Petter Tolnes Ingebrigtsen

The Golden Oil - Replacing the Dinosaurs? A Study on the Sustainability of Palm-Oil Biodiesel

INTERENSHIP REPORT

RegINA Resource Governance in Asia Pacific

UNIVERSITAS GADJAH MADA

NTNU
Norwegian University of Science and Technology

Internship Report

The Golden Oil – Replacing the Dinosaurs?

A study on the sustainability of palm oil-based biodiesel

Petter Tolnes Ingebrigtsen

Resource Governance in Asia Pacific
Department of Politics and Government, Universitas Gadjah Mada
NTNU Department of Geography

Contents

1.0 Introduction

A secure, reliant and sustainable access to energy is of quintessential importance to the prosperity of humanity. Satisfying the global demand of energy, however, faces challenges on multiple fronts. Deposits of oil and gas are declining, the world's population increases, and the overhanging perils of climate change persist without a due date in sight. Though the need for a more sustainable trajectory is widely acknowledged among the world of nations, understandings of sustainability varies. How governments act in relation to the looming challenges, reflects their interpretation of sustainability, and may also change as time passes by (Markard, Raven, & Truffer, 2012, p. 957).

In the endeavour of tackling the growing demand of energy, palm oil producing countries, such as Indonesia, Malaysia and Thailand are undertaking substantial efforts in developing their domestic biofuel industries. The former, Indonesia, status as the world's leading producer of palm oil, is experiencing increasing demand from its growing transport sector, at a time in which its domestic production of petroleum declines. Slashing oil imports is largely viewed as one of the key rationales, legitimizing Indonesia's biofuel programme, which currently enforces commercial distribution of 20 percent blended biodiesel (B20). However, the appropriateness of palm oil-based biodiesel as the solution to the world's energy need has raised several concerns of its environmental impact.

Questions and criticism related to the sustainable aspect of palm oil production has alleviated in recent years due to concerns surrounding deforestation and destruction of peatlands. Both of which are linked to substantial emission of carbon dioxide CO_2, and loss to biodiversity. However, as accounted for throughout this study, understanding of sustainability is not necessarily as clear-cut as the definition may imply. For this reason, placing Indonesia's biofuel mandate in the context of a sustainability transition, makes this a particularly interesting perspective of analysis.

Thus, the form of this paper's research question takes the following form: *Does Indonesia's biofuel programme manifest a viable trajectory to a 'sound' sustainability transition?*

While the research question encourages a somewhat yes-or-no answer, this piece of study will argue why such a clear-cut answer is difficult due to absence of an unanimous understanding of sustainability. However, this paper concludes that ill practices of biodiesel production are overshadowing the benefits of consuming palm oil-based biofuel, challenging the soundness of the proposed sustainability transition.

2.0 Concepts and Theory

2.1 Globalization

Globalization theory paints a picture of the world in which notions of time and space have been fundamentally altered. It highlights processes that have virtually made the world a smaller place. The time needed to travel around the globe has been significantly reduced over the last century due to human's advancement and mastery of technology. In some instances, distances have been as good as eliminated, for example through instant messaging and real time video calls. Important in this regard is the velocity in which information and knowledge are spreading across borders. Citizens, like governments, are nowadays, highly capable of paying attention to developments in far-away corners of the world.

Simply, globalization denotes the "*widening, deepening and speeding up of worldwide interconnectedness*" (McGrew, 2017, p. 16). The term itself has received massive attention since the 1990s, in which a number of academic disciplines, ranging from economics, sociology, political science and cultural studies, have added it to its literature (Osterhammel & Petersson, 2003, p. 5). For example, in the school of economics, Gilpin (2001, p. 364) defines globalization as "*the integration of the world economy*". While the explicit definition of globalization may vary across disciplines, worldwide interconnectedness remains at the core one way or another.

2.2 Socio-technical transition

Energy, water or transportation sectors may be understood as socio-technical systems, in which are made up by networks of actors (individuals, firms, organizations, collective actors) and of institutions (Societal and Technical norms, regulations, standards of good practice), as well as material artefacts and knowledge (Geels, 2004; Markard, 2011; Weber 2003 in (Markard et al., 2012, p. 956)). The components of such a system are diverse yet tightly interconnected and dependent on each other. As result, the aggregate of the different elements within a socio- technical system provides societies with a particular service, such as energy, water or transportation (Markard et al., 2012, p. 956). A socio-technical transition on the other hand, refers to a set of processes that lead to "*deep structural changes in systems, such as energy, that involve long-term and complex reconfigurations of landscapes with technology, policy, infrastructure, scientific knowledge, and social and cultural practices towards sustainable ends*" (Newell & Mulvaney, 2013, p. 2). A transition of this nature involves a broad range of actors, and usually unfolds over a considerable amount of time (e.g. 50 years or more).

2.3 Just Transition

A just transition goes beyond the traditional study of socio-technical transitions in that it incorporates both justice and equity within its foundation (Newell & Mulvaney, 2013). The underlying rationale of extending the way we understand transitions lies in the very reality of a socio-technical transition, which is by no means superficial in nature. For a transition to qualify as a socio-technical transition, the structural changes must go deep, involving long-term and complex reconfiguration of landscapes with technology, policy, infrastructure, scientific knowledge, and social and cultural practices towards sustainable ends (Newell & Mulvaney, 2013, p. 2). Adding justice and equity as additional components implies safeguarding citizens that may be negatively affected by the change of government policy. Questions such as "*how to ensure that the policy or efforts made toward a low carbon economy are equitable, sustainable and legitimate in the eyes of citizens*" (Newell & Mulvaney, 2013, p. 2) are central. Exploring the legitimacy of a palm oil fuelled transition is thus added to the discussion in later chapters.

2.4 Sustainability Transition

If we treat sectors such as energy, water supply or transportation as socio-technical systems, then sustainability transitions refers to a process where the given socio-technical system switches to more sustainable modes of production and consumption (Markard et al., 2012, p. 956). In respect of the research question, both the energy and transportation sector fall accordingly under scrutiny. Like socio-technical transitions, sustainability transitions are also long-term and multi-dimensional. What separates the former from the latter, is that a sustainability transition does not necessarily entail deep structural changes in the given system. Though both are long-term, sustainable modes of production and consumption may be introduced to very specific components of the system, without producing an outright structural change. Socio-technical transitions and sustainability transition may however, very well go hand-in-hand. Smith, Stirling, & Berkhout (2005) note in their article on the governance of sustainability socio-technical transitions that utilization of cleaner technology depends on a multi-fold of factors, such as market-structure, patterns of final consumer demand, institutional and regulatory systems and existing infrastructure.

Although, while there is no uniform nor grand theory to the study of sustainability transitions, this contribution aims to add currency to this emerging field of interest, by exploring whether the introduction of the biofuel mandate facilitates a guiding policy to which more sustainable modes of production of energy supply may occur while linking it with the demand of energy in the transportation sector. Hence, in the absence of a grand theory on sustainability transition, this short study utilizes theoretical insight from globalization theory as a guiding engine to understand how global pressures, such as energy demand and environmental pressures, interplay with the creation of the biofuel mandate.

2.5 Method

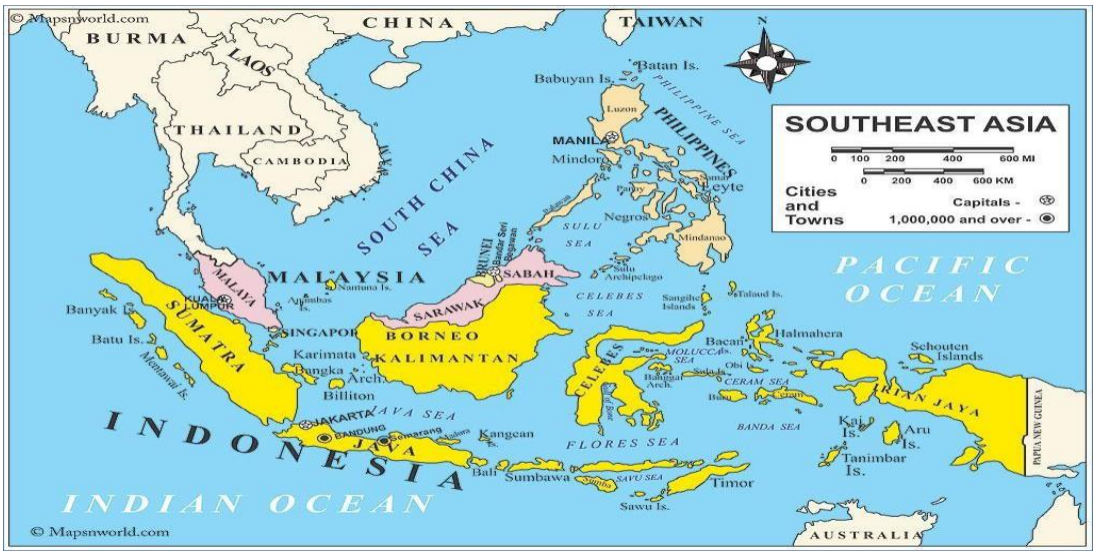
Data for this study was collected by extensive and systematic search through several academic publications, research reports, government publications, as well as recent newspaper articles. Thus, the collected data processed in this paper, are largely secondary

in nature. Though the study was conducted in Indonesia, language barriers and insufficient transparency remained a challenge in obtaining suitable primary data in regards of the Biofuel Mandate and vested interests in the palm oil/biofuel industry. For this reason, relying on secondary data, though by cross-checking said data, remained at the core of the methods utilized. Direct experience from being in Indonesia while the study was conducted have indeed proved helpful. This enabled me to get in contact with people with extensive knowledge on the matter of investigation, who's personal and professional perspectives proved to be valuable insights to the finalization of this paper. Informal interviews were also conducted, though also highly valuable, but the output of the interviews was not directly pasted into this study.

The theoretical base of this short study is grounded in globalization as a concept, coupled with sustainability transition. Where "*Research on "sustainability transitions" comprises all scientific articles that are concerned with the analysis of the institutional, organizational, technical, social, and political aspects of far-reaching changes in existing socio-technical systems (e.g., transportation and energy supply), which are related to more sustainable or environmentally friendly modes of production and consumption. Sustainability transitions research includes empirical studies, as well as conceptual and methodological contributions*" (Markard et al., 2012, p. 959). With this in mind, both the concept of socio-technical systems and just transition are also included as they provide an important framework to understand sustainability transitions.

3.0 Empirical Data

3.1 Geography Map



Source: (Mapsnworld, 2019), from: http://www.mapsnworld.com/asia/south-east-asia-map.html

The Republic of Indonesia is an island country in SouthEast Asia. Its 1.826,440 square kilometres of land is scattered across over 17,000 islands, making Indonesia the world's largest archipelago (Laksmana, 2011, p. 97). With the Indian Ocean to the west, and the Pacific Ocean to its east, Indonesia finds itself strategically located in the near proximity of major economic powers, such as China, India and Australia (see map 1.0), from which a substantial bulks of trade passes along its islands. Most prominent in this respect is the Strait of Malacca, one of the major maritime chokepoints of the world, through which millions of barrels of oil passes through every day (Emmerson & Stevens, 2012, p. 4). Owing to its geographical position along the equator, Indonesia is blessed with a tropical climate which tends to be relatively stable all- year round. Due to the suitability of its climatic environment, as well as a long history of cultivation, South East Asian countries hold a comparative advantage in palm oil production (Mukherjee & Sovacool, 2014, p. 2). In particular, Indonesia stands out in this respect, having dominated production of palm oil in the region since the mid-1960s together with Malaysia (Mukherjee & Sovacool, 2014, p. 2). Collectively, they account for over 80 per cent of the total production in the world, in which Indonesia ranks

as the number one producer (Ibid).

Overall, Indonesia is a country rich in natural resources, possessing significant deposits of fossil resources, ranging from oil, to natural gas, all of which play an essential role to Indonesia's energy supply (G20, 2019, p. 11). Its richness of natural resources is not only confined to non-renewable resources. Due to large amounts of rain, vast forests, and its geographical location within what is known as the 'Pacific Ring of Fire', Indonesia acquires a great potential of producing renewable energy through hydropower, biomass and geothermal energy production (G20, 2019, pp. 11-18; SINTEF, 2019). However, despite the country's great potential of renewable energy, production of said energy remains, unfortunately largely under-utilized.

3.2 The Biofuel Mandate of Indonesia

B20 simply refers to the policy in which defines the minimum blending criteria of biodiesel with fossil diesel, namely 20 per cent. In the roadmap of Indonesia's ambitious biodiesel programme, B20 status as the latest target towards an ever-larger blending percentage. The programme's framework is made by a number of supporting laws, regulations and presidential decrees, making this a complex unit of analysis. Promotion of biofuel was first initiated in 2006 with the enactment of the Presidential Instruction on Biofuel Supply and Utilization, stipulating the procurement and usage of biofuels (G20, 2019, p. 16; USDA, 2019, p. 3). In 2008, this enactment was followed up by "biofuel mandatory programme" under MEMR regulation No.32, introducing concrete blending targets for biofuel for the period between 2008-25 (G20, 2019, p. 16). In addition, MEMR regulation No.12 enforces the mandatory blend targets, in which 20 percent was introduced in 2016 to the Public Service Obligation (PSO) transport sector, and further expanded to the Non-PSO transport sector (see table below).

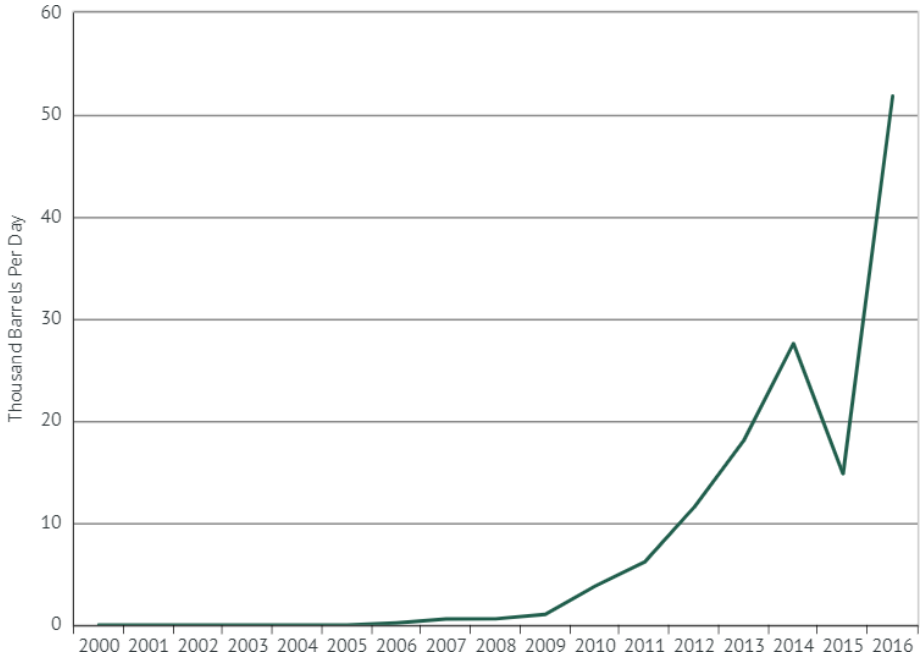
Table 1.0

Sector	2016	2020	2025
Transport, Public Service obligation (PSO)	20%	30%	30%
Transport, Non-PSO	20%	30%	30%
Industry	20%	30%	30%
Electricity	30%	30%	30%

Source: MEMR Regulation 12/2015 in (USDA, 2019, p. 4).

Since the initial launch of Indonesia's policy on biofuel, production has remained largely policy-driven (G20, 2019, p. 16). In helping the industry adjust to the changing architecture of the country's energy supply, the GOI built the first plant for biodiesel production, which followed up the establishment of many biodiesel companies (Naimah & Morgunova, 2018, p. 3). A total of 1.1 billion USD was further allocated to the development of the biofuel sector, in particular to support innovation and technology (Mukherjee & Sovacool, 2014, p. 7). Parties responsible for meeting the targets sketched out in MEMR regulation No.12 are companies possessing a wholesale license to sell fuel to end-users and companies that are end-users of fuel (G20, 2019, p. 16). State-owned company Pertamina, distributes the majority of biodiesel sold in Indonesia. Regulations concerning the enforcement of B20 further lay down rules concerning the "playing rules", including sanctions and threats in the event of non-compliance by affected companies (BPDP, 2018). As seen in figure 1.0 below, domestic consumption of biofuel skyrocketed a few years after the initiation of the biofuel programme. It should be noted however, for the sake of clarification, that the blending mandate does not cover consumers using gasoline vehicles.

Figure 1.0 Indonesia's consumption of biofuel (2000-2016) in t/bpd



Source: (Knoema, 2019) from:

https://knoema.com/atlas/Indonesia/topics/Energy/Renewables/Biofuels-consumption

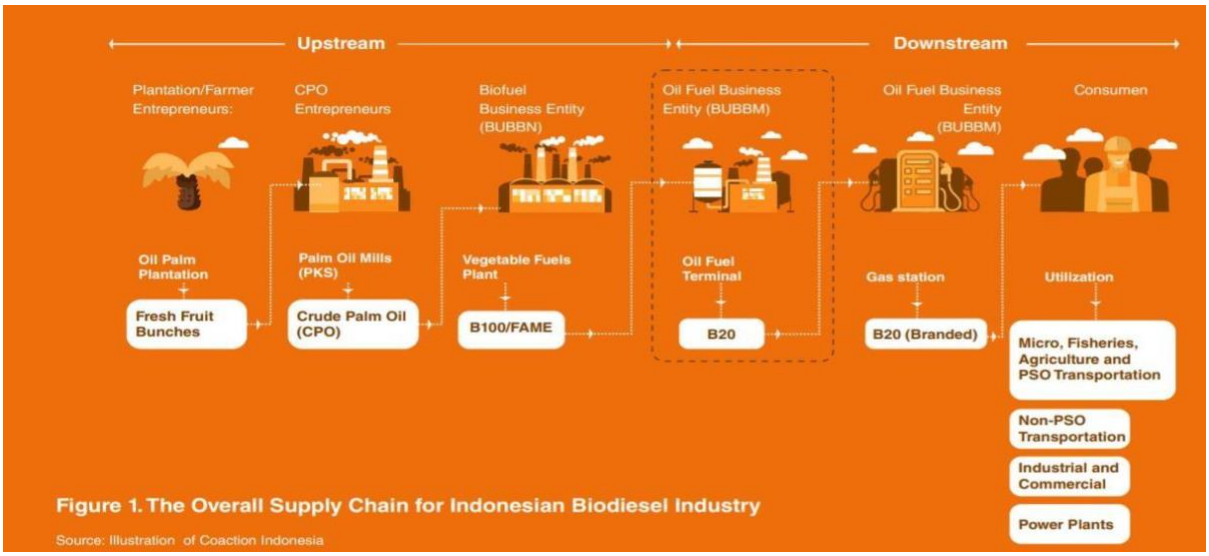
3.3 Biodiesel

In general, we distinguish between two types of biofuel, conventional and advanced. Where the distinction is based on the raw materials used, and how the fuel is produced (Miljø-Direktoratet, 2019). Conventional biofuel is produced from raw materials that are also used for cooking purposes and food for animals. In Indonesia, the biofuel industry is dominated by biodiesel, where palm oil features as the primary raw material (Coaction Indonesia, 2018, p. 3), hence falling under the label of conventional biofuel. Advanced biofuel, or second-generation biofuel, utilizes non-type food biomass, such plant materials and animal waste as input for manufacturing (Miljø-Direktoratet, 2019). The technology utilized in the production of conventional and advanced biofuel also differ, in which the latter require more sophisticated technology for production, capital investment and policy support mechanism (Sims, Mabee, Saddler, & Taylor, 2010). At least if full-scale commercialization of advanced biofuel is to take place in Indonesia. Compared to fossil fuel,

combustion of biodiesel releases less CO2 (Coaction Indonesia, 2018, p. 3; Miljø-Direktoratet, 2019). It is therefore likely that also second-generation biofuel will become integrated into the solution of tackling challenges of energy demand and sustainability.

Yet, production of conventional biofuel will continue to remain an integral part of Indonesia's biofuel programme. Improving the modes of production along the supply chain is therefore of interest, while allowing the development of second-generation biofuel to grow alongside generation one. By reviewing the figure (2.0) below, illustrating the overall supply chain of Indonesia's biodiesel industry, it becomes clear that fruits of the oil palm go through several stages of processing before being released into the market for consumption as biodiesel. Thus, the definite environmental impact of biodiesel cannot be reached by only looking at the combustion level. Every stage of the value change needs to be analysed, from upstream (plantations) to downstream (manufacturing and distribution).

Figure 2.0 Biodiesel's supply chain



Source: illustration of Coaction Indonesia. Retrieved from: (Coaction Indonesia, 2019, p. 10.)

3.4 Palm Oil

Crude Palm Oil is manufactured from the fruit of oil palms, largely cultivated in tropical pockets along the equator. Because the string of qualities palm oil possesses, it has made its way into a great variety of food products, cosmetics and now increasingly in biofuel. As

a result, it has arguably become the most important vegetable oil in the world, ranking globally as the 97th most traded commodity (OEC, 2017a), accounting for over a third of all vegetable production worldwide (Malins, 2017, p. 3). Oil Palms further claim the position as the fastest growing monocultures in the world (Pichler, 2013), where the total area of plantations in Indonesia covers over 14 million hectares (ha) (Coaction Indonesia, p. 2). This constitutes approximately a little bit larger than the Island of Java, an island nurturing 60 percent of all Indonesians. Most plantations are not generally found on Java though. About 70 percent of the plantations in Indonesia are located on Sumatra, whereas the remaining percentage are to a great extent found on the island of Kalimantan (Indonesia-Investment, 2017), (See map 1.0). The palm oil sector in Indonesia increases annually, with expansions of both small-scale and large plantations. Total production in 2016 accounted for 32.52 million tons of CPO. The following year, there had been a 17.6% increase, in which the total volume reached 38.17 million tons of CPO. (Coaction Indonesia, 2018, p. 9).

Compared to other vegetable oils, palm oil production involves some significant advantages. Namely higher yield productivity while being less land intensive (Mukherjee & Sovacool, 2014, p. 2). Meaning that farmers of oil palm can produce a larger output at more efficient rate, with a smaller input of land. Palm oil production in South-East Asia may continue year-round, due perennial yields owing to the region's favourable climate (Ibid). As palm oil features as the main raw material for biodiesel production, the role of the initial upstream actors, play a significant role in relation to the sustainability of the industry. We may distinguish between three main categories in this respect.

First, oil palm farmers/planters. This group include both smallholders and plasma oil palm farmers, who execute their practices without capital assistance from larger companies and banks (Coaction Indonesia, 2018, p. 10). Smallholder production accounts for about 33 percent of Indonesia's total palm oil production, and about 40 percent of the total area of the country's oil palm crops (Yunan Ardian, P. Lubis, Muljono, & Hasri Azahari, 2018, p. 97). This group attains the right of cultivation through "Cultivation Certificate" under the authority of the regent/mayor of the province (Coaction Indonesia, 2018, p. 11). Smallholders are not legally subject to certify their plantations under the Indonesians Sustainable Palm Oil (ISPO) scheme. I will return to certification schemes later on in my

discussion. The second category is middle scale plantation business actors. Actors within this categorisation possess larger plantations and far more capital relative to the first group (Ibid). Third, big oil companies constitute the final category. The latter groupings include both state-owned and private companies and are legally obliged to obtain a Cultivation Right and a Plantation Business License (IUP) and a Business Use rights (HGU) (Ibid., 11) which stipulates "*the rights to cultivate land that is directly controlled by the state, within a certain period of time, for an agricultural, fishery or livestock companies*" (Coaction Indonesia, 2018, p. IV). Large plantations hold about 55 percent of total plantations and production amounts to 60 percent. State-owned plantations amount to 5.1 percent of Indonesia's palm oil plantations (Ibid.). Hence, private plantations largely dominate the country's production of palm oil.

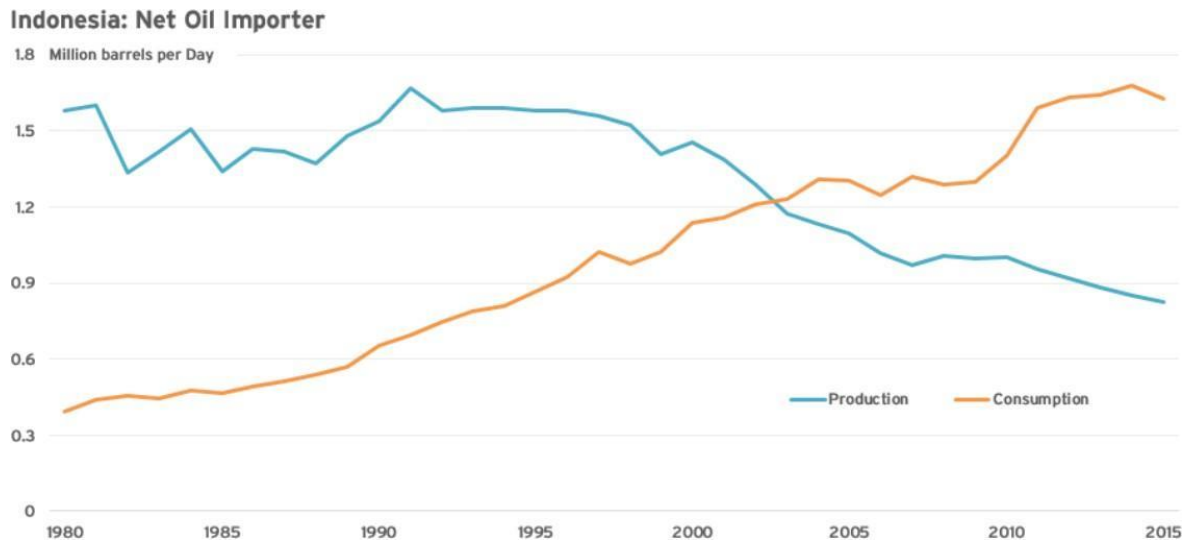
3.5 What is the underlying rational?

Obviously, policy is not drafted in a vacuum. Any country, regardless of its structural composition, is subject to the uncertainties of tomorrow. Meaning, that the degree of worldwide interconnectedness forces governments, businesses as well as individuals to pay attention to developments occurring across each respective border. Globalization has made sure of that. For example, developments at the world markets, such as price fluctuations on a specific commodity, may for example produce great impacts on a country's policies that are net importers of said commodity. National energy policies across the world are influenced by organisations projecting global energy demand, such as the "world's energy watchdog" the International Energy Agency (IEA) (Green, 2019). Indonesia is no exception.

Indonesia emerged as a net importer of oil in the mid-2000. Combined with an increasing domestic consumption of fuel, Indonesia has been importing greater quantities of crude oil (see figure 2.0). According to the International Energy Agency, 45 percent of domestic supply of crude oil was met by imports (IEA, 2017, in (G20, 2019, p. 13). Since consumption of oil surpassed domestic production of oil, an increasing trade deficit in crude oil has been cumulating, peaking 3.3% of GDP in 2014. By virtue of these developments, the country's biofuel scheme may be viewed as countermeasure in

diversifying its energy supply. The leap is expected to drive down imports on oil, thus, to a certain extent, resolving its current account position (Gorbiano, 2019). According to the Office of the Coordinating Economic Minister, 1.7 Billion USD in foreign exchange were saved due to the reduction of oil imports (Ibid).

Figure 2.0. Indonesia oil trade balance in millions of barrels per day.



Source: BP, in (Alie, 2016). Link: http://energyfuse.org/will-indonesias-oil-industry-fare-opec-suspension/

Adding to Indonesia's current account deficit on oil, challenges in exporting oil palm have recently surfaced. The European Union (EU) is the third biggest importer of Indonesian palm oil, where the continent overall is the destination of about 18 percent of Indonesia's total export of the vegetable oil (OEC, 2017b). However, the European Commission presented a proposal of imposing countervailing duties of 8 percent to 18 percent on imports of subsidised biodiesel from Indonesia, in August 2019 (European Commission, 2019). The official statement from the EU, is that these duties are aimed to restore what they perceive as an unfair playing field for European biodiesel producers, due to Indonesian subsidies provided for biofuel production (Ibid). Following an anti-subsidy investigation on the Indonesian biodiesel industry, The EU stated that "*the Commission provisionally concluded that there were no compelling reasons that it was not in the Union*

interest to impose countervailing measures corresponding to the total amount of countervailable subsidies on imports of biodiesel originating in Indonesia" (European Commission, 2019, p. 49).

Import duties proposed on biodiesel from Indonesia are to a certain extent legitimized on the basis of free competition, a move welcomed by incumbent European biofuel producers (Reuters, 2019a). Furthermore, palm oil is further victim to the EUs definition on Indirect Land Use Change Impacts of Biofuels (ILUC). Where the high indirect impact on land use by palm oil production in addition to matter of subsidies, justifies the trade blocks' eventual ban of the commodity (Gro-Intelligence, 2019). In March 2019, the EU announced that palm oil would no longer be considered "green" and would subsequently no longer be branded as a renewable transportation fuel (Reuters, 2019a). Though the recent development in the EU regarding their position on palm oil and biodiesel are relatively new, they reflect a general view that has gained considerable momentum over the last decade. However, we should be careful of jumping to conclusions. Stating that Indonesia's Biofuel programme is a result of Western scepticism towards palm oil would be premature. Nevertheless, one of EU's key arguments for phasing out palm oil is grounded in the very sustainability aspect of cultivation, an interesting point to take into consideration when discussing B20 in relation to Indonesia's 'sustainability transition'.

What about Indonesia's commitment to the cause against greenhouse gas emissions? According to Kern & Markard, sustainability transitions are often associated with sustainability targets (Markard, 2017). A purposive transition. In particular, Indonesia has committed itself to reduce GHG emissions by 29 percent below business as usual (BAU) levels by 2030. With foreign assistance, Indonesia offers to reduce emissions by up to 41 percent compared with BAU (Kharina, Malins, & Searle, 2016; Climate Action Tracker, 2019). However, the linkage between the biofuel scheme and the country's commitment to the Paris accord appear to be weak at best. First, the dates in which the leap to biofuel and its commitment does not correspond with one another, as the biofuel programme was initiated years in advance. Furthermore, due to the tensions that emerged between the EU and Indonesia in regards to the trade blocs' plan on phasing out palm oil as a renewable transportation fuel, Indonesia stated that they may consider exiting the 2015 Paris

Agreement (Reuters, 2019c). Adding some doubt to where Indonesia's true interests are.

However, sustainable development is not only confined to the environmental dimension. As stipulated in the United Nation sustainability targets (SDGs), 17 different targets are highlighted, which recognize that "*ending poverty and other deprivations must go hand-in- hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests*" (Nations, 2019). Despite facing harsh criticism, the palm oil industry is regarded as key in Indonesia's national effort of achieving the SDGs. During the second Belt and Road forum for International Cooperation meeting, Indonesia's Ministry of Foreign Affairs, Arrmanatha Nasir, stated "*We want to emphasize the importance of palm oil as an alternative commodity for Indonesia's development, and also taking into account the prosperity of palm oil farmers and their families*" (Yasmin, 2019). The relationship between palm oil and the prosperity of the Indonesian people were also advocated by the Indonesian Embassy in Brussel earlier in 2019, stating that: ""*Palm oil is one of primary elements of Indonesia's national interest, notably because it is related to the prosperity of 17 million Indonesian citizens, including smallholder farmers, who directly and indirectly depend on the palm oil industry*." (Algamar, 2019).Taking into account the economic opportunities provided by the palm oil industry, now currently boosted due to the ongoing biofuel expansion, the social and economic aspects of sustainable development should therefore not be left out.

3.6 Mapping the nuances in the discussion on palm oil

To guide the discussion on the 'soundness' of the proposed sustainability transition of Indonesia in relation to its biofuel programme, I will add three additional particularities of sustainability transitions into the mix. Of importance here are the centrality of conflicting views, including trade-offs, and power and politics (Kern & Markard, 2016, in (Markard, 2017). And palm oil is without doubt controversial. While bearing the promise of economic growth and sustaining livelihoods, the means of production has been under severe scrutiny in recent decades. Critics of palm oil production are in particular pointing to the dramatic loss of precious rainforests as a direct consequence of the industry. Proponents, on the

other side, argue that production may indeed occur sustainably, and that opponent's claims are exaggerated or some kind of western propaganda to protect their own market interests.

Initially, each view presented so far seems to be in conflict with each other. But are they really mutually exclusive? It would be fair to reach the conclusion that cultivation of palm oil is either sustainable or not. Well, the reality is not as straightforward. Like sustainability transition, the very basic understanding of sustainability too is contested. Meaning that advocates of palm oil production may employ a different understanding of sustainable production compared to its critics, especially considering that it is a renewable raw material. Keep in mind that the EU de facto reclassified palm oil from a renewable raw material to non-renewable.

Substantial research links cultivation of palm oil with deforestation, destruction of peat land and subsequent loss of biodiversity (Koh & Wilcove, 2007; Mukherjee & Sovacool, 2014; Tan, Lee, Mohamed, & Bhatia, 2009). Recent data from the Centre for International Forestry Research estimate a 39 percent loss in forest due to expansions of plantations (Ananthalakshmi, 2019). Alongside logging (legal and illegal), agriculture production and forest fire, palm oil finds itself in company with the four largest drivers of deforestation in Indonesia (Mukherjee & Sovacool, 2014, p. 7). The hard facts are deforestation and conversion of peatlands are major drivers of GHG emissions. Without going into too much technical details, it is important to acknowledge vegetation's extraordinary ability to capture CO2. In this respect, peat lands stand out, capable of absorbing carbon at the rate of 100 kg per hectare annually. Between 20-33 percent of earth's terrestrial carbon are contained by peat soils (Mukherjee & Sovacool, 2014, p. 4). Globally, Indonesia is experiencing the highest rate of deforestation. Between 2000 and 2005, deforestation rates accounted to 2.7 percent annually (Koh & Wilcove, 2007). It is further estimated that approximately 25 percent of Indonesia oil palm plantation are located on peat soil (Tan et al., 2009, p. 423) According to a study by Fargione et al., in (Mukherjee & Sovacool, 2014, p. 4) *"repaying the carbon debt from converting Indonesian and Malaysian tropical rainforests into palm oil plantations would take the resulting biodiesel 86 years. The biodiesel produced from converting peat soils in these two nations, would require 423 years to repay its carbon debt or between 487 and 1743 Mg CO2/ha*", evidencing the vicious nature of palm

oil production if ill practices of cultivation continues to abound. Thus, preservation of forests and peatlands remains at the heart of criticism against the palm oil industry.

NGOs such as Regnskogfondet, a Norwegian organisation fighting to preserve rainforests across the world, spearheads this view. Advocating against the overall use of palm oil based biofuel, due to the industry's linkages to loss of biodiversity, rainforests and peat conversion (Regnskogfondet, 2019). Furthermore, they argue that trade in biofuel sourced from palm oil should be avoided and its usage regulated, in order to hamper corporations' interests in the fuel (Ibid.). Indonesia's President Joko Widodo's wish of wanting to jump from B20 to B30 by January 2020, and B50 by the end of the year (Gorbiano, 2019), conflicts with the view of Regnskogfondet. As they further argue that expansions beyond the current level of production would occur at the expense of the country's rainforests and peatlands (Regnskogfondet, 2019).

However, views regarding the upstream stage of biodiesel differ substantially in South East Asia. To policy makers in Indonesia, a number of challenges are evident. First, the country requires reliable access to energy. The realities are, Indonesia is the fourth most populous country in the world, with the 15th largest motor vehicle market, well on its way of securing 10th place (Kharina et al., 2016, p. 1). With declining oil deposits and a culminating account deficit, palm oil is viewed as a solution. Second, the palm oil industry accounts for a large share of Indonesia's GDP and labour market. A conservative estimate that a little more than 2 million farmers, and 3 million worker's livelihoods depend on palm oil according to Adrian, Lubis, Muljono & Azahari (2018, p. 96). Whereas higher estimates were given by Indonesia's the current speaker of the People's Consultative Assembly Bambang Soesatyo, who claimed that the industry has created some 19.5 million jobs, in which includes 2.6 million smallholders (Djono, 2019). By adding the aforementioned traits of contemporary Indonesia together, a picture of understanding is shaped.

Moreover, because of the different topographical traits between Europe and SouthEast Asia, incumbent stakeholders in the palm oil industry, directly or indirectly, are reflected by the reality of geography. Coupled with the economic potential of the commodity, interests and values differs accordingly. For example, some camps view the

criticism raised against palm oil as means of legitimizing 'the European trade war' (Ibid). More hardline claims, such as that of one government official in Malaysia, brands European efforts to phase out biofuel as 'crop apartheid' and "modern form of colonialism" (Hutt, 2019). The Council of Palm Oil Producing Countries (CPOPC), an intergovernmental organisation founded by Indonesia and Malaysia, further criticize the EU's recent moves against palm-oil based biofuel. For example, the council claimed that the concept of 'Indirect Land Use Change' (ILUC), employed by the EU to phase out palm oil biofuel, is scientifically flawed (CPOPC, 2019). Protection of European producers of vegetable oil and biofuel is rather viewed by the council as the underlying rationale. "*The criteria selected under the proposed Regulation deliberately focusses on palm oil and deforestation and makes no attempt to include broader environmental concerns associated with the cultivation of other vegetable oils including rapeseed*" (CPOPC, 2019). Supporters of the industry further emphasize that production of palm oil requires far less land compared to alternative vegetable oils processed in the EU and the US. Drawing from this, and the far superior yield level, they are of the opinion that an eventual ban of palm oil would only lead to clearance of more forests in order to make way for substitute-crops (Djono, 2019).

As noted, power and politics feature among the particularities of sustainability transitions. The palm oil industry retains a status of strategic importance to Indonesia, generating revenue and employment, while closing the gap on its petroleum trade deficit. In assessing the proposed sustainability transition with the introduction of the biofuel mandate, veins of corruption remain a challenge. Since 2001, the Republic of Indonesia has been a highly decentralized country, in which district governments were granted considerable power over the management of its forestry resources. In study conducted by Djogo & Syaf (2003), they found that decentralization of Indonesia gave birth to an environment in which district governments were not accountable upward to the central government, nor downward to the local people. With substantial power over licensing of palm oil plantations, district chiefs were found in a different study, (The Gecko Project, 2019) to systematically exploit their position by selling permits to major plantation firms, making millions of dollars for their own profit, and to fund election campaigns for themselves. A trend that may thrive due to what they describe as "*a near complete lack of*

oversight" (Ibid.) The illness of corruption does not only lead to large losses in state revenue, studies have confirmed that there is a positive relationship between deforestation and corruption (Koyuncu & Yilmaz, 2008). Furthermore, the existence of patronage networks has made it easier for companies with the right connections to skirt regulations to obtain licenses, and have been a major factor of unsustainable use of peatlands (Varkkey, 2013, p. 29).

3.7 Legitimising Palm Oil?

Acceptance and support for the industry is legitimized by certification schemes, claiming to ensure the sustainability of palm oil production. The Roundtable on Sustainable Palm Oil (RSPO), established in 2004, is the most known certification scheme (Yunan Ardian et al., 2018, p. 101). In addition, Indonesia and Malaysia have also established their own sustainability standard, Indonesian Sustainable Palm Oil Certification System (ISPO) and Malaysian Sustainable Palm Oil (MSPO). Since establishment, the number of plantations qualifying for a certificate have accelerated, covering millions of hectares, amid the increasing global pressure to address the environmental aspects of the industry (Reuters, 2019b). ISPO certification is mandatory for large palm companies, while voluntary for smallholders. RSPO on the other hand, is purely voluntary, but impose stricter criteria compared to ISPO (Reuters, 2019b). Reuters report that the ISPO Commission have certified 502 plantations since its launch (Ibid.), while RSPO certification only covers 36 plantations and 161 palm oil business entities in Indonesia according to Coaction Indonesia (2019, p. 85). An additional RSPO scheme has also been created, in response to requirements found in EU Directive 2009/28/EC, named RSPO-RED. The differences compared to RSPO, is that RSPO-RED includes the issue of clearing land and independent smallholders to its scope. No companies in Indonesia have received an RSPO-RED certification (Coaction Indonesia, 2019, p. 85).

Certification schemes such as the RSPO impose stringent conditions on planting procedures for further expansion. Questions regarding the origin of land for the purpose of palm oil production are one crucial point in the ongoing debates of biodiesel. To the RSPO, it is vital that land clearing does not entail conversion of peat land nor plays part in

deforestation (RSPO, 2018, p. 59 & 63). Conversion of land for planting or replanting should neither be prepared through the use of fire (Ibid., 61), a practice of which have been executed widely across the country, subsequently causing large waves of fires across Kalimantan and Sumatra, despite the central government's effort to curb the practice (Reuters, 2019d). ISPO also disallows slash- and-burn practice, and is further a criminal offence under Indonesia's forestry law (Ibid.)

3.8 Trade-offs

Among the core publications in the field of sustainability transitions, (Kemp, Schot, & Hoogma, 1998) notes that while the unsustainability of the present trajectories of technical change in sector such as transport and agriculture is widely recognized, how to steer the transition into more sustainable modes of development remain far from clear. With the velocity in which ideas and knowledge expands across borders in the era of globalization, businesses and politicians should be well aware of the existence of sustainable technology. Yet, in the endeavour of altering the trajectory of technical change, important barriers to change persist. Development times, uncertainty regarding market demands and social gains, as well as organizational structures, technology and infrastructure and the wider institutional context remain key obstacles according to Kemp, Schot & Hoogma (1998, p. 174).

To Indonesia, the question of how to supply its consumers with a reliable source of energy, as its motor market continues to grow while the volume of domestically produced oil declines, remains prominent. As accounted for above, Indonesia is a country rich in natural resources, and possess significant opportunities for renewable energy production. Utilization of the country's hydroelectric and geothermal potential offers two viable alternatives to biofuel. Yet, only 5.3 GW of Indonesia's estimated 75 GW hydroelectric potential have been developed (G20, 2019, p. 15). With the second largest geothermal potential in the world, estimated 29 GW, current capture subsoil heat stands at just 1.7 GW (Ibid, p. 18). This raises the question of why the output of power sourced from renewables such as hydroelectricity and geothermal resources is under-utilized when its benefit to the heavily populated society of Indonesia is so evident. Is it because of inadequate technology

or infrastructure? Or does the problem lie at the political level due to high production costs of further developments? Or have Indonesian politicians and businesses become locked-in a palm-oil dependency mindset?

Cost of production remains according to a report on Indonesia's effort to phase out and rationalize its fossil-fuel subsidies (G20, 2019, p. 18), one of the main barriers to expand utilization of Indonesia's renewable capacity. Issues regarding acquiring land permits, insufficient supporting infrastructure and lack of financial investments are also highlighted. Another issue is related to the matter of subsidies. In which the high level of fossil fuel subsidies has played part in the sluggish growth in the developments of renewable energy (Ibid). In terms of subsidies provided technologies able to capture renewable energy in 2015, biomass received the most (47%), while geothermal energy received 42% and mini-hydro plants 9% (Attawood et al, 2017, in (G20, 2019, p. 18). In other words, production of biofuel, through biomass subsidies, receives a larger bulk of support relative to geothermal and hydro-electric energy production. Proponents of biofuel subsidies argue that it is needed because of the significant export contribution CPO generates to the GDP (Coaction Indonesia, 2018, p. 29). Although the government of Indonesia recently has initiated tax incentives in order to boost the development of geothermal energy production (G20, 2019, p. 18), its apparent that expansion of biofuel production has received the relative bulk of attention at the expense of alternative renewables. This raises the question of whether there has been a trade-off in favour of biofuel. Though geothermal energy is increasingly advocated as an alternative source of energy, with the opportunity of supporting the increasing demand for energy, it should be noted that expansion in this industry also leaves scares in nature. The construction of a single rig requires approximately an area of 8400 m^2, as well as infrastructures such as roads in order to support its operations (SINTEF, 2019).

4.0 Discussion and Conclusion

The introduction of the biofuel mandate in 2008 evidence that Indonesian industries, such as energy supply, transport, and forestry, are undergoing significant changes. Through the political guidance of the government, the biofuel programme has made its way into the legal framework of Indonesia, supported with both inflow of capital and state subsidies. The reach of the programme affects both producers and consumers. It effectively drives up demand for crude palm oil, incentivising smallholders and big companies to boost production, either through more efficient agriculture practices or by expanding the grasps of their plantations.

The fruits of oil palms go through several stages along the supply chain of the biodiesel industry, before it is distributed in its new form of biodiesel to consumers across Indonesia. Services carrying a PSO, are by law required to utilize fuel mixed with biodiesel as they receive subsidies from the state. State-owned Pertamina, the key distributor of biodiesel in Indonesia, provides the average consumer with blended fuel under the name of Biosolar at any gas station, from which they may literally and figuratively reap the fruits of the policy.

In the final stage of biodiesel's life cycle, that of combustion, consumers utilize a product that releases less CO_2 emissions compared to conventional diesel and gasoline. Increased consumption supports sustaining the oil palm industry, an industry which millions of Indonesian citizens, and businesses are dependent on, either directly or indirectly. The golden oil offers a lifebuoy to a nation that experiences a rising sea of oil trade imbalances. Indeed, the economic value of palm oil is high. It is the most widely traded vegetable oil in the world, from where the majority of exports derives from Indonesia. Thus generating a substantial share of revenue to its GDP, and relating to the prosperity of millions Indonesian citizens as accounted for earlier.

Yet, Indonesia’s industrial transformation, fuelled by biodiesel, has raised strong criticism, especially in the west. A number of studies link the key raw material in biodiesel to ill practices, casting doubt over the sustainable benefits of the plant-based fuel in curbing greenhouse gas emissions. Where the current area of oil palm plantation stands at over 14

million hectares, satellite photos reveal the extent of which plantations have penetrated its way into Indonesian rainforests, effectively casting Indonesia into an enormous carbon debt. Acknowledging the impact of deforestation and conversion of peatlands as major drivers to GHG emissions, particularly when slash-and-burn methods are utilized, it is clear that an equation the calculates biodiesel's CO_2 emissions cannot be restricted only to the stage of combustion. Every node in the supply chain needs to be incorporated.

Hence, the importance of certification schemes, highlighted above, should be crystal. For a moment, let us assume that every company and smallholder holding a certification from RSPO, ISPO or whichever, manage to cultivate palm oil in line with the strictest sustainability criteria. Furthermore, let us assume that every company and smallholder in Indonesia manage to acquire a certificate of sustainable production as the Government jumps to B30. In the event of such a scenario, it would be logical to conclude that Indonesia's biofuel programme manifests a viable trajectory of a sound sustainability transition. However, reality is sometimes disappointing.

As of 2019, only 4.1 million ha of the total 14 million ha are certified under the ISPO (Reuters, 2019b), while the RSPO certificate only amounts to 2.1 million ha (RSPO, 2019). At best, this leaves more than 2/3rd of total plantation area outside any certification scheme, at worst 6/7th. While the total hectares of certified plantations under ISPO stands at twice the amount of RSPOs, it is important to keep in mind that RSPO is voluntary, whereas ISPO is mandatory under Indonesian law. The fact that the majority of plantations operate without a certificate may also reflect the complexity of the given scheme. In an opinion published by the Jakarta post, Edi Suhardi (2019), an Senior Executive in the oil palm industry, claimed that sustainability standards only produced more stringent conditions for the producers. If so, it would be reasonable to argue that the complex nature of schemes such as the RSPO may prove to be a significant entry barrier to producers. Whether that claim affects the discrepancy between ISPO certified plantation or RSPO plantations may be subject for investigation in a future study. Nevertheless, the amount of certified plantation remains far too low at a time of which Joko Widodo has made announcement for the additional jump to B30.

Both RSPO and ISPO represent important tools that palm oil companies and smallholders may utilize in order to achieve more sustainable modes of production. However, the quality varies from standard to standard. What is deemed most sustainable is up for discussion, but the RSPO has received most attention world-wide as the "main" sustainability standard. ISPO has on the other hand been criticized for insufficient performance in achieving sustainable practices according to Forest Watch Indonesia (Coaction Indonesia, 2019, p. 84). In order to ensure that the total GHG emission released during Indonesian biodiesel's life cycle, it is crucial that its production is sustainable as well. Transparency of the origin of the palm fruit is vital. In this respect, the biofuel industry needs to make sure that the palm fruit utilized for biodiesel production is purchased from plantations with a certificate. Plantations selling palm fruit to biodiesel producers, also need to ensure their buyer that all of their fruits derive from their plantations, not purchased from a plantation outside a certification scheme.

This study has analysed the biofuel mandate of Indonesia, aiming to see whether it fits within the framework of a sustainability transition. The empirical evidence confirms that there are several traits of the programme that align with the particularities of a sustainability transition.

Central are the contested nature, power and politics and arguably trade-offs. Thus, while these particularities correspond with a sustainability transition, they also highlight challenges and, in some instances, constrain the very soundness of this transition.

The trade dispute between the EU and Indonesia crystallizes the contested positions on palm oil, showing how concepts such as renewable energy are not understood uniformly. The extent to which alternative renewables have been neglected at the expense of biofuel suggest that Indonesia is locked-in to a palm-oil dependency mindset. This claim may also be transported to its neighbour of Malaysia, the second most prominent palm oil producer, who also maintain a strong position against the EUs palm oil biofuel stance. It also suggests that the current pathway does not produce the most suitable transition in light of the environmental gains. Especially considering the fact that second-generation, or more advanced biodiesel have not been given more importance. Nevertheless, the

government maintains the momentum of the current trajectory. and must therefore address challenges related to the governance of the scheme, such as corruption and ill-methods of land clearing.

Though it is unlikely that palm-based biodiesel will replace petroleum as the key source of energy, it offers an alternative route in solving the increasing demand of energy. But without scaling up efforts to improve sustainability standards on palm oil production, the current trajectory of Indonesia will likely continue to face harsh criticism. Abandoning the scheme on the other hand, would not necessarily alleviate environmental impact considering the yield efficiency of oil palms. Moreover, from a just transition perspective, an exit to the programme may rob millions of citizens of their monthly income. Striking a balance between the economic gains and the social and environmental impact of the programme is key. Otherwise, the biofuel programme will remain a double-edged sword, where sustainable modes of consumption clash with non-sustainable modes of production And, ironically, a real-life lifebuoy may instead be required, as the capital of Jakarta slowly sinks into the ocean.

5.0 References

Algamar, R. (2019). Commentary: East Can Meet West on Palm Oil Controversy. *Jakarta Globe*. Retrieved from https://jakartaglobe.id/opinion/commentary-east-can-meet-west-on-palm-oil- controversy/

Alie, A. (2016). How Will Indonesia's Oil Industry Fare After OPEC Suspension? Retrieved from http://energyfuse.org/will-indonesias-oil-industry-fare-opec-suspension/

Ananthalakshmi, A. (2019). Palm oil to blame for 39% of forest loss in Borneo since 2000 - study. *Reuters*. Retrieved from https://www.reuters.com/article/palmoil-deforestation-study/palm- oil-to-blame-for-39-of-forest-loss-in-borneo-since-2000-study-idUSL3N26A1AI

BPDP. (2018). 4 Regulations To Rule B20 Mandatory Use. Retrieved from https://www.bpdp.or.id/en/energi/inilah-4-payung-hukum-perluasan-mandatori-biodiesel-b20/

Commission, E. (2019). Commission imposes countervailing duties on Indonesian biodiesel. Retrieved from https://trade.ec.europa.eu/doclib/press/index.cfm?id=2057

Imposing a provisional countervailing duty on imports of biodiesel originating in Indonesia, (2019). CPOPC. (2019). JOINT PRESS STATEMENT 6th MINISTERIAL MEETING OF COUNCIL OF PALM OIL PRODUCING COUNTRIES [Press release]. Retrieved from https://www.cpopc.org/wp-content/uploads/2019/03/Joint-Press-Statement-MM-6- CPOPC.pdf

Djogo, T., & Syaf, R. (2003). Decentralization without Accountability: Power and Authority over Local Forest Governance in Indonesia.

Djono, A. L. (2019). House Speaker Slams EU Plan to Phase Out Palm Oil. *Jakarta Globe*. Retrieved from https://jakartaglobe.id/business/house-speaker-slams-eu-plan-to-phase-out-palm-oil/

G20. (2019). *INDONESIA'S EFFORT TO PHASE OUT AND RATIONALISE ITS FOSSIL-FUEL SUBSIDIES A REPORT ON THE G20 PEER-REVIEW OF INEFFICIENT FOSSIL-FUEL SUBSIDIES THAT ENCOURAGE WASTEFUL CONSUMPTION IN INDONESIA*. Retrieved from https://www.oecd.org/fossil-fuels/publication/G20%20peer%20review%20Indonesia_Final- v2.pdf

Gilpin, R. (2001). *Global Political Economy*. Princeton: Princeton University Press.

Gorbiano, M. I. (2019). Jokowi wants 30% biodiesel in cars as soon as January next year. Retrieved from https://www.thejakartapost.com/news/2019/08/12/jokowi-wants-30-biodiesel-in-cars-as- soon-as-january-next-year.html

Green, M. (2019). World's energy watchdog is undermining climate change battle, critics say. *Reuters*. Retrieved from https://www.reuters.com/article/us-climate-change-energy- insight/worlds-energy-watchdog-is-undermining-climate-change-battle-critics-say- idUSKBN1XM2DV

Gro-Intelligence. (2019). Palm Oil Sparks EU-Indonesia Trade War. Retrieved from https://gro- intelligence.com/insights/articles/palm-oil-sparks-eu-indonesia-trade-war

Hutt, D. (2019, 23.07.2019). No winning hands in palm oil trade war. Retrieved from https://www.asiatimes.com/2019/08/article/no-winning-hands-in-palm-oil-trade-war/

Indonesia-Investment. (2017). Palm Oil. Retrieved from https://www.indonesia-investments.com/business/commodities/palm-oil/item166

Indonesia, C. (2018). *Dynamics of Indonesian Biodiesel Downstream and Upstream Industry*. Retrieved from http://coaction.id/download/full-report-dynamics-of-indonesian-biodiesel- downstream-and-upstream-industry/

Kemp, R., Schot, J., & Hoogma, R. (1998). Regime shifts to sustainability through processes of niche formation: The approach of strategic niche management. *Technology Analysis & Strategic Management, 10*(2), 175-198. doi:10.1080/09537329808524310

Kharina, A., Malins, C., & Searle, S. (2016). *BIOFUELS POLICY IN INDONESIA: OVERVIEW AND STATUS REPORT*.

Knoema. (2019). Indonesia - Total biofuels consumption. Retrieved from https://knoema.com/atlas/Indonesia/topics/Energy/Renewables/Biofuels-consumption

Koh, L. P., & Wilcove, D. S. (2007). Cashing in palm oil for conservation. *Nature, 448*(7157), 993- 994. doi:10.1038/448993a

Koyuncu, C., & Yilmaz, R. (2008). The Impact of Corruption on Deforestation: A Cross-Country Evidence. *The Journal of Developing Areas, 42*, 213-222. doi:10.1353/jda.0.0010

Laksmana, E. (2011). The Enduring Strategic Trinity: Explaining Indonesia's Geopolitical Architecture. *Journal of the Indian Ocean Region, 7*. doi:10.1080/19480881.2011.587333

Malins, C. (2017). For Peat's Sake Understanding the climate implications of palm oil biodiesel consumption. Retrieved from http://d5i6is0eze552.cloudfront.net/documents/Publikasjoner/Andre-rapporter/For-peats-sake- Climate-implications-of-palm_May2017.pdf?mtime=20170531170131

Mapsnworld. (2019). South East Asia Map. Retrieved from http://www.mapsnworld.com/asia/south- east-asia-map.html

Markard, J. (2017). Sustainability Transitions: Introduction to newcomers [June 17]. IST Conference, Gothenburg.

Markard, J., Raven, R., & Truffer, B. (2012). Sustainability transitions: An emerging field of research and its prospects. *Research Policy, 41*(6), 955-967. doi:https://doi.org/10.1016/j.respol.2012.02.013

McGrew, A. (2017). In J. Baylis, S. Smith, & P. Owens (Eds.), *The Globalization of World Politics An Introduction to International Relations* (7th ed., pp. 15-30). Oxford: Oxford University Press.

Miljø-Direktoratet. (2019). Fakta om biodrivstoff. Retrieved from http://tema.miljodirektoratet.no/no/Tema/Energi/Biodrivstoff/Fakta-om-biodrivstoff/

Mukherjee, I., & Sovacool, B. K. (2014). Palm oil-based biofuels and sustainability in southeast Asia: A review of Indonesia, Malaysia, and Thailand. *Renewable and Sustainable Energy Reviews, 37*, 1-12. doi:https://doi.org/10.1016/j.rser.2014.05.001

Naimah, D., & Morgunova, M. (2018). Analysis of Palm-Oil-Based Biodiesel in Indonesia using Technological Innovation System Approach. *E3S Web of Conferences, 43*,

01007. doi:10.1051/e3sconf/20184301007
Nations, U. (2019). Sustainable Development Goals. Retrieved from https://sustainabledevelopment.un.org/?menu=1300
Newell, P., & Mulvaney, D. (2013). The Political Economy of the Just Transition. *The Geographical Journal, 179*, 132–140. doi:10.1111/geoj.12008
OEC. (2017a). Palm Oil Retrieved from https://oec.world/en/profile/hs92/1511/ OEC. (2017b). Where does Indonesia export Palm Oil to? (2017). Retrieved from https://oec.world/en/visualize/tree_map/hs92/export/idn/show/1511/2017/
Osterhammel, J., & Petersson, N. P. (2003). *Globalization a short history*. New Jersey: Princeton Universty Press.
Pichler, M. (2013). "People, Planet & Profit": Consumer-Oriented Hegemony and Power Relations in Palm Oil and Agrofuel Certification. *The Journal of Environment & Development, 22*(4), 370-390. doi:10.1177/1070496513502967
Project, T. G. (2019). What we learned from two years of investigating corrupt land deals in Indonesia. Retrieved from https://thegeckoproject.org/what-we-learned-from-two-years-of- investigating-corrupt-land-deals-in-indonesia-17988e27e981
Regnskogfondet. (2019). Dette mener Regnskogfondet om palmeolje i biodrivstoff. Retrieved from https://www.regnskog.no/no/om-regnskogfondet/dette-mener-regnskogfondet/dette-mener- regnskogfondet-om-palmeolje-i-biodrivstoff
Reuters. (2019a). EU plans to impose import duties on Indonesia biodiesel. Retrieved from https://www.reuters.com/article/us-eu-indonesia-biodiesel/eu-plans-to-impose-import-duties- on-indonesia-biodiesel-idUSKCN1UJ1XB
Reuters. (2019b). Indonesia certifies a record amount of palm plantations as sustainable. *Reuters*. Retrieved from https://www.reuters.com/article/us-indonesia-ispo/indonesia-certifie-a-record-amount-of-palm-plantations-as-sustainable-idUSKCN1R80GJ
Reuters. (2019c). Indonesia should not quit climate pact over palm-oil spat: U.N. official. Retrieved from https://www.reuters.com/article/us-asia-climatechange-indonesia-palmoil/indonesia-should-not-quit-climate-pact-over-palm-oil-spat-u-n-official-idUSKCN1RH0VG
Reuters. (2019d). Indonesian province moves to curb slash-and-burn clearances as fires rage. *Reuters*. Retrieved from https://www.reuters.com/article/us-southeastasia-haze-indonesia/indonesian-province-moves-to-curb-slash-and-burn-clearances-as-fires-rage-idUSKCN1VX173
RSPO. (2018). *RSPO Principles & Criteria for the Production of Sustainable Palm Oil* Retrieved from https://rspo.org/library/lib_files/preview/842
RSPO. (2019). Impact Retrieved from https://rspo.org/impact#certification-figures
Sims, R. E. H., Mabee, W., Saddler, J. N., & Taylor, M. (2010). An overview of second generation biofuel technologies. *Bioresource Technology, 101*(6), 1570-1580. doi:https://doi.org/10.1016/j.biortech.2009.11.046
SINTEF. (2019). Nå er fornybar energi mulig i utviklingsland. Retrieved from https://www.sintef.no/siste-nytt/na-er-fornybar-energi-mulig-i-utviklingsland/
Smith, A., Stirling, A., & Berkhout, F. (2005). The governance of sustainable socio-technical transitions. *Research Policy, 34*(10), 1491-1510. doi:https://doi.org/10.1016/j.respol.2005.07.005
Suhardi, E. (2019). Sustainability issue affects fair trade in palm oil. *The Jakarta Post*.

Retrieved from https://www.thejakartapost.com/academia/2019/09/06/sustainability-issue-affects-fair-trade- in-palm-oil.html

Tan, K. T., Lee, K. T., Mohamed, A. R., & Bhatia, S. (2009). Palm oil: Addressing issues and towards sustainable development. *Renewable and Sustainable Energy Reviews, 13*(2), 420-427. doi:https://doi.org/10.1016/j.rser.2007.10.001

Tracker, C. A. (2019). Indonesia: Country summary. Retrieved from https://climateactiontracker.org/countries/indonesia/

USDA. (2019). *Indonesia Biofuels Annual Report 2019* (ID1915). Retrieved from https://www.fas.usda.gov/data/indonesia-biofuels-annual-3

Varkkey, H. (2013). Oil Palm Plantations and Transboundary Haze: Patronage Networks and Land Licensing in Indonesia's Peatlands. *Wetlands, 33*, 679-690. doi:10.1007/s13157-013-0423-z

Yasmin, N. (2019). Indonesia Uses Belt and Road Initiative Forum to Promote Palm Oil. *Jakarta Globe*. Retrieved from https://jakartaglobe.id/news/indonesia-uses-belt-and-road-initiative- forum-to-promote-palm-oil/

Yunan Ardian, H., P. Lubis, D., Muljono, P., & Hasri Azahari, D. (2018). Multi Stakeholder Engagement in Indonesia Sustainable Palm Oil Governance. *Jurnal Manajemen dan Agribisnis*. doi:10.17358/jma.15.1.96