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Conference Paper

RENEWABLE RESOURCES EXPORT OPPORTUNITIES: ACCELERATING DEVELOPMENT

Thomas Wagner
EuroCham, Jakarta, Indonesia

Abstract.

The transition to clean energy systems across the world offers both challenge and opportunities for resource-rich developing countries like Indonesia. Even as the country continues to export large volumes of natural gas, falling domestic quotas and pressure to decarbonize internationally are pushing the country increasingly toward wind and solar power. This paper investigates Indonesia's potential to export renewable energy through bio-based biogas, biomethane, and bio-LNG. Based on a qualitative content analysis of policy documents, institutional reports and international accords, the analysis struggles with an enlargement of the mismatch between ambitious national goals and crawly domestic measures. Given regulatory and infrastructure limitations, the potential for biomass may be relatively unexploited; nevertheless, biomass in Indonesia does remain among the greatest compared to many competitive countries regarding logistics, rising by virtues of geographic placement and export infrastructure. International demand, which results from carbon pricing and fuel standards, as well as corporate decarbonization commitments, opens immediate export market opportunities for renewable energy. Examples from previous instruments, like the Clean Development Mechanism, show how global incentives can quickly lead to investment in green infrastructure. The results highlight the necessity of export-oriented approaches to induce the energy transition in Indonesia, and possible policy reforms to unlock domestic and international value chains.

Keywords: Clean Development Mechanism (CDM); energy exports; energy geopolitics; renewable energy transition; sustainable industrialization

Corresponding Author:
Thomas Wagner
Email: thomas.wagner@iml.rwth-aachen.de

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Introduction

The energy map of the world is changing fast, led by climate concerns, fluctuating prices of fossil fuels, and the imperative of transitioning to sustainable energy systems (1,2). In developing countries like Indonesia, the transition creates two challenges that require them to reach an energy security at their national scale and also to meet carbon reduction commitments at international level (3–5). As a major actor in Asia's energy trade, Indonesia still exports gas, but domestic allocation has been declining. At the same time, there has been a redirection of government and market focus toward renewable sources of energy away from traditional oil and gas, pointing to a structural shift in national and regional energy policy.

The aspirations for economic downstream industries to add value to the depletive natural resources in Indonesia call for immediate action (4,5). Unlike depleting fossil fuels, renewable energy is still a largely untapped resource (6). Opportunities for green growth & industrial sector development for Indonesia in the face of current global decarbonization stimulus. The current preoccupations of incentive disbursement for renewable exports world-wide reiterate the potential for this form of exports to be a trigger for Indonesia's industrial develop ment & green growth.

Literature Review

Theoretical Studies

The geopolitical significance of renewable energy has risen dramatically (7,8). Nations that are wealthy in resources are re-aligning themselves in a time when not wealth comes from raw material extraction but in the green industrial economy. The comparative advantage and green mercantilism theories both anticipate that nations that jump on board early to exploit the opportunities to develop early renewable infrastructure, for example, are the ones that will gain access to high-value markets (9,10). Additionally, export-oriented role of renewable energy can secure long-term competitiveness against worldwide flux in fossil fuel market (4,5).

Institutional economy also offers explanations on why countries with comprehensive policy instruments and investment incentives are more probable to garner capital for renewable projects (11,12). Instruments like carbon markets, fuel standards and trade agreements are external value drivers that condition the appeal of domestic energy systems for export-oriented production.

Empirical Studies

The country's National Energy Plan aims for 23% renewable energy by 2025 and 35% by 2034 (13). However, in practice there

is slow adoption of renewables. By 2024, power generation by renewable will contribute about 14–15% to the overall energy production (14). The PLN's 10-year electricity business plan (RUPTL) allocates 42 GW of renewable energy investments but 70% of that capacity is expected to be operational after 2030.

Concurrently, since 2022 another 9 GW of captive coal capacity has come on stream (15). These locked-in plants are often exempted entirely from emission reduction targets, which suggests a detachment between policy and the reality of technology implementation. Indonesia has established an emissions trading scheme but lacks a carbon tax so invokes little push in terms of incentives for emission reduction. Alternative or secondary means are nonetheless non-monetary or unused (4,5).

In addition, there are cases from several other countries that indicate economic feasibility of renewable-export plans (16). The 13 Memoranda of Understanding (MOUs) between Indonesia and Singapore, aimed at promoting the trade of electricity across borders and developing renewable industry (4,5). Global demand for low-carbon fuels is increasing as the EU ReFuel Aviation Directive, IMO maritime decarbonization targets, Japan natural gas substitution targets, Korea clean hydrogen standard and other regulatory measures drive demand for sustainable fuels (4,5).

Methods

The method of data analysis was content analysis, which may be defined as a research technique for making replicable inferences that can be generalized to some larger population based on specific data (17,18). The study empirically considers the co-generation of renewable energy strategy, export oriented industrial development, and policy networks in Indonesia's energy transition. Primary sources include national energy plans (RUPTL), regulatory documents, bilateral concessions, investment announcements, and reports from the domestic and international institutions. The screener's filtering criteria are for materials on bioresource use, carbon market instruments, inter-regional energy trading, and the deployment of renewable infrastructure. The focus of the analysis is on state-led channels for exporting renewable energy (particularly biogas, biomethane and bio-LNG) as well as institutional constraints and drivers, comprise of price control, access to grid/pipe and power wheeled. The research guarantees the validity of the data through triangulation government publications, industry case applications, and international regulatory examples that have implications for emerging energy export and low-carbon fuel markets.

Results and Discussion

Indonesia has a large biogas potential, especially from the palm oil sector, with theoretically a potential of 280 million MMBTU/year (19). This could be turned into 4–5 million tons of bio-LNG, or 8 million tons of bio methanol per year with an export value between USD 4–8 billion. These products lack domestic competitiveness because of Indonesia's artificially low regulated natural gas prices. However, the world market, for example maritime and chemical industries of the European Community (EC) and Japan and the Korean industry with these targets, pay premium prices for renewale fuels (4,5).

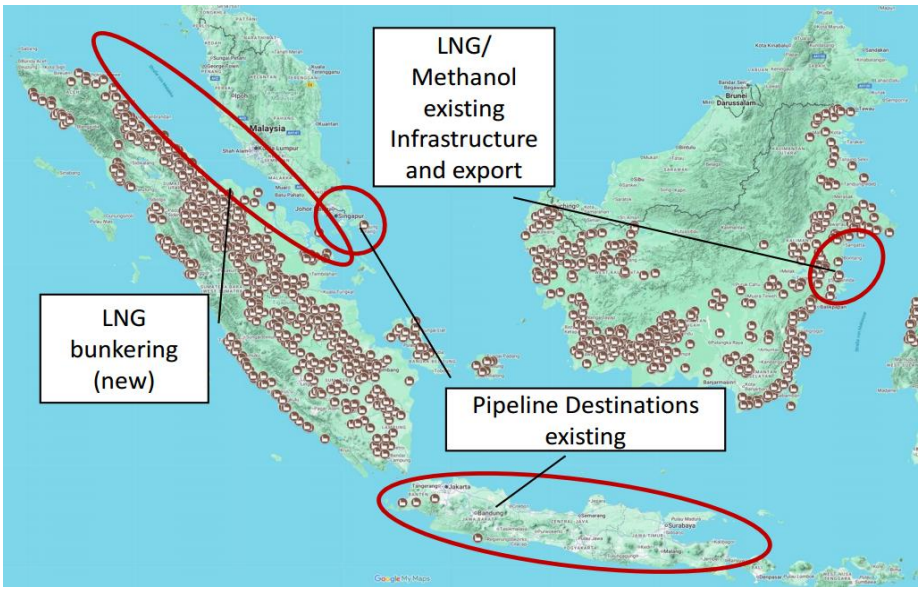

Figure 1. Opportunity of LNG/Methanol in Indonesia
Source: Wagner (2025)

Indonesia is strategically positioned to export (20). These Export could be scaled up with existing LNG and methanol infrastructure in the Bontang cluster, as well as with existing transport infrastructure between Sumatra, West Java and Singapore. 0% Indonesia sits on the Straits of Malacca and sides with the world's busiest bunkering hub, provides the country with a location to cater low-carbon shipping fuel needs, if infrastructure is ready (4,5).

Examples that have been proposed for Malaysia and Singapore suggest that these replicable strategies are available throughout the region. Our Malaysia is a clone of Indonesia in that regard with own bioresource-wealthy lands and the export infrastructure already in place. Singapore is also becoming an organizing center for renewable energy and industrial investment. Experiences from the Clead development Mechanism (CDM)-era show that export-oriented renewable project development works.

Within four years of the CDM's start, Indonesia constructed almost 120 projects, the majority of which are still operating. The developments were promoted through a stable and transparent regulatory environment and reliable international value chains (4,5).

In order to operationalise export-oriented renewable energy strategies, Indonesia faces many challenging domestic barriers. For instance, the investment threshold for tax incentives of renewable energy projects is Rp 500 billion, whereas the treshold should be lowered to also cover those smaller but highly beneficial projects, especially those for distributed power systems. Second, the investment would open access to underutilized pipeline capacities, which could be made available to third parties on a cost-reflective basis for more efficient transmission of low-carbon fuels, for example biomethane. Third, the domestic competitiveness with low-carbon alternatives must be increased by a level playing field with price-regulated natural gas. Regulatory considerations Lastly, policy should be modified to facilitate power wheeling, permitting renewable power to be carried from generation to demand centers via the national grid. These steps are necessary to mobilize investment, promote project implementation and establish Indonesia as a major exporter of renewable energy to the world (4,5).

Conclusion

Indonesia is at a crossroads in energy-transition landscape. With national targets outstripping domestic acceptance of renewables, overseas demand and legislative planning provides the right climate. Add export-based renewable energy development, especially via biogas, biomethane and bio-LNG, and the industry can be a focus for investment in processing and infrastructure. Harmonising regulatory environments, enhancing markets access and benefitting from cooperation with international partners is essential to harness this potential. Instead of waiting for the "right environment" at home, the regulation can show the way by developing export capacity and harnessing global value as the country moves towards the future of a domestic, green economy. The long-term payoffs include not only climate alignment and economic diversification, but also a competitive edge in the global renewable energy supply chain.

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