



Decarbonizing the Maritime Industry: An Opportunity to Further Indonesia's Just Energy Transition

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The race is on to decarbonize the energy sector in Indonesia. In November 2022, the government of Indonesia and the International Partners Group (IPG) ¹ launched their Just Energy Transition Partnership (JETP). As part of the partnership, Indonesia committed to raise the share of renewables in its power generation mix from its current level of 19 percent to 34 percent by 2030. The country also committed to achieving an early peaking of carbon emissions and advancing its net-zero emission commitment by a decade from 2060 to 2050. In return for Indonesia's increased policy ambitions, the IPG in conjunction with leading financial institutions pledged to support the country with an initial amount of \$20 billion, half of which will come from the private sector. ([Ministry of Finance of Japan, 2022](#))

Indonesia's JETP has received considerable attention as a leading test case for how donors, providers of official finance, and the private sector can partner with low- and middle-income countries to reduce emissions while promoting development progress. So far, most of the focus in Indonesia's JETP has been on efforts to reduce the supply of carbon-intensive power by refinancing coal-fired power plants to retire them early and replace them with renewables. But this strategy alone may not deliver the speed and scale of the transition required as it relies on large amounts of grant and concessional funding, which may be difficult to secure. Efforts to boost demand for renewable-based energy deserve more attention. One such effort is particularly promising in generating synergies for Indonesia's low-carbon development goals.

Decarbonizing the shipping industry

Five years after adopting its [initial strategy](#) on reducing greenhouse gas (GHG) emissions from ships, the International Maritime Organization (IMO) is accelerating its efforts to decarbonize the shipping sector, the world's seventh-largest carbon emitter. Next month, the IMO is expected to adopt a more ambitious strategy to cut carbon emissions from the sector, whose GHG emissions are projected to increase up to 50 percent by 2050 compared to 2018 levels if new regulations aren't adopted ([IMO, 2020](#)). If IMO fully aligns the new strategy with the 1.5°C climate goal, it could trigger major investments in alternative bunker fuels (the fuel used by marine vessels) that produce very low, and ultimately zero, GHG emissions during their production, distribution, and use. It could also prompt new investments in zero-emission vessels that can operate on such alternative fuels.

Zero- and low-emission bunker fuel supply infrastructure investments account for nearly 90 percent of the estimated \$1.4 to \$1.9 trillion needed to fully decarbonize the shipping industry by 2050 ([GMF, 2021](#); [UMAS, 2020](#)). While research and development is ongoing, studies identified green ammonia as the most promising zero-emission fuel option for larger ships, followed by green hydrogen.² Compared to other potential low- and zero-emission bunker fuels, green ammonia is assessed to have the largest cost reduction potential over time and superior storage characteristics compared to green hydrogen. Its scalability makes it a more favorable fuel compared to low-emission biofuels, particularly suited for long-distance shipping routes. Moreover, ammonia as a fertilizer is internationally traded and ports are experienced in handling and storing it. Accordingly, annual demand for green ammonia for shipping is projected to increase by up to 950 million metric tons by 2050 and represent a \$5 trillion market ([McKinsey 2023](#), [World Bank, 2021](#), [UMAS, 2020](#)).

The Global Maritime Forum estimates that between 18 and 20 exajoule of alternative zero-emission fuel would be required to fully decarbonize the shipping sector ([GMF, 2021](#)). Based on this projection, we estimate that by 2030, between 70GW and 100GW of additional renewable power and green hydrogen/ammonia production capacity would need to be installed, provided green ammonia becomes the preferred alternative zero-emission fuel; by 2050, that estimate rises to between 800GW and 1,200GW. To achieve full decarbonization by 2050 and the necessary large-scale deployment of alternative fuels between 2030 and 2040, rapid progress must be made between now and 2030 and at least 5 percent of the shipping fuel mix must be made up of low- or zero-emission fuels ([GMF, 2021](#)).

Opportunities and synergies for green shipping in Indonesia

The maritime industry is of strategic importance for Indonesia, the largest archipelagic country in the world. Indonesia is composed of over 17,000 islands and is located along two of the world's busiest trade routes: the Strait of Malacca, and the Sunda Strait. In 2021, Indonesia registered a trade-to-GDP ratio of 39.5 percent; its year-on-year merchandise trade grew by about 40 percent and accounted for 91 percent of Indonesia's total trade. From 2017-2021, Indonesia's merchandise exports grew by 11.8 percent, faster than the Asia Pacific region's 9.6 percent annual average growth during the same period (ESCAP, 2023). Indonesia's container throughput in 2021 amounted to 14,025,449 TEU (twenty-foot equivalent unit—a measurement of cargo capacity). This is larger than that of France and the UK combined (UNCTADSTAT, 2023). Indonesia has 11 international container ports, 97 bunkering ports, and 141 oil terminals. More than 900,000 workers are engaged in both international and domestic shipping (IMO, 2023).

Indonesia's GHG emissions from shipping in 2018 are estimated to represent about 3.7 percent of global total shipping emissions, 87 percent of which are emitted by bulk carriers, tankers, container ships, and smaller industrial ships. (GMF, 2022). Given the rapid trade expansion, Indonesia's share in global emission is forecast to increase rapidly without timely intervention. This underlines the important role Indonesia has in supporting shipping decarbonization in the decades to come.

At the same time, the transformation in the global bunker fuel market and foreseeable near-term demand for zero-emission bunker fuels driven by first-mover green corridor³ projects under development near Indonesia offer the country an excellent opportunity to leverage its national comparative advantages, position itself as a major exporter during the period of growing demand expected from 2030 onwards, and prepare for decarbonizing its national maritime activity.

The port of Singapore, the world's second-largest transshipment port (UNCTAD, 2022) and just 8 nautical miles from a major Indonesian bunkering hub, is at the heart of several first-mover green shipping corridor initiatives. In August 2022, Singapore launched a green corridor with Europe's largest port in Rotterdam (The Maritime Executive, 2022). It is also at the center of the Llyod's Register and partners' Silk Alliance green corridor, linking Southeast Asia to China, the Indian subcontinent, and the Arabian Peninsula, which was launched earlier in 2022 (Llyod's Register, 2022); and one launched with the ports of Los Angeles and Long Beach in April 2023 (The Maritime Executive, 2023). Finally, it is also at the crossroads of a potential green shipping corridor under development by the Quadrilateral Security Dialogue (QUAD) partners.

The viability of these projects depends on a secure and reliable supply of low-cost zero- and low-emission bunker fuels. To date, the shortfall in production capacity remains large. For example, the announced green hydrogen and green ammonia production capacity along the East Asia-Europe

corridor is less than 10 percent of what would be required by 2030 to achieve full decarbonization by 2050.⁴

Indonesia is well placed to seize the opportunities from the decarbonization of maritime shipping and unfold synergies with its ambitious efforts toward a just energy transition, as underlined by several factors.

First, Indonesia already has a clear vision to improve maritime connectivity and develop necessary infrastructure that is being carried out through the Global Maritime Fulcrum. Over the last decade, Indonesia multiplied its diplomatic ties and signed cooperation agreements with key partners, including Australia, China, Japan, Singapore, and the United States to develop human and marine resources, institutional and maritime governance, and maritime economy and infrastructure (Lalisang and Candra, 2020).

The Ministry for Maritime Affairs and Investments is not only the main implementor of the Global Maritime Fulcrum but is also the lead negotiator for Indonesia's JETP with the IPG. The intersection of these roles brings efforts under one roof, creating synergies for efficient policy coordination to address technical, financial, commercial, and political challenges related to the decarbonization of the economy that ideally need to be solved in parallel and at once.

Second, Indonesia is endowed with abundant renewable resources and has recently significantly improved the business ecosystem for an accelerated deployment of these resources. The International Renewable Energy Agency estimated that Indonesia's solar, wind, and geothermal resource potential exceeds 3,500 gigawatts, of which over 99 percent remains undeveloped to date (IRENA, 2022). In September 2022, the country promulgated a revised pricing regime for renewables, putting them at par with fossil fuel-based resources and significantly reducing in-country development risks.

Third, Indonesia can leverage existing partnerships, including the JETP and those between domestic state-owned enterprises and private sector entities with international developers to scale up their learning and production infrastructure for alternative zero and low-emission bunker fuels. For example, in 2022, Pertamina, the state-owned oil and natural gas corporation, signed agreements with Chevron & Keppel Infrastructure to develop a geothermal-powered green ammonia production plant, and one with Aramco to explore the potential for carbon capture, utilization, and storage to produce low-emission ammonia (Ammonia Energy, 2023).

Fourth, the country is also improving its sustainable finance business ecosystem for an accelerated green transition. In February 2023, the government launched a mandatory, intensity-based emissions trading scheme covering coal-fired power plants that account for 81.4 percent of the country's national power generation capacity (World Bank, 2023).

Indonesia has also expanded access to green finance in recent years. Sovereign green sukuk (Islamic bonds) are now Indonesia's main financing instrument for climate actions, renewable energy, sustainable transportation, and climate change resilience projects. As of March 2022, Indonesia's total outstanding green sukuk and sustainable bonds reached US\$7.1 billion (ADB, 2022). The growth of its sustainable bond market has been supported by the government's strong commitment to implementing [ASEAN's Sustainable Capital Markets Roadmap](#). Since 2017, it has adopted green, social, and sustainability (GSS) and Sustainable Development Goal (SDG) bond frameworks as well as the [ASEAN Taxonomy for Sustainable Finance](#).

Challenges to and Solutions for Indonesia's Maritime Decarbonization

For Indonesia to realize the potential synergies with the decarbonization of the international shipping industry, it will need to develop its zero-emission bunker fuel supply chain, including fuel production, transport, distribution, and storage. As bunkering shifts to ports that can provide the most competitive fuels, Indonesia must address the cost gap between the zero-emission and traditional bunker fuel, ranging internationally between \$10 and \$53 per gigajoule (IEA, 2023). Moreover, it will need to catch up with other providers, who are further advanced on the learning curve for developing their green hydrogen and green ammonia supply chains. The government must drive a rapid reduction of both renewable power and zero-emission fuel generation costs. It must also drive accelerated in-country learning, technology improvements, and innovations through support to research, development, and demonstration (RD&D), and deployment of renewable-powered electrolyzers to produce zero emission fuels.

Indonesia will need to invest in new bunkering infrastructure, bunkering vessels, and new regulations and governance systems. It must also address challenges in terms of a shortage in skilled workers and human resources along the value chain. To date, there are over 20 hydrogen bunkering infrastructure projects and over 10 for ammonia worldwide (IEA, 2022). Indonesia needs to scale up its learning in this area.

What could Indonesia do to reap the benefits from these attractive synergies?

To make the most of these synergies, the government of Indonesia should:

- ▶ Send a clear signal by committing to the decarbonization of shipping, updating its Global Maritime Fulcrum strategy, and complementing it with a roadmap to become a preferred supplier of alternative, zero-emission bunker fuel.

- ▶ Expand its existing JETP and its maritime diplomacy ties to develop zero-emission bunker fuel infrastructure. Since the Ministry of Maritime Affairs and Investments is responsible for both the coordination of the JETP and the implementation strategy for Indonesia's Global Maritime Fulcrum, the ministry should take the lead and proactively push for generating these synergies.
- ▶ Harness demand for zero-emission bunker fuels to support investments in the decarbonization of domestic energy systems. Policymakers could aim to complement the country's JETP with a partnership for decarbonizing shipping, and an increase in concessional and public finance (i.e., grants, loans) for RD&D and pilot projects related to zero-emission shipping.
- ▶ Provide financing support for integrated renewable and green ammonia production demonstration projects under the country's just energy transition mechanism and support public-private collaboration on large-scale zero-emission demonstration projects.
- ▶ Leverage synergies and prepare consistent just transition frameworks for the energy and the shipping industry and prepare a roadmap toward a sustainable path for the maritime sector entails. This would require, among other things, strategies for reskilling and upskilling staff and unlocking wider social and resilience benefits.

How can Indonesia's international partners create and support synergies for a just energy transition?

Indonesia's international JETP partners are signatories to the [Clydebank Declaration](#) and supporters of green shipping corridors. Recognizing the need for cost-effectiveness and value-for-money, international partners could work together with Indonesia to advance the decarbonization of the shipping sector in parallel with the country's just energy transition. Potential specific support measures include the following:

- ▶ Incentivize international technology and innovation cooperation with Indonesian state-owned enterprises and private sector entities to develop green hydrogen and green ammonia supply, and to reduce electrolysis costs in Indonesia.
- ▶ Incentivize first movers through concessional funding and long-term offtake guarantees for producers of zero-emission fuels.
- ▶ Use their influence and convening power to connect the JETPs for Indonesia and Vietnam with efforts to decarbonize shipping; create a network of suppliers between these two countries, and work with industry stakeholders to advance the green corridors.

- ▶ Facilitate learning and exchange of experiences, partner and provide technical assistance for the development and implementation of (i) an interoperable, transparent, and consistent certification system for green hydrogen and green ammonia, a must-have if the country is to reap benefits from the trend toward zero-emission shipping; (ii) alternative fuel safety guidelines; and (iii) development of a just transition framework for Indonesia's shipping industry.
- ▶ Finally, international partners could provide expertise in harmonizing taxonomies, disclosure, and reporting standards to facilitate the growth of ESG investing in decarbonizing the sector.

Conclusion

Globally, the speed and scale of decarbonization of shipping depends on an accelerated and cost-efficient energy transition. In Indonesia, the inverse is also true. Demand-side efforts can accelerate the just energy transition.

By coupling the two efforts, Indonesia, in cooperation with international partners, can take concrete steps to catch the wave of bunker fuel market transformation early and benefit from productivity gains and positive impetuses for its sustainable growth and the creation of decent jobs in two sectors of strategic importance for the country. Thus, it can also advance on multiple SDGs, in addition to addressing climate change.

Coupling the two efforts will allow private financial institutions that are part of the JETP to potentially deploy their capital more rapidly.

Endnotes

- 1 The IPG include G7 countries, the EU, Denmark, and Norway. Japan and the United States are representing the IPG and lead in negotiating on behalf of the IPG with the government of Indonesia,
- 2 "Green" hydrogen is hydrogen produced from the electrolysis of water using renewable electricity. "Green" ammonia is produced by combining "green" hydrogen with nitrogen from the atmosphere using an established and scalable process called the Haber-Bosch process. When powered by renewable electricity, green hydrogen, and green ammonia do not create any GHG emissions across their entire lifecycles, from production to use.
- 3 Green shipping corridors are a strategy promoted by the United Nations to advance the decarbonization of the shipping industry. Green shipping corridors are specific shipping routes where the technological, economic, and regulatory feasibility of the operation of zero-emission ships is catalyzed by a combination of public and private actions (GMF, 2022).
- 4 To decarbonize the East Asia-Europe container route by 2050, progress by 2030 requires at least the development of 5GW of electrolyzer capacity to deliver zero-emission bunker fuel to the forecast 50 zero-emission vessels operating on the route by that time. To date, only 7% of the required capacity have been announced to be available by 2030 (GMF, 2023).

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