electronic products can come from domestic industries or import. Indonesia imports a lot of electronic products from many countries, such as China, Japan, European countries (Siringoringo 2013) (Siringoringo et al. 2013). Since electronics products are intended for commercial purposes, they are imported under the general import procedure, by paying normal duties and taxes. The normal import duty is calculated by multiplying the normal tariff rate with the value of goods.

After all customs obligations are fulfilled, the goods can be released from the customs area to the importer's warehouse for redistributed to the domestic market. Each product will eventually be in the hands of consumers up to the End of Life (EoL) or the time when they are no longer used. After that, the goods will end up in the disposal places, either directly or indirectly, as electronic waste or e-waste without any suitable handling (Grant et al. 2013) (Kiddee, Naidu, and Wong 2013). E-waste should be dealt with promptly by the government given its material content that can contaminate soil, water and air. Many researchers have provided information on the metallic

and chemical content of each electronic product that could potentially harm human health, other living things and the environment in general due to their capacity to contaminate the air, water and soil (Fu et al. 2007) (Chung and Murakami-suzuki 2008) (Tang et al. 2009).

Some informal handling procedures carry out the disposal work without the use of appropriate technology or processes (Kojima, Yoshida, and Sasaki 2009) (Chi et al. 2011). The number of such processes are growing continuously due to the potential economic benefits obtained from processing of electronic waste (e-waste) without considering the dangerous or negative impact to the environment (Chi et al. 2011) (Gupta, Modi, and Saini 2014). This condition is expected to get worse, especially in countries that do not have adequate recycling factories for e-waste, such as Indonesia (ASEAN Network 2009) (Gupta, Modi, and Saini 2014).

Developed countries such as Japan, China (Bo and Yamamoto 2010), and the European countries (Araceli and Dios 2015), have especially anticipated the management of e-waste by developing national regulations and establishing a recycling factory specifically for e-waste. One of the solutions being implemented by several developed countries is the requirement of producers of each product to recall them back for recycling, through program such as under the Extended Producer Responsibility (EPR) program (Chung and Murakami-suzuki 2008) (Favot 2014). In principle, Indonesia has developed this kind of initiative as mentioned in the Law Number 18 of 2008 on Waste Management and Government Regulation Number 81 of 2012, on Domestic Waste and Similar Waste Management (Tristiana, Koeswahyono, and Fadli 2018). However, the implementation of the EPR scheme is not a simple task as it needs huge effort, and collaboration between government agencies, producers and the society (Chacón et al. 2010) (Hanafi et al. 2011) (OECD 2001).

In the case of e-waste, Indonesia has developed Government Regulation Number 101 of 2014 on Management of Hazardous Wastes and Toxic. However, this regulation needs further national implementation regulation, as imported electronic goods are impossible to stop. This means potential electronic waste will be growing continuously. To this end, active collaboration from all stakeholders of the state is needed, as a message of the preamble of the Resolution adopted by the General Assembly on September 25, 2015 (United Nations 2015).

Other than the local production, there are many electronic products that are coming from abroad (Wahyono 2013). Customs administration is one of stakeholders handling import and export products. Therefore, the function and role of this agency can be maximized by applying one of their procedures, namely the Temporary Admission or Temporary Import Procedure. This is not a new procedure, as it has already been applied in many Members of the World Customs Organization (WCO) used for any specific purposes. The idea of promoting one of the customs procedures can be a good initiative for other possible contributions of customs administration to the environment program. However, in the limited literature of temporary import policy, this paper probably the first attempt to promote this policy as another contribution of Customs administration to the environmental issues by applying it into electronic products. In the differences between the temporary import policy and the general imports currently in used can be understood based on the description below.

Customs has been responsible for implementing a wide range of government policies, spanning areas as diverse as revenue collection, trade compliance and facilitation, interdiction of prohibited substances, community protector, and enforcement of intellectual property laws (Widdowson 2007). However, the majority of customs administrations are still focused on state revenue through the import duty sector. not yet fully carrying out the trade facilitator function as has been carried out by developed countries (Grainger 2008). The function of community protector is mostly aimed at terrorist security or the entry of items that are a threat to human safety. While for the purpose of environmental preservation or prevention of environmental damage has not been done much (Nguyen 2012).

Furthermore, the existence of temporary import procedures also only focuses on the process of facilitating certain items in a manner, such as boats or yachts, and other equipment (Filberto 2012). Not to consider how temporary import procedures can be utilized for other purposes from facility regime.

The IO analysis method has been widely used in various sectors, both economic and environmental. An example is the research conducted by M. Muchdie at all which focuses on calculating the volume of imported goods in meeting the needs of goods in Indonesia (Muchdie and Nurrasyidin 2018). For research related to the environment, Louise Laumann Kjaer et all

(Kjaer et al. 2015) explained that IO analysis offer a holistic view of environmental performance, provide a foundation for decision-making within reasonable time and cost, and for companies with a large upstream environmental footprint, the analysis supports advancing their sustainability agenda to include supply chain impacts. From this it can be seen that IO analysis is one of the tools that can be used to analyze international trade, and also matters related to the environment.

The focus of this study remains on international trade and the environment. However, different from previous research, this study tries to introduce the temporary import admission procedure as an alternative in supporting the handling of environmental problems from e-waste. The tool used is IO analysis which has been widely used in studies of international trade and/ or the environment.

3.1.1 General Import Procedure

Importation under the general import procedure starts with a transaction between the exporter and an importer which is initiated by signing a contract. When the goods arrive at the importing country, the importer will pay the full customs duty and taxes to the bank, and prepare a customs declaration based on the self-assessment principle. Furthermore, all related documents submitted to the customs office for validity checking. A customs officer may or may not conduct physical investigations on the goods. Once all documents and information are confirmed to be valid, goods will be released with customs approval, from the customs area to be distributed to consumers.

Consumers will use those products for a certain period until achieving EoL or no longer used due to several reasons. Even though each electronic product will reach their own EoL in different periods, all products finally end up in one place, a landfill. Starting this stage, the problem will arise because of the absence of facilities to process further adequately and environmentally friendly.

In the absence of proper recycling factory, the e-wastes will be staying in the landfill and have and may contaminate the environment due to some hazardous contents (Perkins et al. 2014) (Orlins and Guan 2015) (Yoshida et al. 2016).

3.1.2 Temporary Import Procedure

The temporary import is not a new procedure as it has already been applied by most of the member states of the WCO, with the WCO as the initiator. The main instrument of application is the Istanbul Convention on Temporary Admission, which is also regulated in the Revised Kyoto Convention (World Customs Organization 1999).

This procedure is understood as the Customs procedure under which certain goods (including means of transport), can be brought into a customs territory conditionally and be relieved from payment of import duties and taxes and without application of import prohibitions or restrictions of economic character, such goods (including means of transport) must be imported for a specific purpose and must be intended for re-exportation within a specified period and without having undergone any change except normal depreciation due to the use made by them (World Customs Organization 1990).

The key point of this procedure is that all the imported goods will be sent back to exporting countries after being used within a certain period, because the ownership still belongs to the supplier or the exporter. This is not a selling-buying transaction but leasing. To this end, sending back is mandatory, and there will be no more used electronic products remaining in the importing country (developing country).

However, in the limited literature of the temporary import policy, this paper probably the first attempt to promote the temporary admission as another contribution of the customs administration to the environmental issues by applying it into electronic product.

In the case of Indonesia, the temporary admission procedure has been regulated in the Finance Minister Decree No. 178/PMK.04/2017 and electronic products may be included under the partial relief provision. The longest period of use is 3 years. Since the exemption on duty is partial, the importers shall pay the rest e.g., 2% per month (Ministry of Finance Republic of Indonesia 2017).

From the explanations provided, we can learn that the temporary import and general import systems are distinguished mainly based on the ownership system. The general import is a final transaction and the ownership of imported goods is shifted from the exporter to the importer,

whereas there is no final change in ownership of goods under the temporary import policy. The other difference is that the duty is under temporary import.

3.2 Methodology and data collection

The first step of the methodology is to describe the data source, generated from the 2010 Indonesian input-output (IO) table developed by the Central Bureau Statistic (Statistic Bureau Center 2015). This is the last version of the IO table issued by this agency and has establish a transmission of table, including: annual supply and use tables, five-yearly symmetric input-output tables, five-yearly use tables at basic prices, and five-yearly valuation tables. Therefore, this 2010 IO table is still relevant to be used as a main data for IO analysis today. The other reason, as the last version, this table is valid from the date of publication, 2015 (Statistic Bureau Center 2015).

The IO analysis is a theoretical framework and an applied economic tool in a market economy developed by Wassily Leontief with the construction of IO table published in 1936. The table shows interrelationship between economic sectors. It means, once a sector change in input side we can calculate the changes in other sectors due to the existence of fixed-coefficient linear production function that can be a main element (United Nations 1999) (Suahasil 2005). To this end, the employing of this tool will be the suitable option.

The second step is generating the industrial sectors of Indonesia based on the 2010 IO table, the most upgraded IO table issued by the Central Bureau Statistic of Indonesia in December 2015. This table is consisted of 185 x 185 economic sectors aggregated into 17 classifications, namely: 1) Agriculture, forestry, and fishing; 2) Mining and quarrying; 3) Manufacturing; 4) Electricity and gas; 5) Water supply, sewerage, waste management, and recycling; 6) Construction; 7) Wholesale and retail trade, repair of motor vehicles and motorcycles; 8) Transportation and storage' 9) Accommodation and food service activities; 10) Information and communication; 11) Financial and insurance activities; 12) Real estate activities; 13) Services company; 14) Business activities Public administration and defense, compulsory social security; 15) Education; 16) Human health and social work activities; 17) Other services activities.

Assessing the impact of the temporary import procedure to industrial activities requires a comprehensive understanding of the prevailing situation. International trade has a close

relationship with economic growth (Abdullahi, Safiyanu, and Soja 2016). Shifting from the general import to the temporary import procedure would influence some related industrial sectors, due to the changes on the rate of import duty from normal rate into partial exemption rate.

The most potential influenced sectors, at least including a) Electronic and Communication products and equipment; b) Waste management and recycling; c) Transportation and Storage facilities; and d) Leasing and business support services. To this end, this paper will only analyze limited to those affected sectors, and the rest sectors will be aggregated.

The modified classification is shown in the Table 3.1.

Table 3.1. Modified classification on the IO Table

Original Sector Code	Decided Code	Sectors' Name	Remarks
121	121	Electronic and communication products and equipment	Selected sector
148	148	Waste management and recycling	Selected sector
157-163	008	Transportation and storage facilities	Selected sector
176	176	Leasing and business support Services	Selected sector
	190	Rest of sectors	

The third step is calculating the new import duty based on the temporary import procedure as regulated in the Finance Minister Regulation Number 178/PMK.04/2017, e.g. 2% of normal import duty for each month of import period (in this paper is 36 months as a maximum period or 72% of normal import duty). Initial import duty is included in column 4010, imported goods (Statistic Bureau Center 2015).

The formula of calculating new import duty based on the temporary import procedure is below:

$$ID(pr) = 2\% \times ID \times P \quad (1)$$

Related to the equation, ID(pr), ID, and P are the Import Duty partial relief under temporary import procedure (new import duty), the Import Duty under general procedure, and the import period in months, respectively. As mentioned before, the import duty under general procedure (initial import duty) is using the amount at column 4010 (total imported products) because the pure import duty in 2010 IO table was not provided on. The maximum period for temporary import is 3 years or 36 months.

The last step is calculating the impacts of new import duty into the final demand of the selected sector of industry (see Table 1). The scenario of this step started with modifying the amount of total import in column 4010 based on the calculation in step three. New import duties that resulted from equation (1) will cause changing in total demand in column 3100, while also causing changes to total intermediate demand in column 1800 (Statistic Bureau Center 2015). The scenario of the paper can be seen in the Table 3.2 below.

Table 3.2. Scenario of final demand used

	Selected sector	Total Intermediate Demand	Total Demand	Total Import	Total Supply
Selected sector		1800	3100	4010	8000
				Only pay 72% from normal duty	

As a matter of fact, the column 4010t is not merely import duty, but consisted of import value (value of the goods) and import duty itself. However, since the value is not separated by the statistic agency, the study calculated all value with assumption as the import duty.

Ideally, the value has to be distinguished of value of the goods and the amount of import duty, so the study will show the real situation. The other advantage of real amount is including identification of potential loss of import duty due to shifting from general import to temporary import procedure. This expectation, hopefully, can be analyzed by future researchers.

This scenario will employ equations of the IO analyses, including the Leontief Matrix that can predict the new of final demand (United Nations 1999) (Suahasil 2005) (Ubaidilah Zuhdi 2017). The equations of the scenario are as followed:

The basic equation of input-output analyzes is:

$$Xi = zi1 + zi2 + \ldots + zin + Yi \quad (2)$$

Related to the equation, Xi, z*ij*, and Yi are the total output of sector i, value of input i for output j, and final demand from sector i, respectively. This equation shows distribution from output

sector i to other production sectors, and then allocated to final user (household, company, government, abroad)(Robinson 2005) (Suahasil 2005). Since the sectors of industry are more than 1, the whole equation would be:

$$\begin{bmatrix} X_1 = z_{11} + z_{12} + z_{13} \ \ldots + z_{1n} + Y_1 \\ X_2 = z_{21} + z_{22} + z_{23} \ \ldots + z_{2n} + Y_2 \\ \ldots . \\ X_n = z_{n1} + z_{n2} + z_{n3} \ \ldots + z_{nn} + Y_n \end{bmatrix} \quad (3)$$

The first step of input-output analyses is developing the input-output coefficient as the minimum input needed to produce 1-unit output from certain sector. The coefficient can be calculated as followed:

$$a_{ij} = \frac{z_{ij}}{X_j} \text{ or } z_{ij} = a_{ij} \, . X_j \quad (4)$$

aij = coefficient input i for output j

After obtaining the input-output coefficient, the equation 2 can be modified as followed:

$$\begin{bmatrix} X_1 - a_{11}X_1 - a_{12}X_2 - \cdots - a_{1n}X_n = Y_1 \\ X_2 - a_{21}X_1 - a_{22}X_2 - \cdots - a_{2n}X_n = Y_2 \\ \ldots . \\ X_n - a_{n1}X_1 - a_{n2}X_2 - \cdots - a_{nn}X_n = Y_n \end{bmatrix} \quad (5)$$

By collecting the element X, those elements can be written in matrix equation:

$$X = (I - A)^{-1}Y \quad (6)$$

The (I – A)-1 matrix known as Leontief Inverse Matrix, and the elements A (αij) can describe effect of changes in final demand into sectors in the economy. The flow of goods and services can be analyzed by using the input-output analysis. Hence, this tool has a special benefit instead of using algebraic formula (Stilwell and Minnitt 2000).

Furthermore, in calculating the impact of reducing import duty on electronic products due to the shifting procedure from the general import to the temporary import policy can use this matrix as the coefficient.

3.3 Results

Input-output table of Indonesia has been developed based on 185 sectors and then aggregated into 17 sectors of classification (groups), adopted from the Supply and Used Table (SUT) as

recommended by international best practices from the United Nation in developing an input-output table (Statistic Bureau Center 2015).

Table 3.3. Modification of the original IO table of 2010 for targeted sectors*

SECTORS	121	148	008	176	190	1800	3090	3100
121	39,315,959	233	983,632	273,688	77,479,278	118,052,790	275,957,446	394,010,236
148	5,929	-	2,424	8,275	388,635	405,263	6,564,262	6,969,525
008	598,959	1,491	30,032,078	2,943,665	102,393,877	135,970,070	232,712,578	368,682,648
176	773,711	2,169	13,289,645	855,471	68,897,466	83,818,462	21,960,337	105,778,799
190	62,048,207	143,378	263,001,438	34,025,914	5,727,975,243	6,087,194,180	7,864,658,186	13,951,852,366
1900	102,742,765	147,271	307,309,217	38,107,013	5,977,134,499	6,425,440,765	8,401,852,809	14,827,293,574
2010	14,395,257	79,812	86,111,622	24,649,649	2,044,839,866	2,170,076,206		
2020	20,151,125	315	155,579,871	38,751,292	4,241,616,490	4,456,099,093		
2030	374,736	585	1,887,125	505,323	54,736,649	57,504,418		
2090	34,921,118	80,712	243,578,618	63,906,264	6,341,193,005	6,683,679,717		
2100	137,663,883	227,983	550,887,835	102,013,277	12,318,327,504	13,109,120,482		

SECTORS	4010	4020	4090	5090	6090	7000	8000
121	156,050,996	1,793,555	157,844,551	82,529,778	15,972,024	137,663,883	394,010,236
148	6,116,164	-	6,116,164	-	625,378	227,983	6,969,525
008	494	92,068,366	30,568,878	(211,660,026)	(1,114,039)	550,887,835	368,682,648
176	-	3,432,450	3,432,450	-	333,072	102,013,277	105,778,799
190	1,184,964,457	159,736,837	1,339,757,731	129,130,248	164,636,883	12,318,327,504	13,951,852,366
1900	1,280,688,566	257,031,208	1,537,719,774	-	180,453,318	13,109,120,482	14,827,293,574

*Final demand side
1800 = Total intermediate output
1900 = Total intermediate input
2010 = Labor compensation of employees
2020 = Gross operating surplus and mixed income
2030 = Taxes less subsidies on production
2090 = Value added at basic prices
2100 = Total domestic input at basic prices
3090 = Total final demand
3100 = Total demand based on purchasing price
Supply side
4010 = Import of Goods
4020 = Services on import
4090 = Total import
5090 = Total margin of trading and transportation
6090 = Taxes less subsidies and products
7000 = Total output domestic on basic price
8000 = Total supply based on purchasing price

As mentioned before, the Table 3.3 is restructured based on the Indonesian IO Table of 2010 by separating the targeted sectors and collecting the untargeted into the rest of sectors (code

number 190). The targeted sectors are settled as the 4 x 4 matrices (column and row of sectors: 121, 148, 008, and 176). The amount of the final supply (8000) is equal to the Final demand (3100) (Statistic Bureau Center 2015). By applying the temporary import procedure, the partial relief import duty of goods will be as 4010_{t+1} (see Table 3.4).

Table 3.4. The partial relief of import duty

SECTORS	121, 148, 008, 176, 190	1800	3090	3100	$4010_{(t)}$	$4010_{(t)+1}$
121	(see table 3.1)	118,052,790	275,957,446	394,010,236	156,050,996	112,356,717.12
148		405,263	6,564,262	6,969,525	6,116,164	4,403,638.08
008		135,970,070	232,712,578	368,682,648	494	355.68
176		83,818,462	21,960,337	105,778,799	-	-
190		6,087,194,180	7,864,658,186	13,951,852,366	1,184,964,457	853,174,409.04
1900		6,425,440,765	8,401,852,809	14,827,293,574	1,280,688,566	922,095,767.52

Table 3.4 shows the calculation result of the partial exemption of import duty by using the formula (1). The total amount in column $4010_{(t+1)}$ is decreasing from IDR 1,280,688,566 million to IDR 992,095,768 million due to the changing rate percentage being imposed from 100% to 28%. This means that the implementation of the proposed procedure has resulted in potential loss of the import duty side about IDR 358,592,798.48 million.

Under electronic and communication product and equipment (column 121), the potential loss is the IDR 43,694,278.8 million, which is maybe the highest potential loss among questioned sectors, while under other selected sectors are smaller than the electronic and communication product and equipment sector potential loss. The rest of sectors look have big difference because this sector is covering many sectors (see row number 190).

Table 3.5. The coefficient input-output

SECTORS	121	148	008	176	190
121	0.2856	0.0010	0.0018	0.0027	0.0063
148	0.0000	-	0.0000	0.0001	0.0000
008	0.0044	0.0065	0.0545	0.0289	0.0083
176	0.0056	0.0095	0.0241	0.0084	0.0056
190	0.4507	0.6289	0.4774	0.3335	0.4650

Having arranged the new IO table, the next step is finding out the input-output coefficient based on the equation (4). This can be understood as the number of inputs used to produce one sector output unit (Suahasil 2005). The table shows that to produce IDR 1value of sector 121 needs 0.2856 input from sector 121, 0.0044 from sector 008, 0.0056, and 0.4507 from sector 190. The similar interpretation can be developed to the other sectors.

This matrix is very important as the only sources for establishing the Leontief matrix as an output multiplier to calculate the predicted output of each targeted sectors.

Table 3.6. The Leontief Matrix based on the coefficient input-output

SECTORS	121	148	008	176	190
121	1.4106	0.0122	0.0114	0.0098	0.0169
148	0.0000	1.0000	0.0000	0.0001	0.0001
008	0.0176	0.0182	1.0673	0.0369	0.0172
176	0.0153	0.0169	0.0316	1.0132	0.0113
190	1.2136	1.2126	0.9818	0.6730	1.9058

By utilizing the equation (6) the Leontief matrix can be calculated, and the result can be seen in the Table 3.6. This matrix can be used as an output multiplier to predict total supply (8000) or demand (3100).

Table 3.7. The new final supply/ demand

SECTORS	121	148	008	176	190	Y_{t+1}	New Final Supply	Current Supply
121	1.4106	0.0122	0.0114	0.0098	0.0169	348,522,402	723,622,016.30	394,010,236
148	0.0000	1.0000	0.0000	0.0001	0.0001	5,256,999	6,117,470.92	6,969,525
008	0.0176	0.0182	1.0673	0.0369	0.0172	338,114,126	602,172,771.40	368,682,648
176	0.0153	0.0169	0.0316	1.0132	0.0113	102,346,349	271,446,429.09	105,778,799
190	1.2136	1.2126	0.9818	0.6730	1.9058	13,465,269,044	26,491,949,036.34	13,951,852,366

Finally, the calculation of new final supply of each selected sector can be seen in the Table 3.7, by multiplying the Leontief matrix with the total supply/ demand (Y_{t+1}) by using the equation (6).

Based on the result in the table 3.7, we can see some phenomenon as followed:

a. Electronic and Communications Products and Equipment Sector (121). This sector shows the potential for increasing total output to be produced from IDR 394,010,236 to IDR

723,622,016.30. This happens because of the effort of sectors to fulfill the final demand for the products. The other reason, because of lower import duty rate could invite importer to import more than before. Based on that amount, as mentioned before that the more electronic products enter to Indonesia, the more volume e-waste will be. To this end, this increase in total output would also have the potential to raise the volume of waste in landfills because Indonesia has not proper recycling factory in place for the time being. However, since the implementation of the temporary import procedure will be mandating the importer to ship back the goods to the exporting country, then landfills will be saved. In this case, the strategy of implementing the temporary import procedure on the electronic products looks will help resolve the current problem.

b. Waste management and recycle (148). This is quite interesting the result under the sector 148 (Waste management and recycling) which is decreasing from IDR 6,969,525 to 6,117,470.92 million. Logically, the more a country import product they will need more cost of waste management and recycling. However, this issue can be analyzed further under new research by consulting the Statistic Central Bureau on how the IO table being developed.

c. Transportation and warehousing (008). Since the output of sector 121 is increasing, this sector will automatically be busier. The output of this sector is getting higher from IDR 368,682,648 to IDR 602,172,771.40 million. This amount is only for incoming goods because this paper is being developed by analyzing the IO table of Indonesia. As the paper is talking about re-exporting the used imported products while the calculation is limited to the input-output table of Indonesia, then the output in this sector maybe double because of the re-exporting activities.

d. Leasing and Business Support Services (176). This sector shows the higher potential output from IDR 105,778,799 to IDR 271,446,429.09 million. This is a good indication that future business may influence other sectors such as tax and labor.

To be noted that information is only applied to the domestic situation in Indonesia. As we may be aware, the temporary import procedure will also boost the leasing and business support services in the exporting country, because of the goods ownership mechanism. Since the temporary import procedure is regulating import and re-export mechanism, analyzing the inter-regional input-output table may provide more clear impact of this policy.

3.4 Conclusions

As a new initiative, the idea of promoting the use of the temporary import procedure on electronic products will support environmentally sustainable programs by sending back imported goods to the exporting country, which is typically to a producer who has the knowledge of recycling used products before becoming waste. In the line of this, discussion with producer is important on how to take action into the idea.

Even though state revenue from import duty will potentially decrease, the input-output analyses shows that this idea will also promote some opportunities to increase other benefit from product supply chain, transportation and warehousing, leasing and rental services, and other business. The government will also gain some benefits from the tax perspective, hence impacts of the revenue. Since the temporary import procedure is under customs control, this agency could do a more comprehensive study to promote this policy to be more environmentally friendly.

Import and export transaction will involve at least 2 countries, e.g. importing country and exporting country. Since the idea of the temporary import procedure is sending back the used products to the exporting country, then the more comprehensive exhibit of the impact of the temporary import procedure to all involved parties can be seen by analyzing the inter-regional input-output table. The other thing that should be done further is the feasibility study as the consequences of the proposed procedure.

References

Abdullahi, Abubakar Okuwa, Shuaibu Sidi Safiyanu, and Tsalla Soja. 2016. "International Trade And Economic Growth : An Empirical Analysis Of West Africa." *IOSR Journal of Economics and Finance* 7(2): 12–15. http://www.iosrjournals.org/iosr-jef/papers/Vol7-Issue2.

Araceli, Dolores Queiruga, and Queiruga Dios. 2015. "The Reuse of Waste Electrical and Electronic Equipment (WEEE). A Bibliometric Analysis." *International Journal of Waste Resources* 05(02). https://www.omicsonline.com/open-access/the-reuse-of-waste-electrical-and-electronic-equipment-weee-a-bibliometric-analysis-2252-5211-1000177.php?aid=55636.

ASEAN Network. 2009. "E-Waste in Indonesia."

Bo, Bi, and Kayoko Yamamoto. 2010. "Characteristics of E-Waste Recycling Systems in Japan and China." *World Academy of Science, Engineering and Technology, International Journal*

of Environmental, Chemical, Ecological, Geological and Geophysical Engineering 4(2): 89–95. scholar.waset.org/1999.6/10336.

Chacón, Lisa, Gil Friend, Nicholas Kordesch, and Steven Reinhardt. 2010. "Product Stewardship & Extended Producer Responsibility Towards a Comprehensive Packaging Recycling Strategy for the US." *October*: 1–69.

Chi, Xinwen, Martin Streicher-Porte, Mark Y.L. Wang, and Markus A. Reuter. 2011. "Informal Electronic Waste Recycling: A Sector Review with Special Focus on China." *Waste Management* 31(4): 731–42. http://dx.doi.org/10.1016/j.wasman.2010.11.006.

Chung, Sung-woo, and Rie Murakami-suzuki. 2008. "A Comparative Study of E-Waste Recycling Systems in Japan, South Korea and Taiwan from the EPR Perspective: Implications for Developing Countries." *Kojima. Chiba*: 21.

Favot, Marinella. 2014. "Extended Producer Responsibility and E-Waste Management: Do Institutions Matter?" *Economics and Policy of Energy and the Environment* (1): 123–44.

Filberto, Lucas. 2012. "Implementation Of Temporary Admission Policy on Yachts." 19(3): 216–24. http://journal.ui.ac.id/index.php/jbb/article/viewArticle/1869.

Fu, Jianjie et al. 2007. "High Levels of Heavy Metals in Rice (Oryza Sativa L.) from a Typical E-Waste Recycling Area in Southeast China and Its Potential Risk to Human Health." *Chemosphere* 71(7): 1269–75.

Grainger, Andrew. 2008. "Customs and Trade Facilitation: From Concepts to Implementation." *World Customs Journal* 2(1): 17–30. https://www.researchgate.net/publication/237575389_Customs_and_trade_facilitation_From_concepts_to_implementation/link/5c339bcb299bf12be3b558d3/download.

Grant, Kristen et al. 2013. "Health Consequences of Exposure to E-Waste : A Systematic Review." *The Lancet Global Health* 1(6): e350–61. http://dx.doi.org/10.1016/S2214-109X(13)70101-3.

Gupta, Shubham, Gaurav Modi, and Rahul Saini. 2014. "A Review on Various Electronic Waste Recycling Techniques and Hazards Due to Its Improper Handling." *International Refereed Journal of Engineering and Science (IRJES) ISSN (Online)* 3(5): 2319–183.

Hanafi, Jessica et al. 2011. "The Prospects of Managing WEEE in Indonesia." (39).

Kiddee, Peeranart, Ravi Naidu, and Ming H Wong. 2013. "Electronic Waste Management Approaches : An Overview." *Waste Management* 33(5): 1237–50. http://dx.doi.org/10.1016/j.wasman.2013.01.006.

Kjaer, Louise Laumann, Niels Karim Høst-Madsen, Jannick H. Schmidt, and Tim C. McAloone. 2015. "Application of Environmental Input-Output Analysis for Corporate and Product Environmental Footprints-Learnings from Three Cases." *Sustainability (Switzerland)* 7(9): 11438–61.

Kojima, Michikazu, Aya Yoshida, and So Sasaki. 2009. "Difficulties in Applying Extended Producer Responsibility Policies in Developing Countries: Case Studies in e-Waste Recycling in China and Thailand." *Journal of Material Cycles and Waste Management* 11(3): 263–69.

Ministry of Finance Republic of Indonesia. 2017. *Peraturan Menteri Keuangan No. 178/PMK.04/2017 Tentang Impor Sementara*. Indonesia: Indonesian Customs Depository.

Muchdie, Muchdie, and M Nurrasyidin. 2018. "Sector-Specific and Spatial-Specific Multipliers in Indonesian Economy: World Input-Output Analysis." *Jurnal Ekonomi Pembangunan: Kajian Masalah Ekonomi dan Pembangunan* 19(1): 64.

Nguyen, Trang. 2012. "Changes to the Role of US Customs and Border Protection and the Impact of the 100% Container Scanning Law." *World Customs Journal* 6(2): 109–18.

OECD. 2001. Oecd *Extended Producer Responsibility A GUIDANCE MANUAL FOR GOVERNMENTS*. Paris: OECD of PUblication Service. http://www.wastenet.net.au/Assets/Documents/Content/Information/EPR-Guide_for_Govt-2001.pdf%5Cnhttp://www.oecd-ilibrary.org/environment/extended-producer-responsibility_9789264189867-en.

Orlins, Sabrina, and Dabo Guan. 2015. "China's Toxic Informal e-Waste Recycling: Local Approaches to a Global Environmental Problem." *Journal of Cleaner Production* 114(2016): 71–80. http://dx.doi.org/10.1016/j.jclepro.2015.05.090.

Perkins, Devin N., Marie Noel Brune Drisse, Tapiwa Nxele, and Peter D. Sly. 2014. "E-Waste: A Global Hazard." *Annals of Global Health* 80(4): 286–95. http://dx.doi.org/10.1016/j.aogh.2014.10.001.

Robinson, T. 2005. "An Analysis of the Output and Employment Conversion Matrices of Australia ' s Economy An Analysis of the Output and Employment Conversion Matrices of." 2(2).

Siringoringo, Hotniar. 2013. "Consumption Model of Imported Products : Indonesian Case." *Procedia - Social and Behavioral Sciences* 81: 195–99. http://dx.doi.org/10.1016/j.sbspro.2013.06.412.

Siringoringo, Hotniar, Eko Sri, Anacostia Kowanda, and Trini Saptariani. 2013. "Shopping Behavior of Indonesian Consumer Towards Imported Products." *Procedia - Social and Behavioral Sciences* 81: 411–15. http://dx.doi.org/10.1016/j.sbspro.2013.06.452.

Statistic Bureau Center. 2015. *Tabel Input Output Indonesia 2010*. Jakarta, Indonesia: Statistic Bureau Center, Indonesia. https://www.bps.go.id/.

Stilwell, L.C., and R.C.A. Minnitt. 2000. "Input-Output Analysis: Its Potential Application to the Mining Industry." *The Journal of the South African Institute of Mining and Metallurgy* (December): 455–60.

Suahasil, Nazara. 2005. *Analisis Input Output*. 2nd ed. ed. Rahardja Prathama. Jakarta, Indonesia:

Lembaga Penerbit Fakultas Economi Universitas indonesia.

Tang, Xianjin et al. 2009. “Heavy Metal and Persistent Organic Compound Contamination in Soil from Wenling: An Emerging e-Waste Recycling City in Taizhou Area, China.” *Journal of Hazardous Materials* 173(1–3): 653–60.

Tristiana, Enis, Imam Koeswahyono, and Moh Fadli. 2018. “Managing Policy of Extended Producer Responsibility (EPR) Implementation to Reduce Plastic Waste in Indonesia.” 7(07): 25–32. http://www.ijhssi.org/papers/vol7(7)/Version-2/E0707022532.pdf.

Ubaidilah Zuhdi. 2017. “The Dynamics of Total Outputs of Indonesian Industrial Sectors: A Further Study.” *Journal of Physic: Conference Series*.

United Nations. 1999. *Handbook of Input-Output Table Compilation and Analysis*. New York: United Nations publication. https://digitallibrary.un.org/record/370160/files/ST_ESA_STAT_SER.F_74-EN.pdf.

———. 2015. “Transforming Our World: The 2030 Agenda for Sustainable Development.” *General Assembley 70 session* 16301(October): 1–35.

Wahyono, Sri. 2013. “Kebijakan Pengelolaan Limbah Elektronik Dalam Lingkup Global Dan Lokal.” *Jurnal Teknik Lingkungan* 14(1): 17–24.

Widdowson, David. 2007. “The Changing Role of Customs: Evolution or Revolution?” *World Customs Journal* 1(1): 31–37.

World Customs Organization. 1990. *Istanbul Convention on Temporary Admission*. Brussels. http://www.wcoomd.org/-/media/wco/public/global/pdf/about-us/legal-instruments/conventions-and-agreements/istanbul/istanbul_legal_text_eng.pdf.

———. 1999. *The Revised Kyoto Convention*. Belgium. http://www.wcoomd.org/en.

Yoshida, Aya et al. 2016. “E-Waste Recycling Processes in Indonesia, the Philippines, and Vietnam: A Case Study of Cathode Ray Tube TVs and Monitors.” *Resources, Conservation and Recycling* 106: 48–58. http://dx.doi.org/10.1016/j.resconrec.2015.10.020.

Chapter 4 Environmental impact of preferential trade agreements

4.1 Introduction

Trade has been agreed as one of the economic growth factors because of its impact to several economic sectors, such as investment and information technology development; however, it also has an effect on the environment. The more goods traded the more economic activity and the bigger the impact on the environment. The preferential trade agreements have been encouraged to increase the volume of trade between the parties involved. Currently, Indonesia is involved in several free trade agreements, and it which results in a growing volume of imported goods to be used in the economic activities as reflected in the Input-Output Table. This paper attempts to analyze the impact of the implementation of preferential trade agreement schemes in Indonesia by using the Environmentally Extended Input-Output Analysis method developed by Wassily Leontief. The final calculation shows the significance of carbon emissions released from agriculture sectors.

It has been agreed that international trade has an important relationship with the welfare of a society because of its effect on the economy, culture, policy, technological development, and other sectors (IMF, WB, and WTO 2017). The effect varies according to each country's conditions and strategy (Abdullahi, Safiyanu, and Soja 2016) (Zahonogo 2018). Every nation will attempt to find the most effective strategy regarding international trade, with the hope of increasing the import/export volume, stimulating economic growth, and producing a prosperous society (Vijayasri 2013).

One such effort is the preferential trade agreement in the form of the Free Trade Agreement (FTA) scheme with its main focus directed towards decreasing and/or eliminating import duties that are assumed as a barrier in international trade. This scheme is believed to be a profitable plan and one alternative to achieve a country's economic goals (Manger 2015).

The FTA scheme is growing rapidly in almost every country; the main goal being to realize the welfare of society by removing the main barriers e.g. imports duty so that could boost international trade. The World Trade Organization (WTO) has recorded more than 500 notifications of preference-based trade agreements (Hu, Reed, and Nemati 2008), which means almost every country in the world has been involved in a preferential trade agreement.

Indonesia has been considered to be one of the most active countries in improving its trade strategy trough FTA scheme by signing some agreements, including: 1) the ASEAN FTA (AFTA) which later become the ASEAN Trade in Goods Agreement (ATIGA) which is a special goods trade scheme; 2) the ASEAN-China FTA (ACFTA); 3) the ASEAN-Korea FTA (AKFTA); 4) the ASEAN-Australia New Zealand FTA (AANZFTA); 5) the ASEAN-India FTA (AIFTA); 6) the ASEAN-Japan Comprehensive Economic Partnership (AJCEP); 7) the Indonesia-Japan Economic Partnership Agreement (IJEPA); and 8) the Indonesia-Pakistan Preferential Trade Agreement (IPPTA), among others. Some of the FTA schemes are still in the ratification and negotiation process.

As explained before, the FTA scheme is mostly understood as an agreement to reduce and/or removing import duty tariffs, which in turn is believed to increase trade volume. However, as the volume of goods traded increases, this potentially adds to the materials to be processed, used goods, and waste in the field that potentially negatively influences the condition of environments in a negative way. In the absence of appropriate management, this potential damage is also the result of trade diversion and trade creation with the increase of new factories, affecting the condition of the air, water, soil, and biota (Vishuphong 2015).

The increase in trade volume also means the need to produce more goods to be traded, which in turn adds to the number of machines used and their operational hours, not to mention the increase in transportation. Needless to say, these machines and transportation modes are still largely dependent on fossil fuels, increasing the severity of environmental damage caused (Jonathan M. Harris 2004).

That condition strengthens the notion of International Trade not only affecting the economic situation of a country, but also have a significant effect on the environment and on the people themselves (Hu, Reed, and Nemati 2008) (Vishuphong 2015).

Problems occur when the link between the implementation of a preferential trade agreement scheme and environmental damage are unidentifiable. However, trade affects the environment in both positive and negative ways (Commission for Environmental Cooperation 1999). Therefore, it might be agreed that FTA schemes have an effect on the environment, whether on a large or small scale. This is also an important reason to perform an assessment of the substance of each agreement concerning the protection of the environment with regards to developing the FTA

scheme (Vutha and Jalilian 2008). The existence of provisions for environmental issues in a single environmental agreement could reduce the level of pollution (Morin and Gauthier Nadeau 2017).

Some experts have tried to examined several international trade agreements and found that there has been no innovation in the provision regarding environmental protection, while several agreements have used provisions similar to the old provision (Morin and Gauthier Nadeau 2017). Other agreements also only include the environmental provisions to fulfill the condition as a means to passing the ratification process, and not actually related to trade as meant in every free trade agreement (Morin and Gauthier Nadeau 2017).

The NAFTA is an example of a free trade agreement that has become a reference for many experts in relation to the environmental provision. This agreement has been equipped by another agreement, namely North American Agreement on Environmental Cooperation that inseparable from the main trade agreement (Commission for Environmental Cooperation 1999).

Furthermore, some experts have tried to analyze the environmental impact by using various tools. B. Resudarmo (Resosudarmo 2005) utilizes the Input-Output (IO) Table in his attempt to analyze environmental impact focusing on river pollution in Indonesia caused by economic growth. Vuta and Jalilian agree that IO analysis or the social accounting matrix (SAM) can be used to analyze the effect of FTAs on the environment in the Greater Mekong (Vutha and Jalilian 2008). However, because the available data was limited in terms of quality and quantity; they preferred to use the adjusted analysis method. Hu et al.'s (Hu, Reed, and Nemati 2008) effort to analyze the environmental effect of FTAs focuses on finding the relationship between greenhouse gas (GHG) emission, and the Panel Vector Error Correction Model as a tool.

This paper will perform analyses with a different perspective from previous research, by limiting the case of Indonesia internally as a member of several FTAs, and economic activities as reflected in the Indonesian IO table 2010 issued in 2015. The scenario will be: Since the first Indonesian FTA have been applied from 1994s after signing the CEPT-AFTA and followed by the ASEAN-China FTA, ASEAN-Korea FTA and so on, it can be assumed that from that year on imported material from partner's countries will be utilizing preferential tariff instead of normal tariff of import duties. The statistic books are also showing the import data from China, Japan, Korea, Singapore, Thailand, Malaysia, and India as the highest volume and value. All imported

material from those countries will be processed and becoming part of economic activities in Indonesia.

To emphasize, this paper will not analyze the process of trade between countries as reflected in the bilateral IO table or multi-countries IO table, but the process of utilization of imported materials from many FTAs partner countries that consumed domestically.

This paper will also look at the attention of free trade agreement concerning environment provisions. This result will be an input to the Indonesian government on how to deal with existing and future FTA schemes. The scope of this paper is limited to regional FTA schemes, namely: the ATIGA, ACFTA, AKFTA, AANZFTA, and AIFTA. By showing the effect of FTAs, we hope to remind the government of what to pay attention to when engaging in new negotiations with other countries.

4.2 Materials and methods

The first step in our methodology is to analyze the environmental provisions under each FTA, which is separated into two, specifically: 1) The content of articles related to the environment; and 2) Environmental management in the areas determined by the agreement. Article XX(a) and (b) of the General Agreement of Tariff and Trade (GATT) address the issue of a) protecting public morals; and b) protecting human, animal, and plant life or health (World Trade Organization 1992). To strengthen the argument, this study also uses NAFTA as a comparison; many experts consider NAFTA to be a good instrument for handling the environmental problem in relation to free trade (Baver 2011) (Richardson 1998) (Atik 1995) (Gene M. Grossman 1991). This evaluation ignores the effect of NAFTA on the environment itself, but only focuses on the substance of its agreement.

Another reason for using NAFTA as a comparison is the success of this agreement in the resulting supporting instruments annexed to the main agreement with full concern for the environment, namely: 1) the North American Agreement on Environmental Cooperation Commission (NAAEC) to address and monitor environmental issues; 2) the Commission for Environmental Cooperation (CEC) for executing the included provisions and monitoring environment-related issues; and 3) the joint Public Advisory Committee which provides access for Non-Governmental Organization (NGO) and allows input from the public.

Apart from that, the NAFTA also possesses a strong principal in executing environment-related agreements, specifically: 1) agreeing not to induce investment by becoming pollution havens; 2) establishing instruments about the utilization of regulations to protect consumer, plant, animal, and environmental health; and 3) giving priority to international treaties such as the WTO and Multi Environment Agreements (Colyer 2002).

The FTA scheme is a mechanism that decreases and/or removes the import duty tariff for specific goods as negotiated by parties involved in the signing of the agreement. The liberalization of import duties is a parameter of the success of the FTA scheme (Faiz, Hamid, and Aslam 2015).

As mentioned before, Indonesia has been a party to FTA schemes since 1994, and based on the national statistic, most Indonesian goods are imported from China, Japan, Singapore, South Korea, Malaysia, India, and Thailand. Other countries that Indonesia imports from are Australia, New Zealand, Vietnam, USA and European countries (Statistic Bureau Center 2010). Therefore, it can be assumed that most imported material involved in economic activities in Indonesia, as written in IO table, came from partner countries that receive preferential tariffs. Thus, the data in the Indonesian IO table fulfills the condition for a base evaluation regarding its effect on the environment using input-output (IO) analysis.

The second step is generating input-output tables from the Statistic Central Bureau of the Republic of Indonesia. The Indonesian IO table is assembled based on two versions of economic sector classification, namely the 185 sector and 17 sector classifications (Statistic Bureau Center 2015).

The focus of the analysis is the effect of the preferential agreement scheme on the environment. A modification to the IO table is necessary so that several sectors can be re-categorized into CO_2 emitting sectors, while the rest are combined with the remaining sectors. This step is the biggest hurdle, requiring changing 17 sectors into 5 CO_2 emission producing sectors. This was implemented to ease manual conversion based from each sector that emits CO_2, compared with the 17 sectors used in the IO table (Statistic Bureau Center 2015).

After the aggregation process, the next step is to combine the IO table with the list of sectors that produce CO_2. It needs to be noted that the IO table uses monetary units, while sectors that

produce CO_2 use physical units (Tons). This is good information in finding the volume of CO_2 emitted for every Indonesian Rupiah (IDR).

After combining the aggregated IO table with the sectors that producing CO_2, the third step is to calculate the data utilizing IO analysis.

The main reason for using IO Analysis is because it is quite a simple tool and is able to evaluate and provide a conception of the relationship between economic consumption and its effect on the environment, including the effect of the international trade of goods and services (Kitzes 2013). This tool is currently widely used to evaluate the upstream consumption-based drivers of downstream environmental effect and to evaluate the environmental effect embodied in goods and services that are traded between nations. In principle, this coincides with this study's goal, which is to analyze the effect of FTA implementation on the environment, specifically the effect of CO_2 emission. However, the data will be limited to economic activities in Indonesia.

Under the input-output analysis procedure, we have to establish a coefficient technology (CT) to form matrix elements with units in Tons per IDR (Tons/IDR) based on the formula below:

$$\mathrm{CT} = \frac{Pollution}{Sectors} = \frac{Ggrams}{IDR}. \qquad (1)$$

The coefficient technology determines how large the total annual outputs of each sector must be if they are to satisfy not only the given direct demand. In other words, technical coefficients reflect the direct effects of change in final demand.

According to the sectors in the IO table, it will be a 5x5 matrix. However, because the purpose is to find the amount of CO_2 in every IDR of the sector, we need to extend the table by adding one row from the GHG report and one column to form a square matrix (Leontief 1970).

Based on the expanded coefficient technology which added one column to form a square matrix, we can then calculate the inverse matrices as a coefficient multiplier which will become a deciding factor in calculating the effect of international trade towards environment, in form of CO_2 produced for each million IDR. The coefficient multiplier (CM) can be calculated as formula below:

$$\mathrm{CM} = (\mathrm{I} - \mathrm{CT}) \qquad (2)$$

I = Identity matrix

Every IDR 1 of final demand in a sector generates indirect as well as direct pollution effects. That is the function of the coefficient multiplier.

After obtaining the multiplier matrix, then the last step is calculating the total pollution (TP) as an impact of the implementation of the FTA scheme, by using the formula below:

$$\mathrm{TP} = (\mathrm{I} - \mathrm{CT})^{-1}\mathrm{Total\ Output}. \quad (3)$$

Ideally, there will be two calculations in monetary and physical units. However, the input-output table published by the Indonesian Statistic Central Bureau only provided information in currency, resulting in only one table.

Despite this, the calculation above allows us to show the general effect of international trade on CO_2 emission in Indonesia. This is because the data regarding raw material export/import involved in the input-output process of each sector is inseparable.

4.3 Results

In 1992, all ASEAN countries agreed to establish the first preferential tariff agreement, called the Common Effective on Preferential Tariff (CEPT) as the main mechanism of the ASEAN Free Trade Agreement or AFTA. This agreement regulated maximum rate of import duty for agreed products at a maximum of 5% in 2003. This ambition was climbing when the ten countries continued their effort to reduce more the import duty rate to lower than 5% by amending the CEPT AFTA becomes the ASEAN Trade in Goods Agreement (ATIGA).

Currently, the ATIGA is the most liberal mechanism in the ASEAN, in terms of the import duty rate. Other agreements came into force after this successful agreement, beginning with the ASEAN-China FTA and the ASEAN-Korea, among others.

The analysis of the environmental provisions in all Indonesian FTA schemes was conducted manually by studying each of them, and then collecting environment-related provisions in the selected agreements.

It is not too difficult in finding the provisions of environment in the agreements; because the majority of countries involved in FTA schemes are members of the ASEAN, the format and substances of the agreement might be the same, including the environmental concern.

Based on the analysis of the all trade agreements under the preferential trade agreement format, several provisions have shown their concern towards the environment, as shown in the Table 4.1.

Table 4.1. List of Articles in the Agreements

SCHEME	ARTICLE	SUBSTANCES	IMPLEMENTATION
ATIGA (2009)	8	Applying Article XX GATT Principle of Trade Facilitation Sanitary and Phytosanitary (SPS) measures	ASEAN Strategic Plan on Environment 1994
	47	Principle of Trade Facilitation	
	79-85	SPS measures	
ACFTA (2004)	7	the WTO disciplines	Memorandum of Understanding SPS-2007
	12	Article XX GATT	
AKFTA (2006)	7	the WTO disciplines	ASEAN-Korea Environmental Cooperation Project-2005
	8 (3)	Regulation, procedure, and contact point	
	11	Article XX GATT	
AJCEP (2008)	38-42	SPS measures, Sub-Committee, Regulation, procedure, and contact point	ASEAN-Japan Environmental Cooperation Initiative-2007
AANZFTA (2009)	1	Applying the SPS measures	Joint Statement of The ASEAN-Australia Special Summit: The Sydney Declaration-2018
AIFTA (2009)	8	NTM include SPS	ASEAN-India Environment Ministers Meeting-2012

The table illustrates that in general, the agreements focus on accommodating the substance of Article XX in the General Agreement on Tariff and Trade (GATT), for example, paragraph (a) necessary to protect public morals; and paragraph (b) necessary to protect human, animal, and plant life or health.

Furthermore, they included Sanitary and Phytosanitary (SPS) measures as part of the principle of trade facilitation.

There is another trade and environment issue: whereas some experts support including environmental issues in the preferential agreement, others think that environmental issues could hinder the success of trade (Colyer 2002). Perhaps, this argument is the cause of the limited environmental information in the FTA schemes.

Table 1 also showed environmental-related initiatives and collaborations between the parties involved in the FTA scheme.

In the form of ASEAN cooperation, 10 countries have developed the ASEAN Strategic Plan on Environment in 1994. Within Members of the ASEAN-China FTA, they established an MoU on SPS in 2007. The other groups have also shown their concern by establishing environmental instruments. However, there is no information about the relationship between their preferential trade agreements and further environmental cooperation, despite several initiatives mentioning trade-in goods (Secretariat 2007) (ASEAN Secretariat 1995).

Following the agreements, the members agreed to establish a working group which would discuss more detail and monitor the implementation of a customs procedure sub-committee, a rules of origin sub-committee, and even an SPS sub-committee. However, it seems that the main focus of the working group is discussion of increasing trade volume and also the elimination of matters considered as obstacles to the smooth flow of goods are preferred.

Furthermore, we could examine how the environmental provisions in all the FTA schemes refer to GATT under the WTO Discipline. This is understandable, considering the FTA initiative is also one of the reflections of Article XXIV GATT.

As mentioned before, this paper was developed with the assumption that international trade transactions between Indonesia and her FTA partners are utilizing facilities available in the agreement. Hence, the values in the Indonesia's IO table are transactions that already utilize the facilities in the FTA scheme, where the imported materials for sector purposes have enjoyed the preferential tariff.

Based on this assumption, the next calculation is required to know the effect of the transactions of all sectors in the OI table on the environment through the measurement of the amount of CO_2 released because of activities in these sectors.

Before calculating the released CO_2, it is necessary to develop a correlation table, as shown in Table 4.2, between the classifications in the IO table and the CO_2 producing sectors.

Table 4.2 Correlation of IO Table Classification and Emission Sectors

IO Table		Indonesia GHG Report				
IO-CODE	CLASSIFICATION	NO	SECTORS	UNIT	QTY	COVERAGE
002 004	Mining Electric and gas procurement	1	Energy	Gg CO2	652,070.00	Power plant, Fuel and gas, Coal mining, Transportation,

008	Transportation and warehouse					Industries, Energy commercial area, Energy in household
009	Accommodation, food and beverage					
003	Manufacture	2	IPPU	Gg CO2	48,665.00	Manufacture, Product utilization
001	Agriculture	3	Agriculture, LULUCF and Peat	Gg CO2	1,656,310.00	Livestock, Farming, Fisheries, Forest and land usage
005	Water procurement, waste management, and recycling	4	Waste	Gg CO2	95,381.00	Municipal solid waste, liquid domestic waste, pharmacy waste, liquid industry waste
006	Construction	5	Rest of Sectors	Gg CO2	0.00	
007	whole seller and retail, car and motorcycle reparation					
010	Information and communication					
011	Financial services and insurance					
012	Real Estate					
013	Company services					
014	Government administration, defence, and social guarantee					
015	Education services					
016	Health services and social aktivities					
017	Other services					

The IO Code is a classification code for economic sectors used in the Indonesian IO table for 17 sectors. In column 4 of Table 4.2 above, the economic sectors are classified as CO_2 producing sectors according to the Indonesian GHG report, while in the first column, Table 4.2 shows the classification of economic sectors based on the IO table.

The IO table has 17 classifications and the CO_2 producing sectors have 5 sectors. Based on the coverage of CO_2 pollution emitting sectors, the table shows the aggregation result where the CO_2 sectors cover the mining, electric and gas procurement, transportation and warehousing, accommodation, food, and beverage sectors. The other aggregation results can be seen in the table.

Table 4.2 also combines the agriculture and forestry sectors in the GHG report, because the same treatment is also applied in the IO table. This combination results in the high CO_2 emissions from the agricultural sector.

The calculation of the value in the IO table's sectors use financial parameter, counted in millions IDR. However, the value of each sectors in the GHG table are in weight (Giga-grams), but this study will use tons as the unit. This is in line with the study's purpose to find the volume of CO_2 emissions from the economic sector.

This summary can be seen in Table 4.3, where the first to fifth rows and columns are generated from the IO table, and the last rows were taken from the GHG report.

Table 4.3 Modified IO Table Indonesia (Unit: millions IDR)

Sectors	Energy	Manufacturing	Agriculture	Waste	Rest of Sectors	Total Demand
Energy	339,212,444	512,684,932	1,367,464	769,608	271,552,976	2,192,224,118
Manufacturing	462,393,728	1,460,592,164	99,970,698	1,964,701	1,379,003,329	6,910,783,320
Agriculture	81,610,546	697,880,636	64,002,251	-	51,462,542	1,482,845,362
Waste	1,152,687	9,094,944	82,225	798,389	4,164,881	30,864,691
Rest of Sectors	152,211,181	137,912,473	43,770,736	611,120	651,174,110	4,210,576,083
CO2 Emission (Tons)	652,070	48,665	1,656,310	95,381	0	

The highest cost of activity belongs to manufacturing sector, IDR 1,460,592,164 million and the highest demand as well, IDR 6,910,783,320 million.

Again, since the implementation of preferential tariffs began around 1994, with importers have preferring to enjoy the facilities; the goods in all sectors are assumed imported utilizing preferential tariffs as set-up in the agreements.

The coefficient technology in the last row of Table 4.4 shows the contribution of each sector to air pollution. For example, in the energy sector every IDR 1 could contribute 0.00030 Tons.

Table 4.4 Coefficient Technology

Sectors	Energy	Manufacturing	Agriculture	Waste	Rest of Sectors
Energy	0.15473	0.07419	0.00092	0.02493	0.06449
Manufacturing	0.21092	0.21135	0.06742	0.06366	0.32751
Agriculture	0.03723	0.10098	0.04316	0.00000	0.01222
Waste	0.00053	0.00132	0.00006	0.02587	0.00099
Rest of Sectors	0.06943	0.01996	0.02952	0.01980	0.15465

Pollution (Tons/IDR)	0.00030	0.00001	0.00112	0.00309	0.00000

Pollution related with the consumption and production process is depicted from the total output similar to the independence structure with all sectors in the IO table (Tiago Camarinha Lopesa 2016). In the table above, the pollution column gives good information in physical/currency units, showing the clear effect of international trade. The highest pollution is in the waste sector, for example, 0.00309 tons/million IDR, while the smallest is produced by the manufacturing sectors amounting to 0.00001 tons/million IDR. The rest of the sectors have the smallest waste substance, e.g.: 0.0000 tons/million IDR. This is understandable as the sector is comprised of mostly service sectors.

By utilizing formula (2) we can create a multiplier matrix that could be used to calculate the effect of sector activities. The highest coefficient given by input from manufacturing to manufacturing sectors (1.33220 Tons/million IDR), contradictive with the coefficient technology before, that showed waste sectors have the highest amount. This is a normal situation when manufacturing is one of the most polluted sectors in the world (Lü, Geng, and He 2015) (Rajala, Westerlund, and Lampikoski 2016). To this end, this sector has to be broken down further to find out the major impact. However, this paper will only analyze the impact in general without identifying detail of industries.

Based on the calculation of the multiplier coefficient on total output as in formula (3) it was found that the biggest contributor to carbon emissions was the agricultural sector resulting in 1,760,745.61 Tons, followed by the manufacturing sector with 1,480,083.50 Tons, as shown in the seventh row of Table 4.5.

Table 4.5 Leontief Invers Matrix

Sectors	Energy	Manufacture	Agriculture	Waste	Rest of Sectors	
Energy	1.22536	0.12069	0.01402	0.04211	0.14049	0.00000
Manufacture	0.38233	1.33220	0.11112	0.10796	0.54703	0.00000
Agriculture	0.08947	0.14589	1.05790	0.01342	0.07866	0.00000
Waste	0.00130	0.00192	0.00026	1.02675	0.00205	0.00000
Rest of Sectors	0.11282	0.04650	0.04072	0.03052	1.21019	0.00000
Emission (Tons/IDR)	0.00047	0.00021	0.00119	0.00320	0.00014	1.00000

Total Emission of Final Demand	1,032,787.74	1,480,083.50	1,760,745.61	98,805.65	588,767.92	-

In Table 4.3, the agriculture sector has shown the highest pollution value for example, 1,656,310 tons. This amount was taken from the sum of CO_2 in the agriculture (111,310 tons of CO_2) and forestry (1,545,000 tons of CO_2) sectors in the GHG report. To be consistent, referring to the IO table, these two sectors are in the same group.

As a matter of fact, merging these two sectors has resulted in a large amount of pollution, and has caused the agriculture produce to have a higher amount of CO_2 emissions than the energy sector does.

Furthermore, the 2018 Greenhouse Gas Inventory report does not mention the impact of international trade on carbon emissions, so there is no accurate data on whether the calculation of achieving Indonesia's carbon emission reduction targets has taken into account overall international trade activities, including domestic production processes using ex-imported raw materials.

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4.4 Conclusions

Based on the calculations using IO analysis, it can be seen that the economic activities in the 2010 Indonesia IO table have provided an overview of the carbon emissions released, with the highest coming from the agricultural sector. This situation should be monitored carefully considering that Indonesia has set a target of reducing 834 million tons of CO_2 under the unconditional target and 1,081 million tons of CO_2 under the conditional target by 2030 (The Ministry of Environment and Forestry 2017). Although some elements in this study need to be improved, this research has shown a significant potential for carbon emissions. The things that require optimization include the availability of data on export-import and local goods, both types and quantities, so that the research could examine the monetary and physical aspects.

The biggest carbon emission comes from international trade in relation to the agricultural, manufacturing, and energy sectors. Therefore, Indonesia must immediately carry out a strategy of using environmentally friendly materials and goods related to the three sectors.

To optimize the availability of information in the IO table and also the greenhouse gas inventory report, monitoring and calculation of carbon emissions related to international trade should be included in the annual report of all statistic reports.

References

Abdullahi, Abubakar Okuwa, Shuaibu Sidi Safiyanu, and Tsalla Soja. 2016. "International Trade And Economic Growth : An Empirical Analysis Of West Africa." *IOSR Journal of Economics and Finance* 7(2): 12–15. http://www.iosrjournals.org/iosr-jef/papers/Vol7-Issue2.

ASEAN Secretariat. 1995. *ASEAN Agreement on Trans-Boundary Haze Pollution*. ASEAN. https://haze.asean.org/?wpfb_dl=32.

Atik, Jeffrey. 1995. "Environmental Standards within NAFTA : Difference by Design and the Retreat from Harmonization." *Indiana Journal of Global Legal Studies* 3(1): 81–103.

Baver, Sherrie. 2011. "NAFTA, CAFTA and the Environment: The Role of Institutions." 1(Automne): 1–14.

Colyer, Dale. 2002. "Environmental Provisions in Trade Agreements." *Agricultural and Resource Economics*. https://ageconsearch.umn.edu/bitstream/19103/1/cp04co02.pdf.

Commission for Environmental Cooperation. 1999. Group *Assessing Environmental Effects of the North American Free Trade Agreement (NAFTA)*. Montreal, Canada: Scan Express. http://www3.cec.org/islandora/en.

Faiz, Mohammed, Shaul Hamid, and Mohamed Aslam. 2015. "Utilization of Preferential Tariff under ASEAN Free Trade Area (AFTA): Analysis on Malaysia." *Proceedings of ISER 9 th International Conference, Berlin, Germany* (October): 14–20. http://www.worldresearchlibrary.org/up_proc/pdf/93-144644312514-20.pdf.

Gene M. Grossman, Alan B. Krueger. 1991. "Environmental Impacts of a North American Free Trade Agreement." *NATIONAL BUREAU OF ECONOMIC RESEARCH* 3914. https://search.proquest.com/docview/230971373/fulltextPDF/57132ABA53804B98PQ/1?accountid=7121%0Ahttp://www.nber.org/papers/w3914.pdf%0Ahttps://ac.els-cdn.com/S0048969712009217/1-s2.0-S0048969712009217-main.pdf?_tid=50302c06-73ad-460f-a0a4-cdbcbf924af6&acd.

Hu, Wuyang, Michael Reed, and Mehdi Nemati. 2008. "Are Free Trade Agreements Good for the Environment." *Ageconsearch*. http://ageconsearch.umn.edu/bitstream/235631/2/Nemati_AAEA_Are_Free_Trade_Agreem

ents_Good_for_the_Environment.pdf.

IMF, WB, and WTO. 2017. “Making Trade an Engine of Growth for All.” : 64.

Jonathan M. Harris. 2004. Global Development And Environment Institute *Trade And The Environment*. Medford: Tufts University. http://www.ase.tufts.edu/gdae/education_materials/modules.

Kitzes, Justin. 2013. “An Introduction to Environmentally-Extended Input-Output Analysis.” *Resources* 2(4): 489–503. http://www.mdpi.com/2079-9276/2/4/489/.

Leontief, Waasily. 1970. “Environmental Repercussions and the Economic Structure : An Input-Output Approach.” *The Review of Economics and Statistics* 52(3): 262–71.

Lü, Yong Long, Jing Geng, and Gui Zhen He. 2015. “Industrial Transformation and Green Production to Reduce Environmental Emissions: Taking Cement Industry as a Case.” *Advances in Climate Change Research* 6(3–4): 202–9. http://dx.doi.org/10.1016/j.accre.2015.10.002.

Manger, Mark. 2015. “Politics of Preferential Trade Agreements.” *Oxford Bibliographies* (May): 1–27.

Morin, Jean-Frédéric, and Rosalie Gauthier Nadeau. 2017. “Environmental Gems in Trade Agreements Little-Known Clauses for Progressive Trade Agreements.” *Center for International Governance Innovation* (148). https://www.cigionline.org/sites/default/files/documents/Paper no.148.pdf.

Rajala, Risto, Mika Westerlund, and Tommi Lampikoski. 2016. “Environmental Sustainability in Industrial Manufacturing: Re-Examining the Greening of Interface’s Business Model.” *Journal of Cleaner Production* 115: 52–61. http://dx.doi.org/10.1016/j.jclepro.2015.12.057.

Resosudarmo, Budy P. 2005. “River Water Pollution in Indonesia: An Input-Output Analysis.” *International Journal of Environment and Sustainable Development* 2(1): 62.

Richardson, Sarah. 1998. “Sovereignty, Trade, and the Environment -- the North American Agreement on Environmental Cooperation.” *Canada-United States Law Journal* 24(January): 183. http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=1774438&lang=ja&site=ehost-live.

Secretariat, ASEAN. 2007. *Memorandum of Understanding Between The Association of Southeast Asian Nations and The Government of The People’s Republic of China on Strengthening Sanitary and Phytosanitary Cooperation*. ASEAN and China: https://asean.org/wp-content/uploads/archive/21089.pdf. https://asean.org/wp-content/uploads/archive/21089.pdf.

Statistic Bureau Center. 2010. *Statistik Perdagangan Luar Negeri-Indonesia (Jilid I)*. Jakarta, Indonesia. https://www.bps.go.id/publication.

———. 2015. *Tabel Input Output Indonesia 2010*. Jakarta, Indonesia: Statistic Bureau Center,

Indonesia. https://www.bps.go.id/.

The Ministry of Environment and Forestry. 2017. *Laporan Inventarisasi GRK Dan Monitoring, Pelaporan Dan Verifikasi*. Jakarta, Indonesia. http://www.menlh.go.id/download.

Tiago Camarinha Lopesa, Henrique Dantas Neder. 2016. "Sraffa, Leontief, Lange: The Political Economy of Input–Outputeconomics." *Economia* (18): 192–211. http://dx.doi.org/10.1016/j.econ.2016.08.001.

Vijayasri, G V. 2013. "The Importance of International Trade in the World." *International Journal of Marketing* 2(9): 111–19.

Vishuphong, Panisa. 2015. "Rethinking the Relationship between International Trade and Environment:Thailand as a Case Study." *Forum of International Development Studies* 45(4): 62–80. https://www.gsid.nagoya-u.ac.jp/bpub/research/public/forum/45/04.pdf.

Vutha, Hing;, and Hossein Jalilian. 2008. "Environmental Impacts of the ASEAN-China Free Trade Agreement on the Greater Mekong." *International Institute for Sustainable Development* (September).

World Trade Organization. 1992. 1 Review of European Community & International Environmental Law *General Agreement on Tariffs and Trade*.

Zahonogo, Pam. 2018. "Globalization and Economic Growth in Developing Countries: Evidence from Sub-Saharan Africa." *International Trade Journal* 32(2): 189–208. http://dx.doi.org/10.1016/j.joat.2017.02.001.

Chapter 5 Impact of final demand changing on EEE sectors to waste management sectors

5.1 Introduction

The development of technology is increasing rapidly so that the variety of electrical and electronic products (EEE) is increasingly varied, and also increasing in volume. This situation will automatically also potentially increase the volume of Waste of Electric and Electronic Equipment (WEEE) which should be of serious concern. Indonesia is a large consumer of EEE, so it needs to anticipate potentials by providing good WEEE management. Using the latest version of the Input-Output Table in Indonesia, this paper analyzes the impact of an increase in the final demand of the EEE sector on the waste management sector, using an Input-Output Analysis (IO analysis). Based on the final calculation it was found that the costs in the waste management sector increased quite high, so did the EEE sector. However, due to limited data, this paper only analyzes from the point of view of the currency unit (Indonesian Rupiah-IDR), it does not include the physical unit of the EEE itself.

Electronic products have become a necessity for all humanity. Rapid technological developments are realized by the development of electronic products for the ease of human life, so that there is a dependency of human life to always be updated on new electronic products. Advance functions are increasingly attached to electronic products. In utilizing the electronic products, they are also depending on electrical components. Therefore, automatically both electronic and electric will always be needed, both are named as Electrical and Electronic Equipment (EEE) (Krishnan et al. 2017).

As a matter of fact, the large population makes Indonesia one of the countries targeted for the sale of any products, including EEE. This is evidenced by Indonesia's position as one of the countries that has a large enough consumption for EEE, both originating from local and imported from several countries, such as Japan, China, Europe, etc. (Siringoringo 2013) (Siringoringo et al. 2013). However, so far Indonesia has only been a user of EEE either for business or pleasure, without thinking about the impact of the increasing volume of EEE that have become waste or potential waste (Kiddee, Naidu, and Wong 2013). This is due to the low level of public awareness and understanding of the potential hazards contained by the EEE which greatly endangers human health and the surrounding environment (Perkins et al. 2014)(Bo and Yamamoto 2010)(Gupta,

Modi, and Saini 2014), as well as the unavailability of adequate recycling facilities for EEE in Indonesia (Grant et al. 2013), but is still in the form of a simple process by informal businesses (Kojima, Yoshida, and Sasaki 2009).

Some researchers have shown the studies and facts about the dangers of metal content and other elements in EEE that could contaminate the environment due the lack of properly handling as explained in some paper (Frazzoli et al. 2010) (Perkins et al. 2014) (Tang et al. 2009) (Fu et al. 2007) and many other studies. Based on these facts, it is clear that the government must pay serious attention to the potential impact of the environment by the hazardous nature of any electronic goods that are not handled properly.

In general the Indonesian government has tried to deal with WEEE, as we can see from Government Regulation Number 101 of 2014 (Republic Indonesia 2014), although no technical regulations have been provided to implement it. The absence of technical guidelines for handling WEEE is quite complicated, because there are no clear standards that become a reference for recycling entrepreneurs in handling such types of waste.

Based on the facts above, that: 1) In line with technological developments, the trading volume of EEE will increase and will ultimately affect the number of WEEE. This can be assumed that there is an increase in market demand for EEE; and 2) In the increase of demand of EEE and the absence of technical guidelines for the processing of WEEE in Indonesia, this paper examines the effect of changes in final demand in the EEE sector to the management sector of WEEE, using Input-Output Analysis to invite the awareness of government and society.

Table IO does not specifically separate WEEE processing from other types of waste (Statistic Bureau Center 2015), but globally. However, because the changes in the final demand studied were only limited to sectors related to EEE, then it can be assumed that any impact happened during the analysis is also limited to the changes in management of WEEE processing only.

Research on changes in final demand in the electronics sector of the Indonesian IO table has been carried out before, for example Ubaidillah Zuhdi (Zuhdi 2014) although it is limited to changes in the final demand for ICT sectors without looking further about their effects on the waste management sector. The same researcher also used IO analysis to see the effect of final demands

changes on the energy sector (Zuhdi 2015). Leontief itself has actually introduced IO analysis to be a tool in analysing the impact of the economic sector on the environment, by modifying it into Extended IO analysis in units, although it does not see the impact of one sector on other sectors (Leontief 1970).

This paper is different from the previous paper, which maximizes the economic sector in the IO table, specifically the EEE sectors, to see its impact on other sectors, namely the waste handling sector.

Waste management sector in Indonesia IO Table covers economic activities / business fields related to the management of various forms of waste/ rubbish, including solid waste or not, which can pollute the environment (Statistic Bureau Center 2015).

5.2 Methodology and data collection

The purpose of this paper is to determine the effect of changes in the final demands output of the EEE sector on the waste treatment sector using Input-Output Analysis (IO Analysis).

The main reason for using IO Analysis, that was developed by Wassily Leontief (United Nations 1999), is because it is quite a simple tool and is able to evaluate and provide a conception of the relationship between economic consumption and its effect on the environment, including the effect of the international trade of goods and services (Kitzes 2013). This is in line with the purpose of this paper, which is to look at the relations between selected sectors in the IO table.

The first step in this methodology is collecting data from the last version of the Indonesian IO table, namely the 2010 Indonesian IO Table, issued by the Central of Statistics Bureau in 2015, consisting of 185 economic sectors, with the table format as Table 5.1 below.

The paper will calculate the whole 185 economic sectors and then separate the selected sectors to be displayed in the related tables.

Table 5.1. IO Table Format

	Sectors			Final Demand	Output
Sectors	X11	……	X1185	Y	X
	……	……	……		
	X1851	……	X185185		
Value Added		V			
Total Input		X			

Based on the explanation from the IO table book, selected sectors that suitable with the EEE sectors would be as shown in the Table 5.2.

Table 5.2. Selected sectors used in this study

No	Sector Number	Sector Name
1	121	Electronic Goods, Communications and Equipment
2	122	Measurement, Photography, Optical and Clock
3	123	Electric Power Machines and Motors
4	124	Electrical Machines and Equipment
5	125	Batteries
6	126	Other Electrical Equipment
7	127	Electric Appliances for Households
8	148	Scrap, waste and Recycling Management

This paper analyses changes in the final demand of the EEE sector (sectors 121 to 127) and looks at its impact on sector 148. This is assuming that, increasing the EEE sector will lead to the potential increase in the volume of WEEE, and finally will be affecting the amount of waste management sector costs.

In accordance with the rules of the IO analysis, based on the obtained data, the next step is calculating the technology coefficient, which is the ratio of inputs between sector i to sector j with total input sector j, as can be seen in the following formula:

$$a_{ij} = \frac{x_{ij}}{X_j} \quad (1)$$

Technology coefficient is also called the input coefficient because it illustrates how a combination of the use of inputs to produce one unit of output, which in turn will describe the role of each sector in the formation of a sector's output.

The results of this calculation are then calculated further to get the Inverse Matrix of Leontief which is then known as Multiplier Coefficient or Multiplier Output (MC), through the following equation:

$$\mathrm{MC} = (I - A)^{-1} \quad (2)$$

This coefficient has been recognized as a tool to predict the impact of changes in one component in the IO table, as well as the final demands (Ronald E. Miller and Peter D. Blair 2009).

In the process of calculating changes, this paper makes a simulation by adding 22% to the final demands in the IO table 2010. This is consistent with the results of a study by the Ministry of Industry of the Republic of Indonesia which found an increase of 22% for consumer goods, including goods electronic (Perindustrian 2019). After the modified final demand value is obtained, it is then multiplied by MC, so that a new total output is obtained for each selected sector.

5.3 Results

Final demand is the demand for goods and services for consumption, not for the production process. Final demand consists of household consumption expenditure, government consumption expenditure, gross fixed capital formation, changes in stock and exports. The goods and services used to meet the final demand consist of domestic and imported products (Statistic Bureau Center 2015). Therefore, changes in final demand will certainly have an impact on intermediate output.

The 22% change scenario in the final demands does not automatically change transactions between sectors by the same percentage, given the dependence from one sector to another. This is what Leontief did by empowering the flexibility of the MC so that the consequences of the changes in the final demands can be predicted. Other assumptions may be applied, such as price changes that are considered fixed, technologies that are considered unchanged, and so on.

Table 5.3. Modified final demand for selected sectors (IDR million)

Sectors	1800	3090	3090t
121	118,052,790	275,957,446	336,668,084
122	27,272,927	36,330,170	44,322,807
123	14,076,592	11,135,580	13,585,408
124	34,372,911	18,702,042	22,816,491
125	7,910,754	10,103,425	12,326,179
126	33,778,622	46,373,778	56,576,009
127	10,959,455	29,061,309	35,454,797
148	405,263	6,564,262	6,564,262

The report from the Ministry of Industry does not specify the percentage of each industry sector. Therefore, in this paper it is assumed that the final demand for selected sectors has both increased consumption by 22% as shown in table 5.3 above.

Column 1800 is an intermediate output, while column 3090t is a final demand column that has been modified after an additional 22% increase in the volume of public consumption. In row 148 there was no change because the assumption of increased volume only occurred in the EEE sector.

As explained above, this paper makes modifications by giving an increase of 22% to the final demand (column 3090t) and looking at its impact on the value of the sector 148.

As the method described above, the first step taken is to calculate CT, dividing each sector's value by total input. The results of these calculations can be seen in table 5.4 below.

Table 5.4. Coefficient technology of selected sectors

Sectors	121	122	123	124	125	126	127	148
121	0.28559	0.30147	0.24808	0.15435	0.39405	0.08718	0.08674	0.00102
122	0.05074	0.15750	0.02368	0.02351	0.02428	0.01422	0.01432	0.00515
123	0.05167	0.00000	0.14728	0.09717	0.00000	0.00008	0.00008	0.00049
124	0.07279	0.00612	0.06228	0.15876	0.00008	0.06013	0.05962	0.00040
125	0.00454	0.00000	0.00001	0.00101	0.00880	0.00000	0.00002	0.00000
126	0.06090	0.05977	0.06217	0.06294	0.05973	0.09517	0.09612	0.00000
127	0.00066	0.00022	0.00111	0.00158	0.00020	0.01456	0.01442	0.00000
148	0.00004	0.00011	0.00021	0.00012	0.00013	0.00006	0.00010	0.00000
Total	0.52694	0.52519	0.54482	0.49944	0.48727	0.27141	0.27142	0.00707

Table 4 only illustrates the relationship between sectors in smaller amounts, where to produce IDR 1 output of sector 121 required material (intermediate input) of IDR 0.52694 which is the supply from sectors 121 to 127 and sector 148.

Table 5.5. Multiplier Coefficient of selected sectors

Sectors	121	122	123	124	125	126	127	148
121	1.5621	0.5909	0.5328	0.4011	0.6605	0.2358	0.2264	0.0181
122	0.1066	1.2305	0.0758	0.0689	0.0768	0.0431	0.0416	0.0092
123	0.1140	0.0458	1.2237	0.1682	0.0497	0.0293	0.0281	0.0029
124	0.1651	0.0831	0.1591	1.2582	0.0806	0.1265	0.1212	0.0073
125	0.0078	0.0032	0.0031	0.0036	1.0124	0.0017	0.0017	0.0003
126	0.1400	0.1370	0.1453	0.1406	0.1321	1.1593	0.1543	0.0050
127	0.0046	0.0038	0.0054	0.0059	0.0037	0.0208	1.0199	0.0008
148	0.0002	0.0003	0.0004	0.0003	0.0003	0.0002	0.0002	1.0001
Total	2.1005	2.0945	2.1455	2.0468	2.0161	1.6168	1.5934	1.0437

The next step is to calculate the MC by using formula (2) above to get the coefficient that will be used in the final step later. The results of the MC calculation can be seen in the table 5.5 above. In table 5.5 it can be interpreted that, for example sector 121, every increase in demand of IDR 1 in this sector, it will affect the increasing of IDR 2.1005 on EEE and waste management sectors.

Based on the MC and modified final demand, we can calculate the new output by multiplying the two so that we get the results as in table 5.6 below:

Table 5.6. New output of selected sectors

Sectors	1800	3090	3090t	New Output
121	118,052,790	275,957,446	336,668,084	770,853,891
122	27,272,927	36,330,170	44,322,807	136,758,234
123	14,076,592	11,135,580	13,585,408	98,813,986
124	34,372,911	18,702,042	22,816,491	169,911,673
125	7,910,754	10,103,425	12,326,179	25,867,554
126	33,778,622	46,373,778	56,576,009	183,413,825
127	10,959,455	29,061,309	35,454,797	49,531,676
148	405,263	6,564,262	6,564,262	7,338,441

As has been mentioned before that this paper only focuses on the impact that occurs on the waste management sector if there is a 22% increase in final demand. Based on table 6 it can be

seen that the change in output in the 148 sector is quite high compared to the output of the previous economic sector, from IDR 405,263 million to IDR 7,338,441 million.

Just to add awareness of the relevant parties, as a result of a 22% increase in the final demand of the EEE sector there was a very high increase in transaction value, so it is assumed that the volume of goods has also increased, so that the potential of the WEEE will also increase in volume, so it needs to be anticipated with waste management balanced. The allocation of costs to sector 148 needs to be considered for evaluation.

5.4 Conclusions

The need for EEE cannot be avoided along with technological developments in human life. This has the consequence of increasing the volume of WEEE that must be handled by every country, including Indonesia. Indonesia's large population is very promising for manufacturing companies by making it one of the main markets. Therefore, the volume of WEEE in Indonesia will also continue to grow, not only from within the country, but also from imported goods.

Based on a simulation of a 22% increase in WEEE consumption in final demand, using IO analysis, it turns out that the amount of EEE consumption is quite high, while it can be assumed that the potential increase in the volume of WEEE in the same amount. In the sector analyzed, sector 148, there was also an increase in the cost of handling waste is very high, from IDR 405,263 million to IDR 7,338,441 million. This research will be better if there is information on the amount of WEEE in physical units, not only in the form of fees or currency units.

References

Bo, Bi, and Kayoko Yamamoto. 2010. "Characteristics of E-Waste Recycling Systems in Japan and China." *World Academy of Science, Engineering and Technology, International Journal of Environmental, Chemical, Ecological, Geological and Geophysical Engineering* 4(2): 89–95. scholar.waset.org/1999.6/10336.

Frazzoli, Chiara, Orish Ebere Orisakwe, Roberto Dragone, and Alberto Mantovani. 2010. "Diagnostic Health Risk Assessment of Electronic Waste on the General Population in Developing Countries' Scenarios." *Environmental Impact Assessment Review* 30(6): 388–99. http://dx.doi.org/10.1016/j.eiar.2009.12.004.

Fu, Jianjie et al. 2007. "High Levels of Heavy Metals in Rice (Oryza Sativa L.) from a Typical E-Waste Recycling Area in Southeast China and Its Potential Risk to Human Health." *Chemosphere* 71(7): 1269–75.

Grant, Kristen et al. 2013. “Health Consequences of Exposure to E-Waste : A Systematic Review.” *The Lancet Global Health* 1(6): e350–61. http://dx.doi.org/10.1016/S2214-109X(13)70101-3.

Gupta, Shubham, Gaurav Modi, and Rahul Saini. 2014. “A Review on Various Electronic Waste Recycling Techniques and Hazards Due to Its Improper Handling.” *International Refereed Journal of Engineering and Science (IRJES) ISSN (Online)* 3(5): 2319–183.

Kiddee, Peeranart, Ravi Naidu, and Ming H Wong. 2013. “Electronic Waste Management Approaches : An Overview.” *Waste Management* 33(5): 1237–50. http://dx.doi.org/10.1016/j.wasman.2013.01.006.

Kitzes, Justin. 2013. “An Introduction to Environmentally-Extended Input-Output Analysis.” *Resources* 2(4): 489–503. http://www.mdpi.com/2079-9276/2/4/489/.

Kojima, Michikazu, Aya Yoshida, and So Sasaki. 2009. “Difficulties in Applying Extended Producer Responsibility Policies in Developing Countries: Case Studies in e-Waste Recycling in China and Thailand.” *Journal of Material Cycles and Waste Management* 11(3): 263–69.

Krishnan, Selvarajah, Aizat Zakaria, Faiz Khalil, and Syahmi Jofree. 2017. “The Effect of Electronic Device on Human Health.” 7(1): 40–43. http://article.sapub.org/10.5923.j.mm.20170701.05.html.

Leontief, Waasily. 1970. “Environmental Repercussions and the Economic Structure : An Input-Output Approach.” *The Review of Economics and Statistics* 52(3): 262–71.

Perindustrian, Kementerian. 2019. *Analisis Perkembangan Industri Edisi I - 2019 .Pdf*. I. Jakarta, Indonesia.

Perkins, Devin N., Marie Noel Brune Drisse, Tapiwa Nxele, and Peter D. Sly. 2014. “E-Waste: A Global Hazard.” *Annals of Global Health* 80(4): 286–95. http://dx.doi.org/10.1016/j.aogh.2014.10.001.

Republic Indonesia, Ministry of Environment and Forestry. 2014. *PENGELOLAAN LIMBAH BAHAN BERBAHAYA DAN BERACUN*.

Ronald E. Miller and Peter D. Blair. 2009. *Input–Output Analysis: Foundations and Extensions*. New York: Cambridge University Press.

Siringoringo, Hotniar. 2013. “Consumption Model of Imported Products : Indonesian Case.” *Procedia - Social and Behavioral Sciences* 81: 195–99. http://dx.doi.org/10.1016/j.sbspro.2013.06.412.

Siringoringo, Hotniar, Eko Sri, Anacostia Kowanda, and Trini Saptariani. 2013. “Shopping Behavior of Indonesian Consumer Towards Imported Products.” *Procedia - Social and Behavioral Sciences* 81: 411–15. http://dx.doi.org/10.1016/j.sbspro.2013.06.452.

Statistic Bureau Center. 2015. *Tabel Input Output Indonesia 2010*. Jakarta, Indonesia: Statistic

Bureau Center, Indonesia. https://www.bps.go.id/.

Tang, Xianjin et al. 2009. “Heavy Metal and Persistent Organic Compound Contamination in Soil from Wenling: An Emerging e-Waste Recycling City in Taizhou Area, China.” *Journal of Hazardous Materials* 173(1–3): 653–60.

United Nations. 1999. *Handbook of Input-Output Table Compilation and Analysis*. New York: United Nation Publication.

Zuhdi, Ubaidillah. 2014. “The Impacts of Final Demand Changes on Total Output of Indonesian ICT Sectors: An Analysis Using Input-Output Approach.” *IOP Conference Series: Materials Science and Engineering* 58(1). https://iopscience.iop.org/article/10.1088/1757-899X/58/1/012011/pdf.

———. 2015. “An Application of Input-Output Analysis in Analyzing the Impacts of Final Demands Changes on the Total Outputs of Japanese Energy Sectors: A Further Study.” *Journal of Physics: Conference Series* 622(1): 2005–10.

Chapter 6 Summary and conclusions

6.1 Summary

Most of goods traded among countries will be subject to import duties. The amount of import duty tariff applied by a country must be the same for all goods imported from any country, hereinafter referred to in the GATT as the MFN tariff. For example, imported cooling tower from any country will be imposed 5% import duty.

International trade is one factor that supports economic growth. Various studies have shown the impact of international trade on a country's economic growth as can be seen in Chapter 1. In the same chapter it has also been explained that there are other impacts of international trade activities, namely on the environment.

Considering the impact, many countries are seeking various facilities including to provide special tariffs that are different from the MFN tariff rates. The amount of tariff referred to is known as the preferential tariff.

By understanding preferential tariffs as special tariffs that differ from normal tariffs or MFNs, Indonesia currently has implemented temporary import facilities with exemption and/ or relief of import duties on certain goods for importation over a certain period of time. In addition, there are also preferential tariffs provided by the government with regard to participation in FTA schemes, such as ASEAN FTA, ASEAN-China, ASEAN-Korea FTA and so on as explained in Chapter 2. By applying, for imported cooling tower from Thailand will be imposed 0% of import duty.

In Chapter 2 it was also conveyed about waste management by the Indonesian government, to see the government's enthusiasm in managing waste in Indonesia including the current policies that have been in place, as well as the supporting infrastructure, as mentioned in the Government Law Number 81 of the year 2012.

Electronic goods are one sources of hazardous material, where if the components are thrown away into the open place, they could potentially contaminate the surrounding soil, water and air because of the chemical processes of the substances in the components or spare parts of electronic products.

Currently, electronic products are imported using general import procedures, which are purchased directly by importers to be marketed in Indonesia. After completion of use, electronic products will eventually be disposed of in the open place, and the contamination process will begin. Very few electronic items are included in the 3R process, especially recycling, due to technological limitations or not yet many interested parties to manage it.

The implementation of temporary imports procedure of electronic goods provides new discourse in line with government programs to manage previous sources of waste. Returning imported electronic goods to the exporting countries clearly has the potential to reduce the source of waste, especially from ex-imported goods. Chapter 3 shows the positive impact of applying temporary import procedures on electronic goods where the cost of waste management is getting lower which is decreasing from IDR 6,969,525 million to IDR 3,402,308 million.

The agreement to form an FTA signed by Indonesia apparently did not comprehensively provide space for environmental issues, as evidenced by the absence or lack of substance of the provisions governing the environment except to include the provisions contained in article XX of the GATT. However, it was also not followed up with the program or technical guidance of implementation.

To see the impact of preferential tariffs on the FTA scheme to the environment, an input output analysis is used. The sectors were being modified into a new classification to be equal with the sector classification in the GHG report. In this case, the assumption is that the import value contained in the IO table has enjoyed preferential tariffs, taking into account that the FTA scheme in Indonesia has been started since 1994.

The results of the IO analysis show that the agriculture sector, which is a combination of the agriculture and forestry sectors, has the highest emission levels of 1,760,745.61 tons. In Chapter 4 the level of CO2 emissions produced by this sector has been explained.

Further analysis is related to an increase in the final demand for imported goods, so the study conducted is to look at the impact of changes in final demand, especially for electronic goods, which is evidence that Indonesia is very dependent on imported goods.

Based on the assumption of a 22% increase in final demand, as well as the imposition of very low import tariffs or 0%, it can be ensured an increase in electronic goods transactions. However, a very interesting thing is a very significant increase in the 148 sector, namely waste management, from IDR 405,263 million to IDR 7,338,441 million.

6.2 Conclusions

As a new initiative, the idea of promoting the temporary import procedure on electronic products will support environmentally sustainable programs by sending back imported goods to the exporting country.

Even though state revenue from import duty will potentially decrease, the input-output analyses shows that this idea will also promote some opportunities to increase other benefit from product supply chain, transportation and warehousing, leasing and rental services, and other business. The government will also gain some benefits from the tax perspective, hence impacts of the revenue. Since the temporary import procedure is under customs control, this agency could do a more comprehensive study to promote this policy to be more environmentally friendly.

Import and export transaction will involve at least 2 countries, e.g. importing country and exporting country. Since the idea of the temporary import procedure is sending back the used products to the exporting country, then the more comprehensive exhibit of the impact of the temporary import procedure to all involved parties can be seen by analyzing the inter-regional input-output table. The other thing that should be done further is the feasibility study as the consequences of the proposed procedure.

Based on the calculations using IO analysis, it can be seen that the economic activities in the 2010 Indonesia IO table have provided an overview of the carbon emissions released, with the highest coming from the agricultural sector. This situation should be monitored carefully considering that Indonesia has set a target of reducing 834 million tons of CO_2 under the unconditional target and 1,081 million tons of CO_2 under the conditional target by 2030 (The Ministry of Environment and Forestry 2017). Although some elements in this study need to be improved, this research has shown a significant potential for carbon emissions. The things that

require optimization include the availability of data on export-import and local goods, both types and quantities, so that the research could examine the monetary and physical aspects.

The biggest carbon emission comes from international trade in relation to the agricultural, manufacturing, and energy sectors. Therefore, Indonesia must immediately carry out a strategy of using environmentally friendly materials and goods related to the three sectors.

To optimize the availability of information in the IO table and also the greenhouse gas inventory report, monitoring and calculation of carbon emissions related to international trade should be included in the annual report of all statistic reports.

The need for EEE cannot be avoided along with technological developments in human life. This has the consequence of increasing the volume of WEEE that must be handled by every country, including Indonesia. Indonesia's large population is very promising for manufacturing companies by making it one of the main markets. Therefore, the volume of WEEE in Indonesia will also continue to grow, not only from within the country, but also from imported goods.

Based on a simulation of a 22% increase in WEEE consumption in final demand, using IO analysis, it turns out that the amount of EEE consumption is quite high, while it can be assumed that the potential increase in the volume of WEEE in the same amount. In the sector analyzed, sector 148, there was also an increase in the cost of handling waste is very high, from IDR 405,263 million to IDR 7,338,441 million. This research will be better if there is information on the amount of WEEE in physical units, not only in the form of fees or currency units.

6.3 Remaining study tasks

Basically, waste from imported goods in Indonesia can be managed with various alternatives, including the application of temporary import procedures or inviting producers to take part in responsible waste management that will be applied. This needs to be further analyzed to ensure the cheapest treatment for all parties. Specifically, for the temporary import initiatives undertaken in this study, a more complete study needs to be carried out to include related costs such as freight, port handling, insurance, and so on.

In order to study the impact of the FTA scheme on the environment, it is necessary to make an accurate sector classification method, and it is presented in the Central Bureau Statistics annual

report. It is important to see the economic sector that provides the highest amount of emissions for further treatment.

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