

The Impacts of Carbon Trading in General Equilibrium (GE) Model: Malaysian Palm Oil Perspective

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ABSTRACT

The purpose of this paper is to study the impacts of carbon trading project towards stakeholders involving in the project. Carbon trading is a part of the United Nation (UN) initiatives to mitigate climate change issue due to the higher concentration of Greenhouse gases (GHG) in the atmosphere. The data used in this research was fully dependant on secondary sources which were obtained from recognized organizations, reports and previous researches. The General Equilibrium (GE) model was used as a framework to elaborate on the interconnection of the actors affected by the project. This model is suitable to describe the complex relationship between the government, firms, households and developed country which been affected through the implementation of the project.

Palm oil mill functioned as a firm in this research as the highest contributor in the project since 2006. Trade policy agreement, between developed country and mills, will deliver advantages through technology transfer and financial flow into developing countries. Households who are staying close to the mills are considered as a source of employees will benefit when the company can offer more vacancies for local communities. The government will also be able to encourage more industrial sectors practicing eco-friendly project. The

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implementation of the project expecting will affect all the actors through the circulation of the income investment by developed country through carbon trading project.

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INTRODUCTION

Anthropogenic issue is a common topic discussed by experts due to its huge impact on climate change. The anthropogenic climate change can be defined as the cumulative of greenhouse gases (GHG) leading to significant global warming issues. According to Abdulnaser (2017), many scholars, experts and ecologists expressed their concerns toward the variety of changes in the global weather by stating dangerous heating that takes place in the global climate as one of the causes. The most significant anthropogenic GHG is carbon dioxide (CO²), which has risen from 280 parts per million (ppm) to 338 ppm since the beginning of the Industrial Revolution (Wright & Boorse, 2011). The impact of carbon emission is forcing United Nation as the main authority lead the world established United Nation Framework Climate Changes Convention (UNFCCC). They proposed a sustainable development concept that combines economic, social and environmental perspective from one application.

Malaysia as a member of the Kyoto Protocol since 1999, has been encouraged to participate in the project. The outcome of

the Kyoto Protocol is carbon trading which was enforced in 2005. It is an approach that used to break down the content of GHG emissions, which is more than 60% of emission results from the use of fossil energy (Delbosc & Perthuis, 2009). This initiative is influencing the market factors through investment and technology transfer. Pigou in World Economic Forum (2015) had recognized the efficiency of this project when it was pointed to the benefits of tax incentives as external initiatives emanating from pollution. There are three types of mechanism introduced under the carbon trading project known as Emission Trading Scheme (ETS), Joint Implementation (JI) and Clean Development Mechanism (CDM). As a developing country, Malaysia is capable to volunteer in CDM since Malaysia is one of Non-Annex members. UNFCCC (2018b) defined CDM in Article 12 of the Protocol, allows a country with an emission-reduction commitment under the Kyoto Protocol (Annex 1 Party) to implement an emission-reduction project in a developing country. Thus, to implement CDM projects in Malaysia, the collaboration with Annex 1 (developed country) are needed. Since 2006 until May 2018, Malaysia had participated in 253 CDM projects involving various types of sectors.

Palm oil industry is the biggest contributor in CDM project. As a first mover and the second largest palm oil producer in the world, Malaysia has a high tendency to participate in carbon trading project. Agreed by Lim and Biswas (2015), palm oil could offer sustainable

benefits of improving socioeconomic and environmental conditions in Malaysia. As of April 2015, Malaysia has a total of 143 registered CDM projects and the end of the first Kyoto commitment period, the projects are expected to yield 23.95 million t CO₂eq emissions reduction (Ministry of Natural Resources and Environment [NRE], 2009). Accordingly, there are four parties involved in this implementation, including firm, household, government and developed country. All of them have their own roles to play in this project. Thus, the aim of this research is to discuss the impacts of carbon trading project towards economic actors. There are two objectives to achieve in this study. Firstly, to identify the capability of the palm oil industry to participate in CDM. Secondly, to describe the impact of carbon trading project towards economic actors, including the government, firms, and household. General Equilibrium (GE) model used as a conceptual framework to describe interconnection of the actors towards project implementation.

Carbon Trading Project

The higher concentration of carbon dioxide since Industrial Revolution increasing the average world temperature drastically. United Nation (UN) as the responsible organization for taking care of the world and mitigate climate change issues had been agreed to adopt the Kyoto Protocol agreement undertaken by the United Nation Framework Convention on Climate Change (UNFCCC).

The Kyoto Protocol was initially adopted on 11 December 1997 and participated by 37 countries and the European Union known as Annex 1 countries (Almer & Winkler, 2017). The outcome of the Kyoto Protocol is a carbon trading project was enforced in 2005, as an international agreement linked to the UNFCCC committed its parties by setting internationally binding emissions reduction targets (UNFCCC, 2018a). Among the emissions, carbon dioxide is the largest proportion responsible for 60% of the 'enhanced greenhouse effect' (BBC, 2014). Thus, the term of carbon trading has been chosen to represent the main of the gases were should be reduced.

Carbon trading is a strategy for mitigating the emission of CO₂ and other GHGs through a "Cap-and-Trade" system (Delbosc & Perthuis, 2009; Kerste et al., 2010). It is the process of buying and selling permits and credits to emit carbon dioxide (Naughten, 2010). Combining the meaning, Wightman (2012) stated cap-and-trade were regulatory programs that capped the harmful emission (e.g. mercury, sulphur and carbon) by limiting the proportion through permitting system and distributing the emission permits to the stakeholders. One tonne of carbon reduction equivalent to one Certified Emission Reduction (CERs) functioned as a credit. The project allows the market to determine a price on carbon, and that price drives investment decision and spurs market innovation. There have three based-mechanisms offered by the Protocol to Annex 1 and Annex II countries, which are Emission Trading Scheme (ETS), Joint

Implementation (JI) and Clean Development Mechanism (CDM) (UNFCCC, 2018c).

Due to different levels of economic growth, UN divided the countries based on different commitments. Annex 1 and Annex II parties obligated to reduce the emission of GHG (e.g. carbon dioxide, methane, nitrous oxide and fluorinated gases) by 5.2% on average over the period between 2008 and 2012 compared to the level of GHG in 1990 (Almer & Winkler, 2017) through ETS and JI. Then Non-Annex parties are not obligated to reduce their emissions but encouraged to volunteer through CDM project. It is because those countries are needed to focus more into other anxieties such as poverty, health care and economic development, which required more attention. The aims of the mechanisms are to;

1. stimulate sustainable development through technology transfer and investment
2. help Kyoto commitment to meets their target by reducing emission in other countries in a cost-effective way, and
3. encourage the private sector and developing countries to contribute to emission reduction efforts

(Sources: UNFCCC, 2018c)

Malaysia as a member of Non-Annex countries was encouraged to participate in the CDM project. CDM project was established to assist developing countries in achieving sustainable development by promoting environmentally friendly project investing by industrialized country government or private business (UNFCCC,

2019b). It is designed to help Annex 1 countries to achieve their meeting emission targets through practicing carbon reduction at lower cost countries that can be done domestically. By encouraging developing countries practicing environmentally friendly project that are able to reduce emission through technology and financial investment, it is expected to spur innovation and competitive advantages to the firms, either directly or indirectly to the actors that play a role in the economic factor's linkage. In 2020, Paris Agreement will replace Kyoto Protocol as a new legally binding framework for an internationally coordinated effort (Streck et al., 2016) aimed to tackle climate change issues through a new application project known as National Determined Contribution (NDCs) (UNFCCC, 2019a). Even the application is undertaken by new climate change policy, but the aim of the mechanism is still the same. UN is encouraging developing country by optimizing the opportunity of sustainable development through technology transfer and investment offered through the project that are beneficial, influencing the competitiveness of all the producers and consumers.

METHODS

This paper was fully dependant on secondary data to elaborate on the ability of the palm oil industry contributing to carbon trading project and its impacts to the economic actors. Palm oil production is the main contributor to the CDM project in Malaysia. It has a high tendency to participate in

the project due to the composition of the plant that easily to alternate into another source was significant for environmental practices. Based on previous studies, the annual report published by recognizing organizations likes UNFCCC or UNEP and scientific articles referred as the main sources. Many fields have been reconsidered included in the study to verify the ability of the product contributes to the project. The ability of palm oil production to be utilized as an environmental product in the CDM, identifying the mill as a firm that will play a role in this concept.

General equilibrium (GE) model was used to estimate how an economy would react to the changes in policy, technology or other external factors. GE is a standard tool of empirical analysis and it is widely used to analyse the aggregate welfare and distributional impacts of policies which effects may be transmitted through multiple markets or contain menus of different taxes, subsidy, quota or transfer instruments (Wing, 2004). This framework shows the motivation and behaviours of all producers, investors, and consumers in an economy and the linkages between them (Burfisher, 2011).

The GE model can analyse policy impacts of different scales and levels (Chen et al., 2001) providing information on the policy impact of a certain variable, be it employment or output, for instance.

The GE combining demanded by private households, investors and government met by firms (private sector) complete the circular flow of income and spending, buy inputs and hire workers and capital used in their production processes (Burfisher, 2011). In other words, the GE model shows the combination of economic actors which will affect the behaviour of each actor. Albrizio et al. (2017) agreed where environmental policies affected GDP per capita via a number of the channels: productivity, capital, intensity, labour participation, and human capital becoming more competitive. Figure 1 is a basic structure of a GE model and it shows the interconnection between all producers (firm, government) and consumers (household) in a normal economy event. As a whole it is showing the interconnection of the motivation and behaviours among them, reacting to the new economic application (Burfisher, 2011).

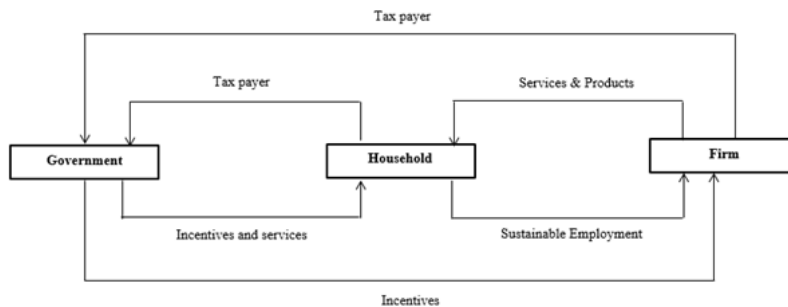


Figure 1. General Equilibrium (GE) model (Burfisher, 2011)

Based on Figure 1, economic actors' categories into three groups named as individuals/household, firms and the government (Zsolnai, 2018). Their functions are:

i. Household, spend their income on goods and services, pay taxes to the government, and put aside savings. They are the factors of production and the final consumers of produced communities,

ii. Firms, produce goods and services in response to the demand in the, which in turn determines input demand, factor employment levels, households' wage and rental income of the production from the household for producing goods and services,

iii. Government, responsible to collect taxes and disburse these revenues to firms and households as subsidies and lump-sum transfers. The government uses its tax revenue to buy goods and services, and investors use savings to buy capital investment goods for use in future production activities.

(Source: Burfisher, 2011)

This model describes all the interrelationships in an economy event at once when expecting "everything depends on everything else" (Burfisher, 2011). The purpose of the model is to determine the connection of all actors and economic factors when new policy or initiative are been introduced in the market. Forth actors included in the model when the CDM project is implemented and it is expected will influence all the actor behaviour that will react to the new project implementation. It

will be Annex 1 parties or can also be known as developed or industrialized countries. GE model was widely used to analysis carbon trading project which enables to provide flexibility to analysis in terms of trade effects through the incorporations of alternative assumptions about the foreign exchange market and global commodity markets (Pradhan et al., 2017). Thus, it is suitable to estimate the impacts of the changes under carbon trading project in terms of trade policy agreement influencing the behaviours of the economic actors in the Malaysian palm oil industry.

RESULT AND DISCUSSION

Production of Palm Oil

Today, palm oil products are leading the vegetable oil industry around the world for various purposes, either for food or non-food consumption. Palm oil is a special species originated from Africa known as *Elaeis guineensis*. The fleshy fruit of palm oil tree also thrives elsewhere in the humid tropics (Union of Concerned Scientists, 2013). During Industrial Revolution in Europe in the 19th century, young Frenchman Henri Fauconnier who travelled to East Asia planted the first commercial palm oil tree with his friend at the Tennamaram Estate in Batang Berjuntai, Selangor, when the first business-related to rubber and coffee prices began depreciating (NSTonline, 2017). After a Malaysia independence-day in 1957, the government established Federal Land Development Authority (FELDA) (NSTonline, 2017) to organise palm oil development around the country

and economic wealth among the people where there is a huge gap in the poverty rate in rural areas (Nambiappan et al., 2018). At the beginning of palm oil development in 1960, there were only 55,000 ha plantation areas in Malaysia, which then expanded to 5.74 million ha in 2016 (Nambiappan et al., 2018). This huge expansion during that period suggests that palm oil products are a part of the most productive activities in Malaysia that could generate profit for Malaysia economic growth. In 2016, export revenue from the palm oil industry has reached RM67.6 billion, which was equal to 6.1% of total Malaysia's GDP.

The capability of this industry to produce various types of the product had attracted more industrial sectors to change their preference into palm oil. Palm oil has been identified as one of the high demand products, especially from the food manufacturing field, oleochemical and biofuel industries (Arip et al., 2013). According to Levin et al. (2012), palm oil is the highest yielding oil crop with a yearly output of 5-10 times greater per hectare more than other leading vegetable oils and is predicted to potentially increase to more than 65% growth by 2020 over 2010 baselines. The multi-function of palm oil as a fatty product has attracted many industrial interests to use palm oil as a part of their product ingredient. The total production of palm oil has been estimated to be more than 45 million tonnes in the world with Indonesia and Malaysia as the main producers (Wisena et al., 2014). Palm kernel and palm oil are used widely as they

can be blended very well as a vast range of products with different characteristics (GreenPalm Sustainability, 2016). Besides, the capability of this product to replace soybean and sunflower production has been proven when this industry was capable to reduce 20% of the land area to produce the same tonnes of oil needed by other crops (Persey et al., 2011).

Since 1964, palm oil production in Malaysia had slowly increased until now. Globally, the total production of palm oil in the world had increased by almost three times from the last decades to 2010 (Wisena et al., 2014). According to United States Department of Agriculture [USDA] (2017) database, at the beginning of palm oil development, the production of oil palm in Malaysia was only 151,000 metric tonnes and drastically increased to 20,500,000 metric tonnes in 2017. Moreover, it has been expected to increase from 17.7 million tonnes in 2015/16 to 19.4 million tons in 2016/17 and 21 million tonnes in 2017/18 after the palm trees recovered from tree stress due to prolonged dry season caused by the El Nino weather anomaly recorded throughout 2015/16 (USDA, 2017). Thus, it can be assumed that the palm oil industrial sector in Malaysia is in a good shape. However, the greatest challenge in this industry is to continually increase the yield per unit land area to meet the high demand of the human population that burst rapidly (Chan, 2005). By contributing to Research and Development (R&D) involving palm oil products, the capability of this industry to compete with other

sectors could be achieved. The capability of palm oil products to compete with other vegetable oils are significant for Malaysia GDP growth.

Sustainable Development and CDM in Palm Oil Industry

According to the Brundtland (1987) reported on World Commission on the Environment and Development in Our Common Future, sustainable development is the process to meet the present needs without compromising the ability of future generations. In other words, this concept is the necessity to fulfil the need, without reducing the ability of future generation. The concept of sustainability is guided by the Triple Bottom Line (Elkington, 1997) and Sustainability Triangle by Fritz and Schiefer (2008) that could be seen from three crucial aspects, which are economic, social and environment or known as the concept of 3P (Profit-People-Planet). When palm oil and sustainability topic emerged, the Roundtable Sustainable of Palm Oil (RSPO) policy was come out as one of the famous regulations to increase the awareness regarding sustainable practice in the palm oil industry.

With a sustainable perspective, palm oil as a part of agricultural components plays an important role to contribute to global warming issues. As one of the main producers and leaders in palm oil technology and innovation, Malaysia is capable to develop this industry as one of the leading sectors to fully practicing eco-friendly project when most of palm oil waste products could be recycled into

other sources. There are four main forms of palm oil waste generated from palm oil mill, which are Empty Fruit Bunches (FFBs), mesocarp fibres, shells, Palm Oil Mill Effluent (POME) and boiler ash (Er et al., 2011). Each part of waste products is useful to be changed into other sources, beneficial for eco-friendly practices. This process is crucial to ensure that this industry could be one of the leaders in the zero-waste industrial sector.

Oil palm cultivation dictates that the best agro-management techniques are capable to emphasise triple pillars of sustainable development, which are economic, social and ecological (Choo, 2002). To sustain the capability of palm oil products in the future, the long-term economic viability of the crop production system must depend on the Best Developed Practices (BDPs), which are highly cost-effective and non-capital intensive, ecologically and culturally (Chan, 2005). The efficiency of waste management products plays an important role to ensure that this concept could be applied wisely without constraints. Palm oil as a part of the biggest contributors in the CDM project has been oriented as the most encouraging projects to practice sustainable project in Malaysia. Thus, the concept of competitiveness is described to evaluate the capability of the project in encouraging more palm oil industries to participate in the CDM project. According to Lim et al. (2015) sustainable palm oil product defined as:

“the production that doesn't cause the loss of biodiversity, increasing GHG

emissions and associated ecological footprint, affect the livelihood of indigenous peoples, including enhancing the commercial operation and sharing together with the local community through employment and fair trade.”

As an example, the benefits of POME treatment in palm oil industry could

- i. Removal organic carbon contents from POME efficiently by collecting and combusting methane enriched biogas
- ii. Would lead to the development of regional economies and improve their socio-economic condition, and
- iii. Develop an environmental consciousness of POME from social perspective

(Sources: Pacific Consultant, 2008)

Those advantages are crucial to influencing sustainable development practices in the palm oil industry. By doing the eco-efficiency project through environmentally friendly practices, they can earn profitability by recycling waste products (Berzengi & Lindborn, 2007). Besides can reduce disposal cost of waste product, they also gained an advantage through the benefits of CERs. According to Shafie et al. (2012), the production of biomass is increasing annually, especially palm oil-based which beneficial for electricity generation through biomass residue. Other components of the palm oil crop are also useful for other purposes such as fertiliser, fossil fuel, and wood dust. Through the efficiency of cost management and technology improvement

in palm oil mills, the local community indirectly gains an advantage through more job opportunities. Quality of environment also will be improved when the company tends to reduce its emissions and other waste products. In other words, the economic barrier can appear as the ability of companies to recognise the costs of waste, insurance, and potential of future environmental legal responsibility (Barnes & Barnes, 1999).

CDM project emphasizes the palm oil industry in practicing eco-friendly mechanism, especially in Malaysia and Indonesia as the main palm oil producer in the world. The requirement to reduce emission for certain companies in the developed country might be a burden for them when it was involving the high cost of environmental technology cost. Thus, by offering clean energy investment under CDM project in developing countries, the high cost of renewable technology could be reduced. The different level of living cost and money exchange in the developing country offers more reasonable cost for a developed country to achieve their commitment of reducing an emission. Hence, there are no reasons for the developed countries to excuse their responsibility in reducing their emissions. Under the CDM project, four sub-types of the sustainable project are involved palm oil waste products including composting, palm oil waste, palm oil solid waste and wastewater. Variety types of innovation have been done to ensure the palm oil industry capable to be one of the leaders in zero waste product in the future. The opportunity offered by CDM project

should be one of the prospects to increase the competitiveness of sustainable practices in the palm oil industry.

Since 2006, the implementation of CDM project has attracted many researchers to evaluate the implications of CDM project towards sustainable development practices in Malaysia. The balancing between environmental, social and economic are crucial. Through the project, several benefits such as job opportunity for the local community, good environmental practices and cost-efficiency capabilities to influence the competitiveness of the palm oil industry. Based on the report by Kirkman, et al. (2012), hosting countries have received 96% benefits in an economic perspective, 86% social benefits and 74% environmental benefits. According to Buron et al. (2007), the participants in the CDM project will be influenced by three terms of sustainable development. It can be seen in Table 1.

The impacts of CDM project towards sustainability, crucial to be maintained to ensure the interconnection of human and

environment could be enhanced.

The Advantages of CDM Project

The advantages of technology transfer from developed countries into developing countries are totally beneficial for palm oil industry. Technology plays an important role to increase productivity of industrial projects, which extensively applied in the production, commercialisation and distribution of goods and services (Chew, 2006). Hamilton and Singh (1992) defined the technology transfer as the process of movement or transfer of information, technical know-how and people such as R&D and skills to yield innovative products and services that met corporate business goals and fulfilled customer needs. The opportunity to receive new technology from other countries by collaborating with developed countries should be utilized since the benefits through this project are useful for company growth. According to Seres et al. (2010), 58% of technology were frequently transferred by Germany, USA,

Table 1

The impacts of CDM towards sustainable development practices

SD Dimensions	Impacts
Environmental	The impacts on local air, water and soil quality, biodiversity, resources and GHG emission are crucial to maintain the stability of the environment.
Economic	The advantages of the project towards employment, technology transfer, national economy and macroeconomic enhance the revenue of economic development.
Social	The development of social benefits obtained from education opportunity, health, quality of life, local heritage and stakeholder participation.

Source: Buron et al. (2007)

Japan, Denmark and China to developed countries, meanwhile, India, Taipei, Brazil and Malaysia lead a supplier of technology among developing countries. Table 2 shows ten host countries with the most projects expected to be involved with technology transfer. In June 2012, among 110 CDM projects in Malaysia, 90% out of the total projects claimed technology transfer (Table 2).

In June 2012, Malaysia received 36 of technologies transfer, involving 90 projects (Table 2) and most were related to the palm oil industry. Most of the palm oil mills utilize the CDM project installed biogas capturing system on closed Continuous-flow Stirred Tank Reactor (CSTR) anaerobic treatment of Palm Oil Mill Effluent (POME) (Chuen & Yusoff, 2012) to reduce the emission from methane. With the target of Annex 1 countries reducing the overall emissions by at least 5% below 1990 levels in the commitment period 2008 to 2012, the period time to issues the credit was limited (United Nation [UN], 1998). In term of technology, there have two possibilities of transfers that can be obtained from the project, either in the foreign technology form or thoroughly implemented training programs to smooth an operation (Burton et al., 2007). For instance, one of the new technologies transferred in Malaysia is eBio technology from Japan enzymatic conversion of vegetable oils into bio-lubricants (Najihah, 2017). Currently, the automotive industry is depending on crude oil (petroleum), which is a part of a non-renewable resource. Petroleum is a naturally

occurring form liquid found underneath the earth's surface that can be refined into fossil fuel created by the decomposition of organic matter over millions of years (Investopedia, 2018). The dependency on petroleum should be controlled since the implication of mining activities were more harmful to environmental degradation. By changing into eBio technology, biodiesel product generated from crude palm oil are capable to replace the dependency on non-renewable sources. This initiative can increase the capability of the palm oil product to compete with other vegetable oil. Besides it can reduce the dependency on fossil fuel sources generated through petroleum. Palm oil industry can also reduce their utility cost for transportation.

Besides that, the CDM project is also offering additional financial revenue flow into developing countries. The revenue could be obtained from saleable CERs or through funding programs. When a developed country agreed to a joint venture with a developing country, reducing an emission, they also agreed to invest some amount of money in the developing country for clean development technology. It also can be known as a foreign direct investment. According to Desbordes and Wei (2017), many countries seek to attract foreign direct investment as they believe that multinational enterprises can contribute to economic growth by creating new job opportunities, increasing capital accumulation and raising total factor productivity. Thus, through this project, they can attract investment from developed countries to increase the

Table 2

Technology transfer for CDM projects among host country in June 2012 (Murphy et al., 2013)

Country	Number of Project	Estimated emission reductions (tCO ₂ e/yr)	Average project size (CO ₂ e/yr)	TT claims as percent of		% of projects where TT could not be determined
				Number of projects (%)	Annual emission reduction (%)	
Brazil	205	24,175,021	117,927	47	76	25
China	1858	367,754,013	197,930	20	49	6
India	805	67,474,383	83,819	23	53	34
Indonesia	80	8,308,580	103,857	95	79	31
Malaysia	110	6,293,316	57,212	90	94	36
Mexico	140	12,520,350	89,431	98	99	9
Philippines	57	2,238,466	39,271	59	87	14
Rep. of Korea	63	18,187,041	288,683	85	99	35
Thailand	67	3,541,395	52,857	100	100	16
Vietnam	90	5,410,299	60,114	96	83	17
All others	474	67,520,169	142,448	91	97	28
Grand Total	3949	583,423,033	147,739	39	59	18

capability of clean technology. Developing country with CERs can trade it with developed country significant to increase the profitability of the company. According to Tan (2015), on May 2015, the registered projects related to the palm oil industry had successfully traded almost 7000 CERs to developed countries equivalent to 5604.858 from oil palm solid biomass, 1385.436 from POME and 202.534 from composting sub-types. Thus, through the project, the benefits of palm oil received from CDM implementation are higher than other sub-types of the projects.

Meanwhile, during Bali Action Plan 18th session of the Conference of Parties

(COP18) negotiations that took place on 26 November to 7 December 2012, National Appropriate Mitigation Action (NAMAs) opened new opportunities for developing countries to obtain new financial support (UNFCCC, 2018b) encouraging environmental projects. The priority of NAMAs plan country-led mitigation is to reduce GHG emission or enhance sequestration and support sustainable development initiative (Tan, 2015) prepared under the national governmental initiative. NAMAs are capable to enhance technology, financing and capacity-building aiming at achieving a reduction in emission relative to 'business as usual' emission in 2020 (UNFCCC, 2018b). The aim of NAMAs

is almost the same as CDM but having a different style of application. Most importantly, the CDM is a mechanism with detailed rules, while NAMAs is a concept practically without rules. However, the application of Malaysian companies with NAMAs is still under development. Therefore, in the future, Malaysia will gain more financial support to enhance energy efficiency especially, in the agricultural field.

Table 3 shows the comparison of CDM and NAMAs that could be identified from six categories. Both applications have the same goal to reduce the concentration

of GHG emission in the atmosphere by influencing the power of funding.

According to Tan (2015), a total of USD 27,430,492 has been provided by NAMAs for developing countries to develop renewable technology. Besides the CDM project, many opportunities have been offered to developing countries to practice environmental-friendly projects, especially in the palm oil industry. The benefits of this project capable to increase the competitiveness of the palm oil industry, which relates to the environmentally friendly project.

Table 3

The comparison between CDM and NAMAs

	CDM	NAMAs
Definition	One of the flexible mechanisms introduced by Kyoto Protocol were provides flexibility of emissions reductions that allowing emissions reductions undertaken in a developing country to offset emissions in a developed country, typically through a trading agreement.	Voluntary activities of Greenhouse Gas (GHG) emissions mitigation in developing countries that are not subject to mitigation commitments under the UNFCCC.
Actions	Projects and programmes of activities	Policies, programmes and projects
Initiator	Private sector or public sector	Typically, public sector
Investment driver	Normal returns from the market that the project activity addresses with the addition of returns from Certified Emission Reductions (CERs). CERs are issued by the CDM Executive Board based on project verification reports. CERs can be traded on carbon markets.	The sustainable development priorities of the host country, with possible added benefits from including emissions reductions in the policy planning. The NAMA may attract international financial participation and may include the generation of business opportunities for the private sector, which will invest from profit motives supported by the NAMA.

Table 3 (Continued)

	CDM	NAMAs
Requirement	Reductions in emissions must be additional to any that would occur in the absence of the certified project activity. CDM to assist developing countries in achieving sustainable development.	A NAMA, framed in the context of sustainable development, aims at achieving a deviation in emissions relative to ‘business as usual’ emissions in 2020.
Financing	Upfront financing, generally through the private sector. Certificates are issued ex-post based on regular verification reports. CERs are sold on a carbon market.	Domestic resources and/or international support (e.g. through bilateral/multilateral agreements, development banks) for the preparation and implementation of NAMAs.

Source: Lütken (2014)

The Impact of Carbon Trading Project Towards Economic Actors Based on GE Model

As one of the initiatives where combining environmental requirement and economic benefits, carbon trading project capable to influence the competitiveness of the industry. Competitiveness in environmental practices is important to ensure a sustained, superior long-term performance (Govindan et al., 2015; Zainorfarah et al., 2017). Firms as the main actor to implement environmental practice capable to gain competitive advantages through their strategic positioning and at the same time taking advantage of environmental issues (Zainorfarah et al., 2017). By using a GE model, the explanation regarding the impacts of carbon trading project towards economic actors will be described.

Based on Figure 2, there have four actors who are involved in this practice, including the government, household, firm and Annex 1 country. At the first stage, the

willingness of Annex 1 country to binding trade policy agreement will be affected;

Annex 1 Country. In the CDM project, Annex 1 countries play a role as an investor in the project. The commitment to reduce emission at their countries is encouraging them to find another platform in developing country if they are unable to fulfil the target that has been set by the CDM executive board in the Kyoto Protocol. Before the Annex 1 companies or the government want to transfer their commitment to a developing country, they must follow some instructions provided by UNFCCC board who is responsible to monitor the implementation of the project. Both parties must agree with trade policy agreement. Under an agreement, the firm must prepare some proposal to show the capability of the firm to reduce its emissions. Meanwhile, Annex 1 parties also need to agree to deliver some advantages to the company

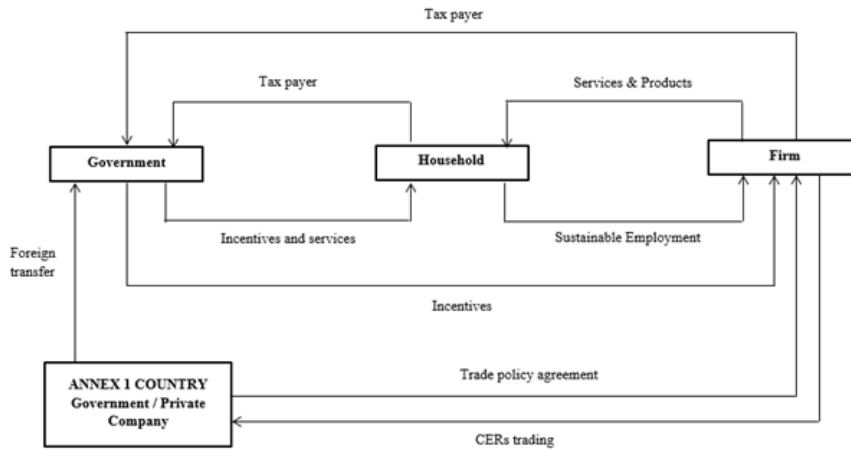


Figure 2. General Equilibrium (GE) model for CDM project.

which related to the implementation of environmental practices. It could be new technology, knowledge, and skills which are significantly crucial to enhance the potential of the company to reduce their emissions. As a return, they will receive CERs permits and at the same time open more opportunities for collaboration in the future. In 2015, estimated 9,844.435 kt CO₂e total of CERs issued for 1st crediting period have been sold to annex 1 country to fulfil their requirements (NRE, 2009). Through the agreement, the developed country who agrees to invest some amount of money will deliver foreign transfer into the developing country. It will be beneficial for the government and also the firm. It is expecting will give more financial support to the firms increasing the capability of environmental technologies.

Firm. In this case, Malaysian palm oil mill plays a role as a firm to participate in carbon trading project. The company needs

to apply and pass the validation process through the CDM executive board before started issues their emission. After passed validation process, they will sign trade policy agreement with developed countries. Both of the parties must to agree with cap-and-trade processing and preparing some financial support to invest in the host country. Palm oil industry has the biggest potential to develop renewable energy through biomass and methane avoidance, enable to recycle into other sources or treated, before releases back into the environment. One tonne of carbon reduction equivalent to one of saleable CERs. With the credits, the firms can trade or sold it to developed country depending on policy agreement which need to be fulfilled. As a return, the firm will receive additional financial support for manufacturing cost and capable to invest back into their environmental project. Besides can reduce the impacts on the environment, the management cost also could be diminished. In terms

of the linkage between the household and the government, the company could offer environmental services and products which crucial to increase the quality of our environment. Meanwhile, as a taxpayer to the government, the revenue was obtained will be returned back to society which a part of government sources to increase the quality of administration.

Government. The government is the responsible authority to monitor the stability of economic growth in the country. In the context of the palm oil industry, the Malaysian Palm Oil Board (MPOB) is a premier government agency was entrusted to serve the country related to palm oil production (MPOB, 2011). The mission of MPOB is to enhance the well-being of the palm oil industry through research and development, increasing the potential of the producer to contribute in the project. By reconsidering the effort of the Ministry of Energy, Green Technology and Water (KeTTHA) (2017) to promote utilization of renewable energy, the government plays an important role to ensure the concept of sustainable development could be enhanced over time. To ensure the company will be more interested in the project, the government also offered several incentives to promote the project and one of the incentives is tax exemption equivalent for those who agreed to support government incentives. An additional, the government will receive the benefits from foreign transfer through foreign investment in local companies from developed countries. At the same time, the increase of job vacancies for

local communities, especially in the palm oil industry field, will reduce the government burden to overcome unemployment issues, especially from the rural area.

Household. The households who play a role as a final consumer and employee sources for the company also will be affected. In the palm oil industry, there have three majors of employees were required to ensure the implementation of carbon trading can be done properly which is labour, skilled, and semi-skilled workers. The qualification of the employees is dependent on their higher education level. In the palm oil industry, most of the skilled and semi-skilled workers are coming from local communities, while more than 50% of labour workers are from foreign countries (e.g. Indonesia). By improving new sustainable technologies, more skilled and semi-skilled workers could be hired reducing the dependence on foreign workers. Skilled and semi-skilled workers are needed to operate and monitoring new instrument in the mill when more technologies are been developed. More job opportunities for local communities will increase the purchasing power of the household for good and services when they can increase their standard living. As a taxpayer, the increase of household income will generate more revenue to the government profits, significant for economic growth.

As an overall, carbon trading can spur investment in innovation and modernization that can lead to competitive advantages and economic gain in Malaysia. Through the project, policy-maker will be able to

understand the impacts of carbon trading project influencing the behaviours of economic actors, significant for future studies. According to Burfisher (2011), some content and interesting detail must be left behind by the economist when they are trying to explain realistic events. Through the GE model, the impacts of carbon trading influencing the behaviours of economic actors can be determined and the implementation of the project will be studying likely a possible outcome with new solutions. It was significant for policymaker understanding the behaviours of all the actors in the palm oil industry before introducing new application or policy in the future. As one of the platforms to increase the capability of the mill improving environmental technology, the introduction of CDM will benefit all the actors including household and the government in generating their profitability.

CONCLUSION

As a conclusion, the introduction of carbon trading project in Malaysia enhances the opportunities of the firm investing in the environmental technologies in the palm oil industry. The ability of the palm oil industry to contribute to the project cannot be denied when this product has been utilized by the producer volunteering to participate in carbon trading. Since 2006, the Malaysian government had taken this initiative seriously when they are encouraging all the potential sectors volunteering to participate in the project. Palm oil manufacturing is

the most potential sectors to contribute to this initiative proposing palm oil wastes product to be utilized reducing the emission over time. Since the beginning, palm oil mills who are agreed to work together with developed countries (Annex 1) reducing the emission will earn saleable CERs capable to generate profitability for the company. The agreement signed by both parties assumed to influence all the actors in the market. The circulation flow of income and spending from the developed country into the firm will be able to buy the inputs, hired the workers, and capital used for their production processes (Burfisher, 2011).

By volunteering in the project, the firms seem to receive more financial support and technology transfer from the developed country which beneficial for the firm. Then households indirectly will be affected when the company tends to offer more vacancies to the skilled workers among the local communities who have the qualification to fulfil the vacancies. Beside it could increase their standard living, they also enjoyed a good quality life related to a clean environment when the mills change their manufacturing method into eco-friendly practices tangible to increase environmental quality. Meanwhile, the government who is responsible to encourage sustainable practices and provide some revenue for eco-friendly project enable to reduce their burden through the project. The implementation of carbon trading in Malaysia expecting will be influencing all the actors in the market over time. Thus, to enjoy the benefits offered by the project, the Malaysian palm

oil mill should optimize the opportunity by volunteering to participate in the project. In 2020, new international climate change policy known as the Paris Agreement will replace this instrument continuously to tackle climate change issues. Even the implementation of the project is slightly different, but the goal and methodologies used to achieve the target are still the same when UNFCCC offered financial investment for developing countries practising eco-friendly project enhancing sustainable development practices. This study can be utilized by policy-maker to understand the interconnection of the project that will be influencing all actors that playing a role in the market.

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