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BIOFUELS POLICY IN INDONESIA: OVERVIEW AND STATUS REPORT

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CONTEXT FOR FUELS POLICY IN INDONESIA

Increasing domestic use of palm oil biodiesel is a strategic issue for Indonesia. Despite its membership in the Organization of the Petroleum Exporting Countries (OPEC), Indonesia is a net importer of oil. Fuel subsidies impose a significant burden on the national budget and therefore have become a sensitive political issue. After decades of spending a significant portion of the federal budget on fuel subsidies, Indonesia finally abolished most of its fuels subsidies in 2015. On the other hand, since 2006 Indonesia has been increasing its biofuel blend targets as well as providing biofuels subsidies to producers, mainly to reduce the country's dependence on oil imports, but also to support the domestic agricultural economy and to mitigate climate change.

FUEL CONSUMPTION AND OUTLOOK

Indonesia is the world's 15th-largest motor vehicle market, well on its way to becoming one of the 10 largest, and national demand for transport fuel is growing rapidly. Based on the 2015 annual energy forecast from Indonesia's Agency for the Assessment and Application of Technology (BPPT), if present trends in energy usage continue unaltered, transport fuel consumption in Indonesia will increase on average almost 5% per year through 2050 (Figure 1). Currently, liquid fossil fuel accounts for around 35% of Indonesia's energy demand across all sectors (ESDM, 2015).

The government of Indonesia sees rising oil demand as a problem with implications for both the economy and environment. Nevertheless, Indonesia has not adopted a fuel economy standard for any type of on-road vehicle, nor has it announced any plans to do so, though studies have shown that such standards would provide significant and cost-effective benefits to the national economy and the environment (Atabani et. al., 2012; Safrudin, et. al., 2013). A 2010 study estimated that a fuel-economy standard could drive a 12–27% reduction in fuel consumption compared with business as usual (BAU) in 2035 by making vehicles more efficient (GFEI and CAA, 2010). Indonesia's current biofuels target is for 30% blending in the transport fuel supply in 2025, so the level of petroleum reduction that could be achieved through fuel economy is comparable to this target.

Indonesia's four-wheel vehicle market grew by double digits every year from 2003 through 2012, and continues to increase at a rate that outstrips even China's (Bandivadekar, 2013). Diesel fuel accounts for about 43% of Indonesia's land transportation energy demand, and almost 40% of Indonesia's diesel fuel is imported (ESDM, 2015). The need for oil imports to supply the high demand for diesel is a major driver behind government support for palm biodiesel. However, because of increasing energy demand, BPPT predicts that the country's dependence on fossil fuel will not decrease even if Indonesia fully meets existing biofuel targets.

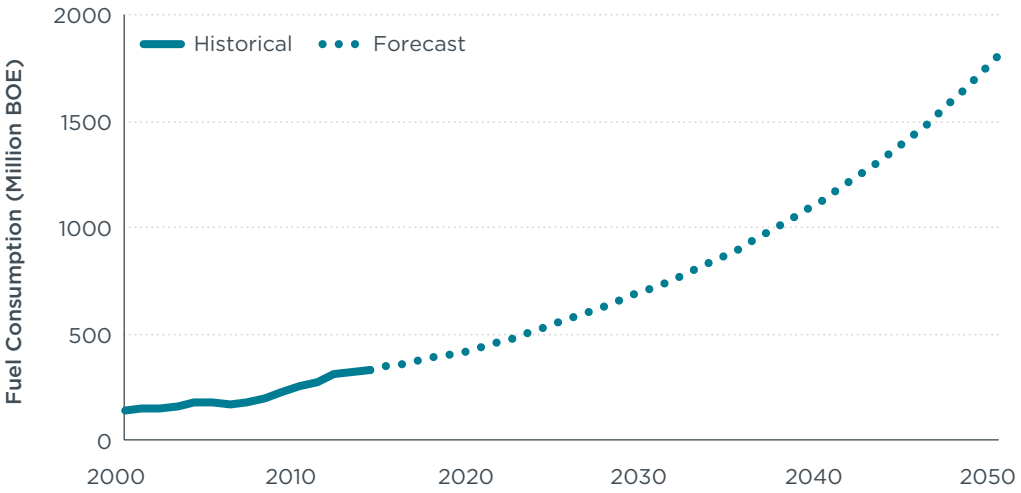

Figure 1 Indonesia transport fuel consumption, historical and forecast. (Notes: The source for the historical date is ESDM Pusdatin, 2015; the source for the forecast is BPPT, 2015.)

STATE OF THE PALM OIL INDUSTRY IN INDONESIA

Indonesia is the largest palm oil producer in the world, accounting for half of global production. Indonesia's palm oil production overtook Malaysia's around 2006 due to rapid expansion of its oil palm plantation area (FAOSTAT, 2016).

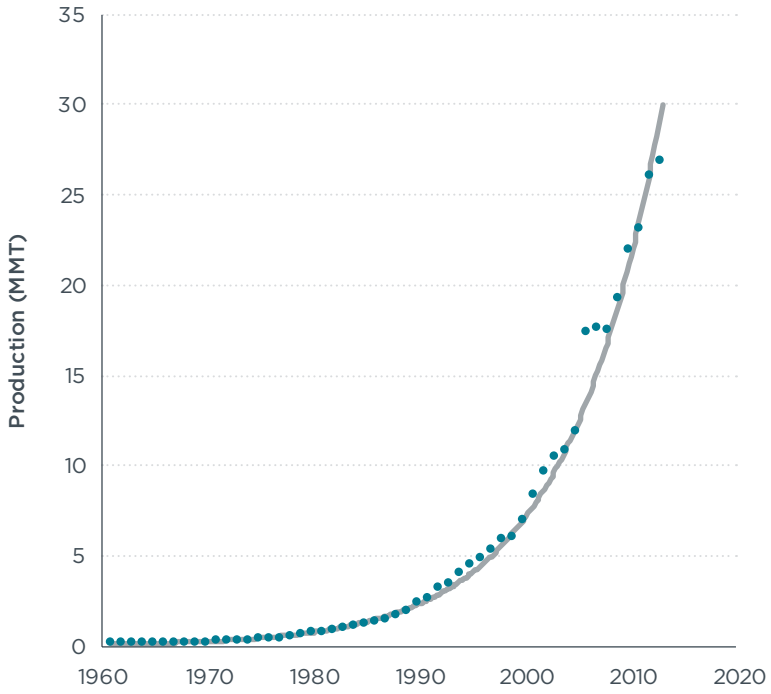

Figure 2 Indonesia palm oil production since 1960 (FAOSTAT, 2016)

Figure 2 presents Indonesian palm oil production (in million metric tons) since the 1960s, showing exponential growth over the past two decades. Growth in the industry since 2009 is explored in more detail in Figure 3 and Figure 4. In 2015, palm oil plantations in Indonesia extended over 11 million hectares, or an area larger than all of South Korea. In

the past seven years, on average Indonesia has expanded its oil palm plantation area by more than half a million hectares per year (Figure 4).

The majority of Indonesia's palm oil production comes from private estates, with government estates accounting for only a small fraction. Smallholder estates—those owned and operated by small-scale farmers—produce about 40% of the country's palm oil.

On average, more than 70% of Indonesia's palm oil and palm oil products are exported, according to data from FAOSTAT (FAOSTAT, 2016). Of the palm oil and its derivatives consumed domestically in 2013, 73% was used for food products, and 12% was used for biofuels, translating to about one million metric tons of palm oil in fuel.[1]

Oil palm plantations in Indonesia are required to comply with the Indonesian Sustainable Palm Oil (ISPO) certification scheme.[2] To be certified under ISPO, a palm oil estate must comply with a list of criteria, including sustainable business development and environment management and monitoring. This standard was first set up by the Indonesian government in March 2011, and was later updated in 2015. The regulation is mandatory for all palm oil plantations, but is voluntary for palm oil smallholders. However, the Ministry of Agriculture's Regulation No.11/2015 has specifically also exempted plantations supplying palm oil for biofuel production from ISPO compliance, hampering the effort to ensure a sustainable production of palm oil for biofuel.

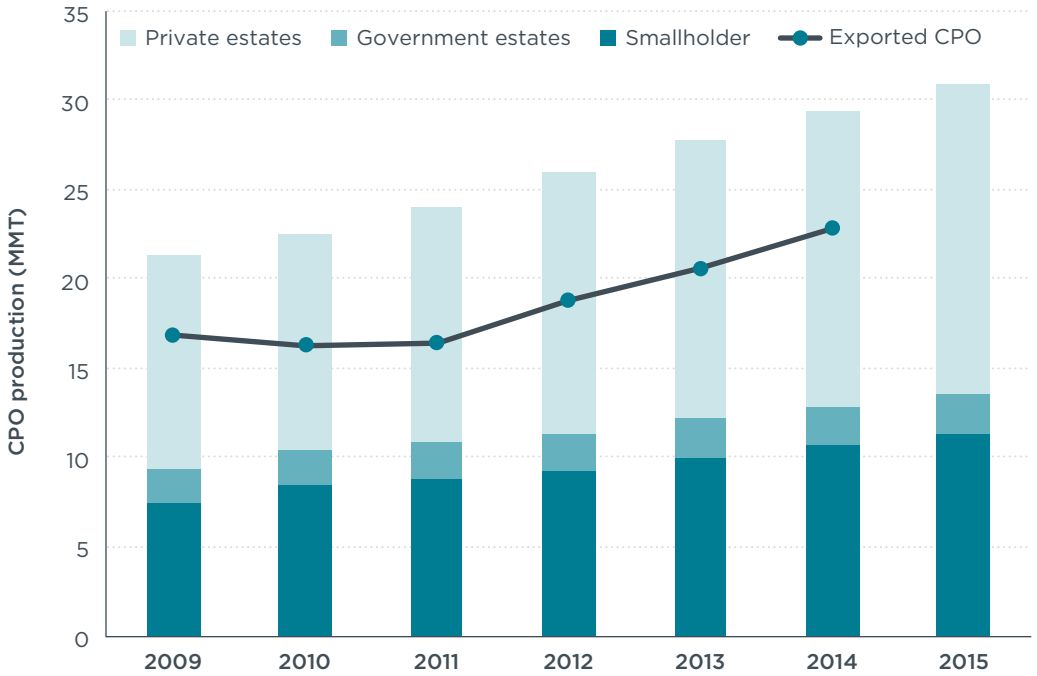

Figure 3 Indonesia crude palm oil (CPO) production by plantation type and export value, 2009-2015 (Statistics Indonesia, 2015).

1 See Kementerian Perindustrian, Republik Indonesia. *Industri Sawit Harus Dibedakan untuk Makanan dan Nonmakanan.* (Ministy of Industry, Republic of Indonesia. *Palm Industry Must be Differentiated Between Food and Non-food*) Retrieved from http://www.kemenperin.go.id/artikel/6372/Industri-Sawit-Harus-Dibedakan-untuk-Makanan-dan-Nonmakanan

2 ISPO is mandated under Indonesian Minister of Agriculture Regulation No. 11/Permentan/Ot.140/3/2015.

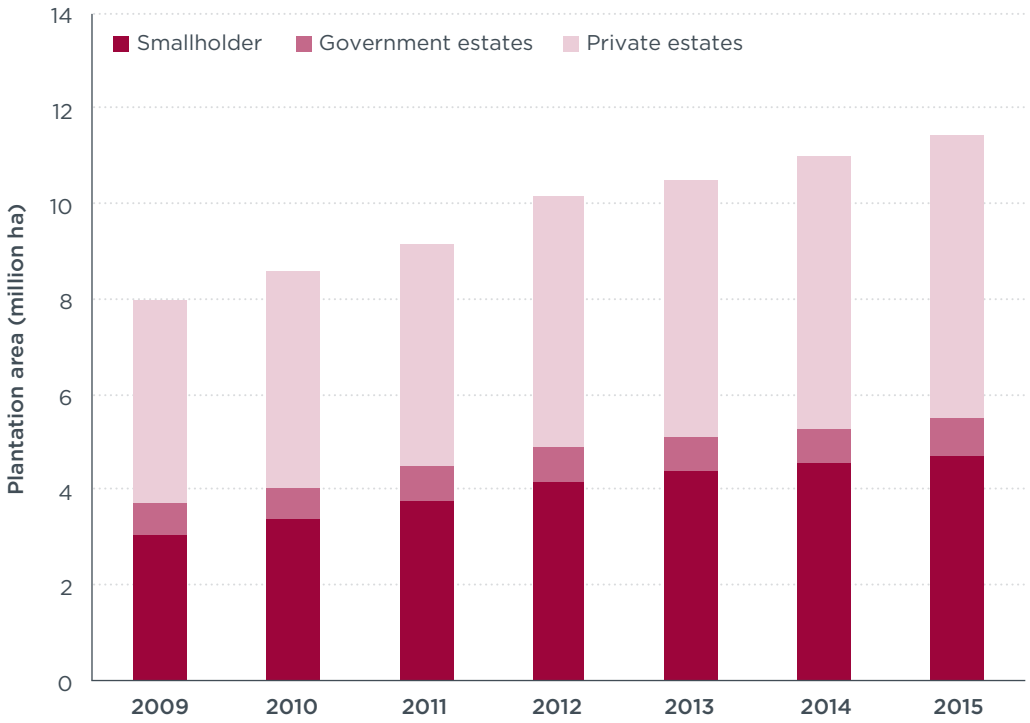

Figure 4 Indonesia oil palm plantation area by plantation type, 2009-2015 (Statistics Indonesia, 2015).

INDONESIA AND CLIMATE CHANGE

Indonesia has expressed interest in combating global climate change and has made several commitments to reducing greenhouse gas emissions nationally. At the 2015 United Nations Climate Change Conference, Indonesia submitted an Intended Nationally Determined Contribution (INDC) outlining climate actions the nation would take under the new international agreement. Indonesia's INDC includes a commitment to reduce GHG emissions by 26% below BAU by 2020, reinforcing earlier commitments made by President Yudhoyono in 2009 (Austin et al., 2014).[3] In the INDC, Indonesia also commits to reducing emissions to 29% below BAU by 2030, and, with foreign assistance, offers an additional reduction (for a total GHG reduction of 41% compared with BAU).

These climate goals, however, are at odds with Indonesia's high GHG emissions from land use. Indonesia exhibits the highest national rate of primary forest loss globally, with two of the largest sources of emissions in the country being deforestation and peat loss from land-use change and fires (Margono et.al, 2014). According to a report by the Indonesian National Carbon Accounting System (INCAS, 2015), Indonesia emitted about 900 million tonnes of carbon dioxide from deforestation and peat loss in 2012 (emission sources shown in Figure 5). The rest of the Indonesian economy, on the other hand, emitted 760 million tonnes of carbon dioxide that year. Historically, rates of peat degradation emission have likely been understated, so it is possible that even this estimate understates the importance of peat loss in the Indonesian emissions inventory (Page, S.E., et al., 2011).

3 This commitment was enacted into law under the Presidential Regulation No. 61/ 2011 regarding the National Action Plan For Reducing Greenhouse Gas Emissions (Rencana Nasional Penurunan Emisi Gas Rumah Kaca, "RAN-GRK").

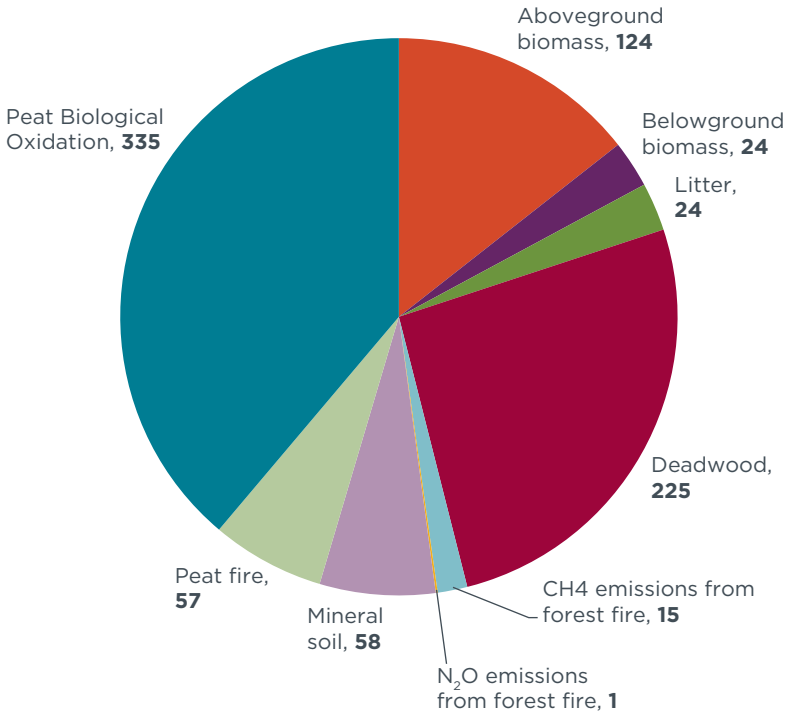

Figure 5 Indonesian 2012 peat and forestry emissions, as reported by INCAS. (Note: All numbers are in millions of tonnes of CO_2e.)

Given the dominance of these biomass-related emissions in the Indonesian emissions inventory, reducing rates of deforestation, peat degradation, and fire will be important if Indonesia is to meet its international climate change commitments. Indeed, the Indonesian National Council on Climate Change (DNPI) has found that more than 75% of Indonesia's emissions reduction opportunities by 2030 lie in the land-use, land-use change, and forestry (LULUCF) sector (DNPI, 2010). While the importance of managing emissions from LULUCF is uncontested, the INDC does not provide detailed information on how the country plans to mitigate forest and peat conversion and the recurring forest and peatland fires in the country. The country's new Directorate General of Climate Change, formed in 2015 under the Ministry of Environment and Forestry, is expected to manage the country's efforts in mitigating climate change effects in the energy (including transportation), industrial processes and product use, agriculture, LULUCF, and waste sectors.

One of the most notable actions taken thus far to support Indonesia's commitments to reducing emissions is the forest moratorium. The Indonesian government instituted a moratorium beginning in 2011 on granting new concessions to clear its primary natural forests or converted peatlands for palm oil, timber, or logging. This was part of the funding deal for Indonesia under Norway's International Climate and Forest Initiative (NICFI).[4] The two-year moratorium has been extended twice, in 2013 and 2015. While the aims of the moratorium are consistent with Indonesia's stated emissions reduction goals, there are several features of its implementation that have limited its efficacy to date.

4 The deal was stipulated under the Letter of Intent signed between Indonesia and Norway in 2010 on REDD+.

The World Resources Institute (Austin et al., 2014) has shown that despite the prima facie commitment to preventing primary forest and peat conversion, several major gaps in the moratorium have allowed land-use change to continue. Most notably, the moratorium exempts existing concessions, covering 3.5 million hectares of carbon-rich ecosystems. This area of potential deforestation is significant compared to Indonesia's historical annual deforestation rate of 0.8 million hectares (Margono et al., 2014). Secondary forest is also excluded from the moratorium, and reportedly neither enforcement nor monitoring have been well-enforced (Austin et al., 2014). In short, while the moratorium represents a major step toward reducing deforestation, because of its shortcomings it must be understood as only a first step.

Indonesia's strategy for GHG reduction in the energy sector is laid out in the Indonesia National Energy Plan, which was signed in October 2014 as Government Regulation No. 79/2014. The stated goal in the National Energy Plan is to have 23% of Indonesia's total energy demand in 2025 supplied by renewable energy. It is an update from the previous 2006 National Energy Plan, which was originally written because of Indonesia's growing dependence on foreign fuel imports, and was designed in conjunction with the launch of a rapid biofuels development program in Indonesia. The government's priority at the moment was reducing the country's dependence on petroleum, rather than mitigating climate change. While the National Energy Plan is perceived as being consistent with the country's efforts to reduce greenhouse gas emissions, there is a fundamental tension at the heart of Indonesia's renewable energy policy.

In 2006, Indonesia developed a biofuel plan, which was not coordinated with efforts to reduce Indonesian LULUCF emissions. As part of the plan, the Indonesian National Biofuel Team (Timnas BBN) proposed an expanded biofuel industry that would produce 34 million tonnes of biofuel per year, requiring more than 10 million hectares of land that was expected to replace "unproductive," or damaged, forestland (Caroko, Komarudin, Obidzinski & Gunarso, 2011). However, the report only identified 0.3 million hectares of degraded land as suitable for biofuel production, exposing a large gap between the amount of biofuel that can be produced without causing environmental damage and what would be required under the Timnas BBN plan. While damaged forestland generally contains lower carbon stocks than primary natural forest, the large-scale land use conversion implied by the Timnas BBN plan would result in considerable LULUCF emissions. This means that the National Energy Plan, intended to expand Indonesia's renewable energy production and contribute to adhering to the INDC, is predicated on a vision of biofuel expansion that would require extensive deforestation. Unless significant effort is taken to resolve this inherent contradiction, the expansion of biofuel demand in Indonesia, particularly from palm oil biodiesel, could very well increase, not reduce, Indonesian inventory emissions over the period from now to 2050.

ENVIRONMENTAL IMPACTS OF PALM OIL PRODUCTION IN INDONESIA

While many Indonesian government stakeholders continue to believe that palm biodiesel delivers high emission reductions compared with petroleum, the ICCT has previously shown that palm expansion is a major driver of deforestation and peat drainage, resulting in massive CO_2 emissions (Miettinen, et.al., 2012). Peat is formed by the accumulation of organic matter over millennia, which is preserved in waterlogged soil. When peatlands are drained to allow cultivation of oil palm, exposure of the peat to air results in rapid decomposition, releasing 95 tonnes of CO_2 per hectare per year when amortized over a 30-year timescale (Page et al., 2011). One-third of new palm

plantations are expected to expand onto peatland (Miettinen et al., 2012). A lesser, but still significant amount of CO_2 is released from palm cultivation on mineral (non-peat) soils (Don et al., 2011), and palm oil plantations contain lower-biomass carbon stocks than the cleared forest (Murdiyarso et al., 2010).

Additional CO_2 emissions result from forest fires caused by forest clearing activities and peat drainage for palm oil. A massive forest and peat fire on plantation areas in Indonesia that took place between July and November of 2015 was estimated to have emitted approximately 1.75 billion metric tons of CO_2 equivalents[5]. Fires of this type have occurred annually since at least 1997, releasing 680 million tonnes of CO_2 per year (Page et al., 2002; van der Werf et al., 2008). Approximately 20% of wildfires in Indonesia can be attributed directly to oil palm plantation practices (Goodman and Mulik, 2015). Altogether, after taking land-use change emissions from palm expansion into account, palm biodiesel actually increases emissions compared with fossil diesel (Malins, 2012; Valin et al. 2015).

Palm oil expansion has other negative environmental impacts, including the health impacts from wildfire haze. Wildfires cause an estimated 110,000 deaths per year in Southeast Asia (Johnston, 2012), and lead to additional economic impacts by causing school closings, flight cancellations, and non-fatal diseases. The haze from the 2015 wildfire reached Indonesia's neighboring countries, including Malaysia and Singapore, creating respiratory problems for residents in those nations. Palm expansion has strong negative effects on biodiversity because it replaces some of the world's most diverse ecosystems with monoculture (Fitzherbert et al., 2008). Expanding palm oil production to support Indonesia's ambitious mandate for 30% biofuel blending by 2025 has the potential to dramatically worsen these problems.

5 Global Fire Emissions Database. (2015, November). *Indonesian fire season progression.* Retrieved from http://www.globalfiredata.org/updates.html#2015_indonesia

BIOFUELS POLICY IN INDONESIA

OVERVIEW

Indonesian biofuels development started with the 2006 Presidential Instruction on Biofuel Supply and Utilization.[6] The Presidential Instruction mandated other government agencies to take action in advancing biofuel development in all stages, from feedstock supply to commercialization of biofuel technologies and increased biofuel consumption. It issued forest utilization permits for biofuel plants in "critical or abandoned forest/land," and further promoted biofuel use with the goal of replacing fossil fuels as an alternative for transportation. To reinforce the Presidential Instruction, the government issued Indonesia's National Energy Policy under Presidential Regulation No. 5/2006. This regulation formalized the promotion of biofuels in Indonesia, for both ethanol and biodiesel, and established a 5% biofuel in national energy consumption mandate by 2025.

That same year, the president issued a decree forming Timnas BBN (the National Biofuel Development Team)[7]. One of the team's responsibilities, as described in the decree, was to create a blueprint and a road map for biofuels development in Indonesia. The team's Blueprint on Biofuels Development, completed in 2008, served as guidance for the government to define its biofuel blending targets.

Also in 2008, Indonesia's Ministry of Energy and Mineral Resources (MEMR) issued a regulation with a progressive target for a biofuel blending mandate over the 2008–2025 time frame[8]. The regulation defines the minimum biofuel quantity used in transportation, in industrial and commercial use, and for electricity generation by the target date set for the mandate. Since then, the blending mandate regulation has been revised several times, most recently through another MEMR Regulation released in March 2015.[9] This regulation increases mandatory biodiesel blending from 10% to 15% for transportation and industrial uses, and it increases mandatory biodiesel blending to 25% for electricity generation as of April 2015.

The blending targets have been supported largely by subsidies. This is necessary since biodiesel prices have been generally higher than those for petroleum fuels. The targets have not been otherwise enforced, and they have not been met to date (Wright & Rahmanulloh, 2015, Wright & Rahmanulloh, 2016). In 2015, Indonesia started collecting a levy from the exports of palm oil and palm oil derivatives, partly as a mechanism to support domestic palm biodiesel consumption. This levy is separate from the palm export tax, which was introduced in 1994 (Rifin, 2010); the differences between these two measures are described below.

Following the massive forest fire in 2015 and continued international pressure to curb the use of palm oil, Malaysia and Indonesia, which collectively control about 85% of the global palm oil production, signed a charter agreement establishing the Council of Palm Oil Producing Countries (CPOPC). In the future, council membership will be extended to other palm oil producers, such as Brazil, Colombia, Nigeria, the Philippines, and Uganda.

6 Presidential Instruction No. 1/2006 on Biofuel Supply and Utilization.
7 The formation of Timnas BBN was regulated under Presidential Decree No. 10/2006.
8 Indonesian MEMR Regulation No. 32/2008 features the first Indonesian biofuel mandate.
9 Indonesian MEMR Regulation No.12/2015 is the latest update of the biofuel mandate.

KEY PLAYERS IN THE INDONESIAN GOVERNMENT

There are many governmental bodies influencing Indonesia's policies on biofuels. Among them are:

Ministry of Environment and Forestry (MoEF) (Kementerian Lingkungan Hidup dan Kehutanan [KLHK]) issues land-use change permits, in coordination with local governments.

Directorate General of Climate Change under MoEF (Direktorat Jenderal Pengendalian Perubahan Iklim di bawah KLHK) is a new agency that oversees climate change mitigation and adaptation issues as a result of the merger of the Ministry of Environment, Ministry of Forestry, National Council on Climate Change, and REDD+ Agency[10] into the Ministry of Environment and Forestry. This merger was regulated under Presidential Decree No. 16/2015.

Ministry of Agrarian and Spatial Affairs / National Land Agency (Kementerian Agraria dan Tata Ruang / Badan Pertanahan Nasional) issues permits for plantation land use. This ministry also mandates ISPO compliance under Ministerial Regulation No. 11/2015.

Ministry of Energy and Mineral Resources (MEMR) (Kementerian Energi dan Sumber Daya Mineral [ESDM]) mandates biofuels targets.

Directorate General of New and Renewable Energy and Energy Conservation (NREEC) under MEMR (Direktorat Jenderal Energi Baru Terbarukan dan Konservasi Energi di bawah ESDM) regulates and controls biofuels, including setting biofuel quality standards.

Directorate General of Taxes under Ministry of Finance (Direktorat Jenderal Pajak di bawah Kementrian Keuangan) regulates taxes paid from palm oil and biofuel companies, as well as taxes incurred on the domestic trade of palm oil.

Indonesia Oil Palm Estate Fund (Badan Pengelola Dana Perkebunan Kelapa Sawit [BPDPKS]) works under the Ministry of Finance to retrieve and manage the palm oil fund distribution. The agency is in charge of Indonesia's biodiesel subsidies and oversees how much unblended biodiesel is procured for domestic energy consumption.

KEY REGULATIONS

Indonesian regulations on biofuels today are designed to increase domestic consumption of palm oil in biodiesel. The country began developing its biofuels industry in 2006, and since then, several regulations supporting biofuel have been introduced and evolved.

BIODIESEL MANDATE

Ministerial Regulation No.12/2015, issued by the MEMR, sets an ambitious blending target, building on those established in 2008. The Indonesian biofuels mandate is one of the most

10 REDD+ (Reducing Emissions from Deforestation and forest Degradation) Agency, established in 2013, was a cabinet-level institution working specifically on deforestation, forest degradation, conservation, and forest management in Indonesia.

aggressive in the world,[11] especially for biodiesel. Regulation 12/2015 is the third version of the blending mandate, the first one being MEMR Regulation 32/2008, followed by MEMR Regulation 25/2013. Table 1 presents the Indonesian biofuels mandate as per MEMR Regulation 12/2015. The blending mandate is called the B20 program domestically.

In this regulation, companies holding the wholesale license to sell fuel to end users—including retail distributors such as Pertamina (Indonesia's national energy company), Shell, Petronas, etc.—as well as companies that are end users of fuel (e.g., electricity-generating companies) are named as the responsible parties for meeting this target.

Indonesia abolished fuel subsidies for gasoline in 2015, but still provides subsidies for domestic sales of diesel fuel through Pertamina and AKR Corporindo, the only two companies licensed to distribute subsidized diesel fuel. For these companies, MEMR directly appoints biodiesel suppliers to provide certain volumes of biodiesel to specific oil depots. An example is MEMR Regulation No. 258/2015, which requires 1.6 million kiloliters of unblended biodiesel sold by the designated biodiesel producers to be blended with subsidized diesel fuel and shipped to end users by the designated distributors from May to October 2016.

Table 1 Indonesian biodiesel mandate according to Ministerial Regulation No. 12/2015 (percent of biofuel blending required).

Sector	April 2015	January 2016	January 2020	January 2025
Micro-business, fisheries, agriculture, and public service (subsidized)	15%	20%	30%	30%
Transportation	15%	20%	30%	30%
Industry and commercial	15%	20%	30%	30%
Electricity	25%	30%	30%	30%

PALM OIL EXPORT TAX

The tax on palm oil exports was first introduced in Indonesia in 1994, and has undergone several changes. These changes included a temporary ban on the export tax, changes to the minimum palm oil price for which the export tax would be active, rate alterations, and changes to the way the rate is calculated (from a percentage of sales price to a nominal amount). In the latest regulation (Regulation No. 136/2015), the Ministry of Finance defines a progressive export tax tariff ranging from $0/tonne, when the international CPO price is below $750, up to $200/tonne when the price is above $1,250.

PALM OIL EXPORT LEVY

In July 2015, Indonesia introduced a new funding mechanism to support its biofuels subsidy, by imposing a levy on palm oil exports,[12] ranging from $30/tonne for downstream products such as refined palm kernel olein (RBD PKOL) and refined palm kernel stearin

11 Out of 64 countries having biofuels targets and/or mandates, fewer than 10 impose biodiesel mandates. From those that do, with exception of Costa Rica that has 20% biodiesel mix mandate, none of the countries mandate more than 10% mix. (Source: Lane, J. (2016, January 3). Biofuels Mandates Around the World: 2016. *Biofuels Digest.* Retrieved from http://www.biofuelsdigest.com/bdigest/2016/01/03/biofuels-mandates-around-the-world-2016/)

12 Presidential Regulation No 61/2015 on Collection and use of palm oil funds.

(RBD PKST), to $50/ton for CPO[13]. The income from the palm oil levy is channeled into a "plantation fund," managed by the BPDP, that can be used for the procurement and utilization of biodiesel. The export levy is only charged when international CPO prices are lower than $750/tonne. When, and if, prices rise above the threshold, the levy would be subtracted from the export tax, discussed above, to avoid double taxation.

BIOFUELS SUBSIDY

Due to the drop of oil prices globally, biodiesel prices in Indonesia are currently significantly more expensive than the base diesel fuel price, especially after a diesel subsidy of 1,000 rupiah (7 US cents) per liter. To ensure the success of the blending mandate, the Indonesia Oil Palm Estate Fund (BPDP) provides a subsidy to biofuel producers. The agency collects the palm oil export levy (see above), and redistributes it to biofuels producers selling their products domestically for B20 mixing. The amount paid to these producers is based on the price differential between fossil-based diesel fuel and biofuels, as defined by the Market Price Index (MPI).

The Ministry of Energy regulates the MPI for biofuels through ministerial decrees issued each month. As a rule of thumb, the MPI is the sum of the published CPO price for the preceding month, plus a $125/tonne fee for converting to biodiesel from CPO, and a transport fee defined by the ministry, following the formula below:

MPI = CPO price + conversion fee + transport fee.

Given the high differential between fossil diesel fuel and CPO because of low oil prices, most, if not all, of the funds collected through this levy will be used to support domestic biofuel production.

ISPO COMPLIANCE

While the Roundtable of Sustainable Palm Oil (RSPO) certification scheme is purely voluntary, oil palm plantations in Indonesia are required to comply with the Indonesian Sustainable Palm Oil (ISPO) certification scheme. The ISPO program covers greenhouse gas emissions (including methane capture), land use, biodiversity, and labor.

The Ministerial Regulation No. 11/2015 from the Ministry of Agriculture specifically exempts palm oil plantations supplying palm oil for biofuel production from ISPO compliance.

HISTORICAL PERFORMANCE AGAINST TARGETS

In 2006, Timnas BBN envisioned enormous growth in biofuel production over 10 years (see Table 2), but the biofuel industry has actually developed at a moderate rate in the intervening period. In 2016, it is expected that Indonesia will consume up to 3.8 billion liters of biodiesel from palm oil (Wright & Rahmanulloh, 2016), while ethanol consumption is currently almost negligible due to the absence of subsidy support (Wright & Rahmanulloh, 2015). This represents only about one-sixth of the biodiesel consumption proposed in Table 2 for 2015, and about one-tenth of total proposed biofuel consumption for that year. Although it is likely that implementation will continue to lag behind the aspired goals, Indonesia's ambitious targets for biofuels blending indicate a strong government interest in expanding the domestic palm biodiesel industry.

13 The amount of levy collected is regulated under Ministry of Finance Regulation No. 133/PMK.05/2015.

Table 2 TImnas BBM (2006) projection for the impact of the Indonesian biofuel industry in 2015.

Parameter	Unit	Palm oil	Jatropha	Sugarcane	Cassava	Total
Direct labor	Thousand people	2,000	1,000	3,500	750	72,500
Income per capita	US $/year/ person	2,160	1,458	987	1,269	5,901
Bioethanol/ biodiesel	Mtoe	16.0	4.25	8.750	5.1	34.1
Land area	Thousand Ha	4,000	3,000	1,750	1,500	10,250
On-farm investment	US $ (millions)	12,960	972	2,835	567	17,334
Off-farm investment	US $ (millions)	2,880	491	11,025	5,164	19,560

Aside from setting an ambitious blending target, MEMR Regulation 12 is considered a relatively lax regulation. While there is an opportunity under the regulation to apply for exemption from the target, there is no mention of any set of predetermined conditions warranting leniency. In practice, there is little enforcement of the target. The regulation requires the Directorate General of Oil and Gas (under the Ministry of Energy) to perform regular (routine) sampling of diesel fuel sold at pumps, storage depots, and blending facilities, and the available data published by the agency suggests that actual biofuel utilization rates have consistently fallen short of targets (Wright & Rahmanulloh, 2016). The mandated levels have generally not been fully achieved in the past, as seen in Table 3 for 2014. Based on this table, Pertamina, Indonesia's national energy company and the sole retail distributor of subsidized diesel fuel, delivered the highest level of biofuel blending, although its fuel was still far from compliance with the target rate. Other fuel suppliers blended at only about one-third of the target rate. In theory, penalties exist for non-compliance with the targets, ranging from a warning letter (minimum) to revocation of a business permit. However, it seems that the regulation is effectively not enforced and is not seen as a binding mandate, especially for fuel suppliers not receiving subsidy funds. To the best of our knowledge, no penalties for noncompliance have been issued to date.

Table 3 Biofuel mandate target realization in 2014.

Entity	2014 target in kiloliters (Kl)	Q3 2014 target (Kl)	Realization up to Q3 2014 (Kl)	% Realization
Pertamina (for subsidized fuel)	1,567,000	1,175,250	852,463	73%
Pertamina (for non-subsidized fuel)	959,732	719,799	63,478	9%
Other fuel companies	607,519	455,639	161,257	35%
PLN (electricity generator)	742,972	557,229	137,174	25%

(Source: NREEC, December 2014)

2014 is the most recent year for which we have data on the realization of the biofuel blending target. As 2014 precedes the establishment of the palm oil export levy fund and the "plantation fund," it would be interesting to see how the funds affect Indonesia's target realization performance in 2015 and in future years. However, the slump in crude

oil prices has led to a larger price gap between conventional diesel fuel and palm biodiesel, and therefore has increased the nominal funds needed as a subsidy. In 2016, projected palm export levy proceeds of about 16 trillion rupiah ($1.2 billion at current exchange rates) will allow subsidization of only about 2.5 billion liters of biodiesel production (Wright & Rahmanulloh, 2016). This would allow blending to about 15% on average, which would fall short of the government target of 20% biodiesel blending in 2016, although there is the potential for some additional unsubsidized fuel supply.

POTENTIAL OTHER USES OF THE PALM OIL LEVY FUND

If the palm oil levy fund were redirected toward supporting lower carbon biofuel pathways, rather than subsidizing existing palm biodiesel production, Indonesia could take advantage of an opportunity to support its biofuel blending mandate, while also more effectively meeting its GHG reduction goals. We outline two potential options for utilizing this support for low-carbon biofuels below.

One option is to support the establishment of new palm oil plantations on degraded lands only. Degraded lands should not be confused with degraded forests in this context. Only lands with very low biomass stocks and low levels of biodiversity (e.g., Imperata grasslands) should be included in the criteria. Peatlands would automatically be excluded from this category. Some form of financial incentive to use palm oil produced from degraded land could also be considered. Eligible projects could be required to be RSPO-certified. Sustainable biodiesel from palm oil produced on this type of degraded land has the potential to significantly reduce GHG emissions compared with fossil diesel, and to greatly reduce GHG emissions compared to BAU palm oil biodiesel.

Another option is to support cellulosic biofuels from oil palm residues. ICCT's research (Paltseva et al., 2016) has shown there is a significant potential to produce low-carbon cellulosic biofuel from sustainably available palm residues in Indonesia. The potential amount could be sufficient for replacing approximately 15% of Indonesia's gasoline and diesel consumption. ICCT has found that cellulosic biofuel from other types of agricultural and forestry residues such as corn stover and forestry slash would deliver life-cycle GHG savings of 60% or more compared with petroleum (Baral & Malins, 2014). Utilizing the palm oil levy fund in this way could potentially make a significant contribution to displacing petroleum imports and meeting the country's GHG reduction goals without causing any land-use change or leading to other negative environmental impacts. In addition, it could support the development of a new cellulosic biofuel industry in Indonesia.

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