

Challenges and opportunities of bioenergy development in Indonesia

A synthesis of the workshop co-organized by Ministry of National Development Planning/Bappenas and CIFOR, 31 May 2016, Jakarta.

Structure of the workshop and participating stakeholders

- **Overview of existing policies and achievements in the field of bioenergy in Indonesia.**

Participants: Bappenas, CIFOR and IPB (Bogor Institute of Agriculture).

- **The case of biodiesel: what policies and what prospects?**

Participants: Session moderated by CIFOR with the Palm Oil Estate Fund, Pertamina (state-owned oil and gas company), FORDA (Research Center of the Ministry of Environment and Forestry) and APROBI (Indonesian Association of Biofuels Producers).

- **The case of wood-based energy (Part 1): Is there a business case and for what?**

Participants: Session moderated by TIGFII (Indonesia Green Financial & Investment Institute), with the Ministry of Environment and Forestry, Inhutani III (state-owned forestry company), PLN (state-owned national electricity company) and OJK (Financial Services Authority).

- **The case of wood-based energy (Part 2): Institutions and investments.**

Participants: Session moderated by Bappenas with the Ministry of Environment and Forestry, the Ministry of Energy and Mineral Resources, MAPHEBI and PT Korintiga Hutani (private forestry company).

As part of the project "Forests in the global bioeconomy: Developing multi-scale policy scenarios" funded by the German Ministry of Economic Cooperation and Development (BMZ), and the study by Bappenas "Development of forest energy to support the forest industry cluster", a national stakeholder workshop was co-organized by CIFOR (Center for International Forestry Research) and Bappenas. This document synthesizes the main inputs and messages that were delivered.

Bioenergy as one component of the New Energy Policy

Energy security represents a great challenge as supplies have to catch up with rocketing demand (predicted three times higher by 2035) due to economic growth and changing living standards. Moreover, the country spreads over thousands of islands and local contexts differ a lot in terms of infrastructures, incomes or access to local sources of energy. As Indonesia has committed to significant reductions of greenhouse gas emissions, and still relies heavily on fossil fuels, there is a need to stimulate energy production based on renewable and sustainable sources and processes.

Indeed, the current sources of energy are mainly crude oil, coal and natural gas with less than a tenth coming from renewable energy sources. Yet the government issued a National Energy Policy in 2014 (*PP No. 79 Tahun 2014 Kebijakan Energi Nasional*) that targets 23% of new and renewable energy by 2025. As the country has huge natural resources, vast forested areas and degraded lands, and suitable conditions for the development of oil palm, the government has decided to rely to a large extent on bioenergy to achieve energy targets.

Bioenergy refers to energy production based on biomass. It can take many forms – from liquid biofuels such as biodiesel produced with palm oil and bioethanol, to solid biofuels such as pellets or chips produced with wood, and others. Biomass can serve the purposes of electricity generation, transportation fuels or heat production.

The potential for bioenergy development is assumed to be significant, as millions of hectares could theoretically be used to produce various kinds of biomass, either as residues (e.g. from agriculture, forestry or municipal waste), alternative products (e.g. biofuels vs. other palm oil-derived products) or dedicated tree plantations. Moreover, the government plans to stimulate restoration of degraded lands and to support access to electricity in remote rural areas, in a context of declining domestic production of fossil fuels and increased reliance on exports (Indonesia is the largest importer of gasoline in the world) that are expected to play in favor of bioenergy.

Technologies and data management have room for improvement

While there is general consensus on the potential to tap into large existing biomass and land resources, more could be done to map these resources across the archipelago. Efforts are ongoing, for example, to map the extent of Nipah palm on the coasts before an effective strategy can be developed. Regions have often specialized in the cultivation of crops that could be promising sources of raw material, yet specific strategies are still lacking to process these resources into energy. For instance, parts of Papua host substantial areas of coconut trees and Aceh hosts substantial areas of coffee plantations. These existing resources call for a regional vision that would specialize in some forms of bioenergy production.

Data management also needs to apply to land availability. The recurrent discourse that degraded lands should be developed in a more productive way still faces limitations on the ground where communities are engaged in their own activities with resulting conflicts with investors. In addition, a number of biophysical factors may, in practice, also impede productive activities with

difficult access, steep slopes, unfertile soils and other conditions. The challenge is daunting when it comes to providing operational maps for planning and investments, and the One Map policy – a national initiative to centralize and harmonize information on land tenure, land uses and related licenses – remains a work in progress.

Regarding technologies, second generation biofuels that would rely on lignocellulosic biomass are still not operational and their future development remains uncertain. Otherwise, most technologies required to produce bioenergy are available either from agricultural crops, trees or organic waste; they are operational, although their efficiency could be increased.

But participants were also aware of a number of obstacles that may have significant impacts on bioenergy development in rural areas, and that take place on the demand side. For instance, possible mismatches between feedstock availability and end-consumption were mentioned: there are many cases where, although it would be possible to draw on locally sourced biomass for, say, the production of bioethanol, this fuel cannot be consumed locally (the example of fishermen was mentioned).

Taking local demand situations into account will hence be key to the successful development of biofuel projects – particularly in remote regions of the country. Other obstacles are in-between technologies and cultural norms, and households are commonly reluctant to use bioethanol-based products when they are used to consuming government-supported LNG (liquefied natural gas).

Biofuels based on oil palm and municipal waste are spearheading bioenergy

There has been an earlier and faster bioenergy development with palm oil and municipal waste because of more secure and affordable sources of supplies, with standing plantations, lots of residues and organic waste. In contrast, forestry does not provide the same enabling conditions. It is therefore logical that – with the enactment of the Presidential Regulation framing the National Energy Policy – palm oil was chosen as the main feedstock for biodiesel.

Several lessons were learned over a decade of oil palm-based biodiesel production. First, biodiesel is feasible only when the price of oil is not at its lowest. Indeed, loads of subsidies are needed to enable the biodiesel mandate to unfold as its costs of production are currently much higher than diesel prices (liquid fuels require 20% biodiesel content from 2016 onwards). These subsidies now flow to producers through the Indonesian oil Palm Estate Fund (BPDP), which was established in July 2015. The fund is financed through a levy of USD 50 per ton of Crude Palm Oil (CPO) exported, and the proceeds are channeled to CPO producers to make up the difference for low diesel prices.

Early findings indicate that (subsidized) biodiesel has attracted a lot of interest within the private sector as several new refineries are up and running. The subsidy also had an important impact on the global market as exported production has been significantly reduced. As a consequence, CPO prices are on the rise. But one issue with this arrangement is the extent to which the CPO fund can cope

with lower proceeds from the levy with fewer exports, and greater subsidy needs with part of the production being reallocated to domestic energy consumption.

The regulation governing the National Energy Policy also plans for the next level of the biodiesel mandate – 30% of liquid fuels made of biofuels by 2025 – that will require approximately a hundred new refineries with Pertamina, the state-owned oil and gas company, playing a key role. This is an opportunity, as well as a challenge, not only in terms of refining capacities, but also for continuous availability of feedstock. Synergy, integration and partnership between oil palm plantations, CPO mills and biodiesel refineries are necessary to ensure the biofuel mandate will be successful.

Wood-based power generation: still needs proof of concept

The workshop stimulated lots of discussions about one specific bioenergy product and model, namely the management of tree plantations for the specific purpose of providing feedstock for biomass power plants. This model refers to investments in dedicated tree plantations for on-site processing into woodchips and power generation to feed into the grid of the national electricity company. As such, it differs from the processing of wood into pellets for exports (especially to South Korea) that experienced some development in the past, but that recently stopped due to record low international prices. It also differs from the case of residues from forest operations processed on-site to operate an integrated power plant that supplies electricity to the industry complex – e.g. plywood or pulp mills – with potential sales of excess power to the grid.

A Memorandum of Understanding was signed between the Ministry of Energy and Mineral Resources and the Ministry of Environment and Forestry in 2014. It aims to accelerate use of HTI (Hutan Tanaman Industri – Industrial Tree Plantations) for energy ends, as well as to encourage power plants to become investors themselves. Furthermore, participants are confident that the current revision of the 2014 feed-in-tariff policy by the Ministry of Energy and Natural Resources would provide more planning security to investors and make these types of investments more profitable; this would trigger the development of the sector. With millions of hectares of concessions not fully developed yet across the country, the overall policy approach seems very sound.

As a result of these policies, 32 HTI concessionaires have either already revised (with approval from the Ministry of Environment and Forestry) their management plans to include energy production, or are submitting revised management plans (see map). It is fair to say, though, that progress is still limited as no integrated wood-based project is up and running yet. So far, only forest-based industries have developed operational power plants running on their own residues from forestry operations; PT Korintiga Hutani in Central Kalimantan, for example, sells excess power to the grid.

There are reasons for this slow implementation of a fairly recent policy. The history of the HTI program in Indonesia serves as a good lesson as it has basically only been fully implemented for the two main pulp and paper groups that control the bulk of the productive planted estate. Indeed, in the case of wood energy, the usual problems such

as difficult operations on the ground because of unsecure land tenure and local claims, or long licensing processes, are amplified by fierce competition with other traditional sources of energy and a lack of access to the credit market. As a consequence, it appears that investors remain prudent. The business model is still to be proven and there is not yet proof of concept.

It was asked whether wood-based power generation in remote areas could also be developed with small-scale operations at the village level, off-grid and for local needs. Despite small-scale biomass gasifiers being available and well suited for small-scale, off-grid operations, the prospects for this model remain uncertain. Practical experience from countries like India and Sri Lanka shows that operating and maintaining small-scale gasifiers is challenging, and that the model struggles to compete with other sources of energy such as locally-operated diesel generators, solar panels and mini-hydropower; both its investment and operational cost are generally higher than those of competing small-scale technologies.

In the context of the Indonesian government promoting and supporting the small-scale tree plantation scheme (HTR, Hutan Tanaman Rakyat) and considering the aforementioned constraints of the development of large-scale plantations, outgrower schemes that rely on smallholders to supply larger biomass power plants with (woody) biomass might be a more viable way ahead. There are currently a few planned biomass gasification projects that intend to rely primarily on externally sourced biomass, especially Kaliandra trees provided by local smallholders. As with integrated projects, however, there is no proof of concept of these models in Indonesia. It remains to be seen how investors will tackle challenges such as long-term supply contracts with smallholders. Ultimately, the model most successful at securing feedstock continuously at relatively low cost is likely to prevail.

Integrated power plant projects seem a necessary condition for wood-based energy to take off

Discussions during the workshop converged toward the conclusion that integration was probably a necessary condition for wood-based power generation investments. Investors can hardly be expected to develop either power plants or large-scale energy plantations in isolation due to the high risks involved. Plantation forestry dedicated to electricity generation was praised as one type of renewable energy that can provide sustainable and continuous feedstock supplies that are relatively independent from weather conditions as opposed to, for instance, solar or hydropower energy. Yet this assumption only holds when management of the plantation is effective and performing, which in turn demands that the buyer of the feedstock control field operations. Indeed, forestry in Indonesia, including plantation forestry, has not always proven to be capable of reaching this level of sustainability as exemplified by the HTI program since its beginnings.

Participants raised the issue of difficult access to funding for both power plants and energy tree plantations. Investors are reluctant to fund projects seen as too dependent on erratic supplies of feedstock when the plantation is not sufficiently well managed for the long term, or when power plants depend on markets to secure their raw material needs (exemplified by the rise in palm kernel prices). These observations lead to the conclusion that integrated tree plantation / power plant projects are a requirement for capital to flow and for investments to materialize. Moreover, with the largest share of profits made at the power plant level, participants also explained that schemes such as Special Purpose Vehicles were pursued by investors to jointly run the business and ensure that profits were appropriately distributed across the value chain.

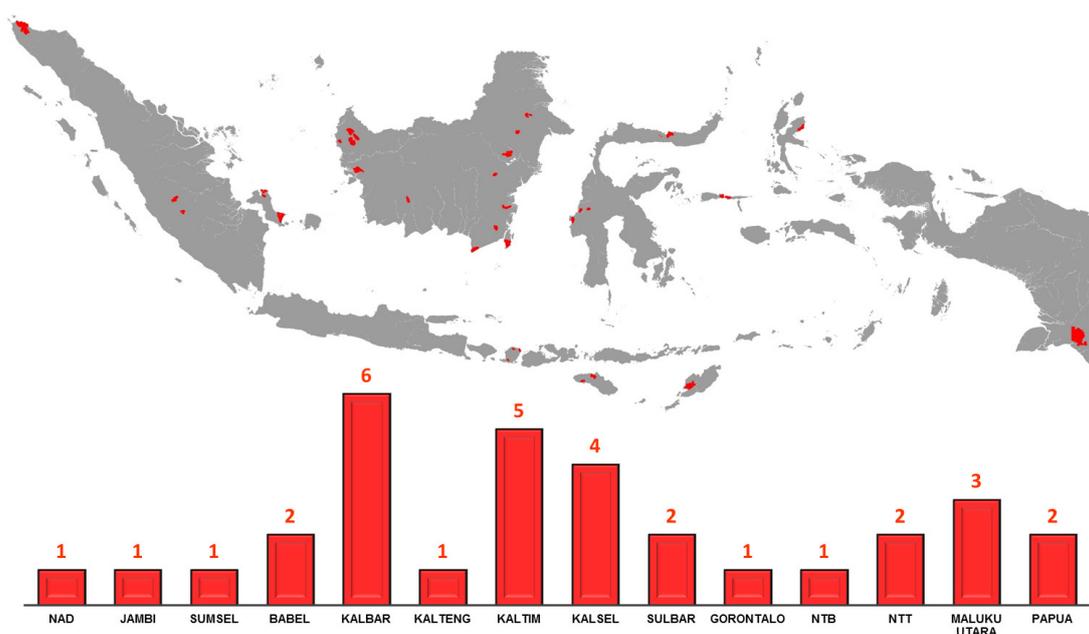


Figure 1. Location of Industrial Tree Plantations (HTI) with commitments to produce bioenergy

Source: Directorate General of Sustainable Production Forest Management, Ministry of Environment and Forestry, 2016

Indonesian banks are still largely unaware of the bioenergy business and therefore reluctant to support investments at scale. The Financial Services Authority (OJK) has formulated a roadmap to increase the interest of banks and their involvement in this field by training personnel at evaluating the specific risks of projects in the bioenergy sector, among other activities. Participants stressed the urgency of the domestic financial industry becoming more engaged in the bioenergy sector; if it left this highly strategic sector exclusively to foreign investors, it would lose out on opportunities that will increasingly present themselves with reduced access to domestic fossil fuels and fluctuating international energy prices.

The government is expected to do more, including with state-owned enterprises and Forest Management Units (KPH)

As economic and financial aspects are major obstacles to investments in wood-based power generation, the government has started to take action with the issuance of a feed-in-tariff regulation that guarantees higher prices for electricity based on renewables. This regulation provides different prices depending on the type of renewable and the regions of production. Participants collectively criticized the perceived low level of these tariffs; with their relatively high production costs of wood-based electricity, the tariffs are assessed as insufficient to close the gap.

The government is aware of the limited effectiveness of its regulation and is revising it. Revisions might not only target prices, but also the currency in which they are expressed. This is an encouraging move that shows the commitment of the government to make progress on that front. But in a context where the state-owned electricity company PLN is rather reluctant to take care of the price premium it is legally forced (through the feed-in-tariff regulation) to pay for electricity from renewable resources, the government must take decisive action.

As illustrated by the feed-in-tariff regulation, competitiveness is indeed a major challenge as other sources of energy remain more affordable. However, the situation is likely to change in the

medium to long term as the country becomes increasingly dependent on imports of fossil fuels and its reliance on domestic production of coal puts at risk commitments toward reduced emissions. Moreover, the consideration of a number of externalities and co-benefits induced by well-designed tree plantations in degraded areas could increase the economic value of wood-based power generation relative to other (even renewable) energy sources.

This observation has to be related to the strategic shift expressed by representatives of state-owned companies in terms of support to bioenergy. For instance, the national oil and gas company Pertamina is now expanding its scope to become a broader energy company serving government policies expressed in the New Energy Policy. Such a move still has to be accompanied by the state-owned electricity company that remains tied to its obligation not to operate with a deficit, which inhibits more action on its side, e.g. investing in bioenergy-related infrastructures.

The government as a whole could also make better use of existing fiscal transfer mechanisms at the regional level to enhance investments in power plants and related infrastructures, as exemplified by one such investment in the iconic island of Sumba. State-owned forestry companies could also directly invest in the production of the feedstock as Inhutani III does. More generally, specific state-owned companies could be established to develop bioenergy, following the example of what happened for renewable energies.

The role of Forest Management Units (KPH) was also mentioned as a key issue. These new institutions, yet to be fully operational across the country, are indeed responsible for sustainably managing the forest estate and for attracting investors. This might prove absolutely essential in the case of bioenergy once a number of barriers are removed. Land tenure as a major inhibitor of plantation development should be addressed, e.g. by providing clean and clear licenses and accelerating the licensing process, and smallholder integration schemes. They are clearly in a perfect position to implement the vision of the government on wood-based energy on the ground.

This report was written by Romain Pirard (CIFOR, r.pirard@cgiar.org), Simon Bär (BMZ, simon.baer@giz.de), Ahmad Dermawan (CIFOR, a.dermawan@cgiar.org). Contact person at Bappenas: Nur Hygiawati Rahayu (nur.hrahayu@bappenas.go.id)



RESEARCH PROGRAM ON
Forests, Trees and
Agroforestry

This research was carried out by CIFOR as part of the CGIAR Research Program on Forests, Trees and Agroforestry (CRP-FTA). This collaborative program aims to enhance the management and use of forests, agroforestry and tree genetic resources across the landscape from forests to farms. CIFOR leads CRP-FTA in partnership with Bioversity International, CATIE, CIRAD, the International Center for Tropical Agriculture and the World Agroforestry Centre.



Fund



Federal Ministry
for Economic Cooperation
and Development



Center for International Forestry Research (CIFOR)

CIFOR advances human well-being, environmental conservation and equity by conducting research to help shape policies and practices that affect forests in developing countries. CIFOR is a member of the CGIAR Consortium. Our headquarters are in Bogor, Indonesia, with offices in Asia, Africa and Latin America.

