

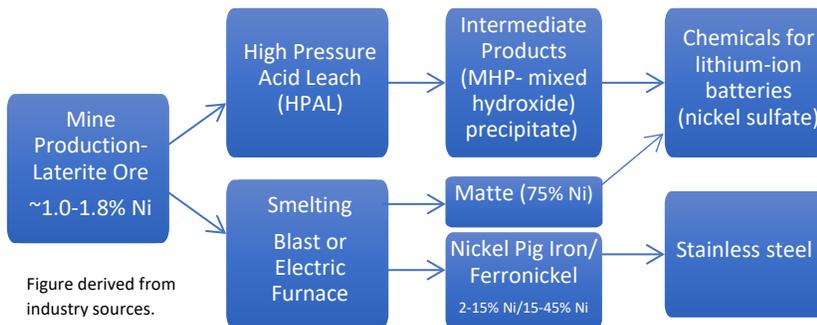
Nickel in Indonesia: A Story of Trade Restraints and Emerging Technologies (Part 2)

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Following Indonesia’s nickel ore export restrictions, foreign investment in the country increased and a frenzy of new projects appear to be in the pipeline. The initial intent of the nickel mining law of 2009 was to encourage domestic production of specific higher-value products (i.e., ferronickel or nickel pig iron) which are primarily used in stainless steel. In 2009, lithium-ion battery (LIB) technology was not yet widely adopted for use in electric vehicles (EVs) and the incorporation of nickel in such batteries was still in the relatively early stages of development. In the ensuing years, nickel has become an integral part of the cathodes (the positive electrodes) that are building blocks of lithium-ion batteries and Indonesia intends to supply that market with nickel products. Nickel’s use in batteries accounted for about five percent of global nickel consumption in 2019; however, analysts have forecasted that usage in batteries will increase dramatically and could account for nearly 25 percent of global nickel consumption by 2030.

Developments Since the Export Ban: The nickel ore that is subject to Indonesia’s export ban had historically been exported to China (the leading global consumer of nickel), where it was then processed into nickel pig iron (NPI)¹ or ferronickel and then used in Chinese stainless steel production. Since the ban was implemented, Indonesia has received significant inbound foreign investment, allowing it to expand production capacity for those downstream steel-related products. In addition, there are also plans to process nickel ore for use in LIBs. These steel- and LIB-related nickel products are quite different and require separate manufacturing processes and plants. The simplified production processes are presented in figure 1. While the process for producing NPI and ferronickel is well established, the high pressure acid leach (HPAL) process that is expected to be utilized for battery inputs has not previously been used in Indonesia due to the high capital investment and waste disposal requirements.

Figure 1: Simplified production process for nickel in Indonesia²



Ferronickel/Nickel Pig Iron Production:

Since the export ban was first enforced in 2014, Indonesia’s NPI production has increased substantially, and it has become the leading supplier of NPI to China. According to the World Bureau of Metal Statistics, Indonesia produced 513,314 metric tons (mt) of NPI in 2020, over 100 times more than the

4,680 mt produced in 2014 when the export ban was initially enforced. The NPI production increase reflects new smelter capacity—according to Indonesia’s Ministry of Energy and Minerals, the number of operating nickel smelters increased from three in 2014 to 13 in 2020. In 2021, three more nickel smelters with a combined 285,000 mt of NPI capacity are scheduled to open. Foreign investment, particularly from China, has helped fuel many of the new smelter projects, as China was the leading consumer of much of the additional output, which is supported by the trade data. In 2020, Indonesia’s total exports of ferronickel (includes NPI) were valued at \$4.7 billion, with 96 percent destined for China, compared to \$292 million in

¹ A low-grade ferronickel product first produced in 2005 and predominantly used in China to make stainless steel.

² MHP is an intermediate product derived from laterite ores, which contains both nickel and cobalt. MHP is becoming one of the preferred raw material feedstocks for the battery supply chain due to lower cost and ample supply.

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2014. During that time period, Indonesia’s share of China’s total ferronickel imports increased to 66 percent from 2 percent.

Nickel for LIBs: Indonesia’s abundant nickel resources are not only valuable as inputs for steelmaking but have also emerged as an important component of LIBs used in EVs. Indonesia’s intention to become a leading global producer of nickel for batteries was amplified by a 2019 Presidential Regulation that aims to accelerate the country’s EV battery program by granting fiscal and non-fiscal incentives to industry players, and laying out a framework to make Indonesia a production and export base for both nickel-related LIB materials and the actual batteries. As of mid-2020, at least five plants (see table 1 for examples of these investments) were under construction in Indonesia to produce intermediates and battery-grade chemicals (nickel sulfate) for EVs. Indonesia is hoping for more projects at other stages in the battery supply chain, including manufacturing of cells and battery recycling. However, this ambitious plan faces hurdles in that Indonesia’s nickel ore is found in laterite deposits, which have not been commercially processed for use in batteries on a widespread basis and never in Indonesia. The production method relies on HPAL to upgrade nickel, a process that is historically complex, costly, and has had mixed results. Case in point: HPAL operations in New Caledonia and Madagascar were placed on care-and-maintenance (closure with the potential to reopen) in 2020 and a related company spokesman stated “HPAL is exceedingly complex and can be prone to failure.”

Table 1: Nickel projects for EVs in development in Indonesia

Company	Product	Expected Capacity	Start of Production
GEM Co Ltd & Tsingshan Holding	Ni intermediates/nickel sulfate	50,000 t/yr intermediates, 150,000 t/yr nickel sulfate	2022
PT Halmahera Persada Lygend	Ni intermediates/nickel sulfate	37,000 t/yr intermediates, 240,000 t/yr nickel sulfate	2021; full capacity 2023
PT Huayue	Ni intermediates	60,000 t/yr	2021

Source: Compiled from industry reports

International Response: Indonesia’s export restrictions have not gone unnoticed by the international community. The European Union (EU) filed a complaint at the World Trade Organization (WTO) in November 2019 against Indonesia’s restrictions on exports of nickel and other raw materials. The EU claimed that the restrictions unfairly limited EU producers’ access to nickel ore in particular and contended that “the

measures are in clear violation of Indonesia's WTO obligations, specifically the prohibition restricting the export of products to other WTO members.” Soon after the initial filing, the EU requested consultations with Indonesia at the WTO and the United States requested to join these meetings. After failing to reach a settlement during the initial consultations, the EU followed up in early 2021 by requesting the WTO’s Dispute Settlement Body to establish a panel to consider the case.

Outlook: The growing output and exports of Indonesian NPI smelters will likely continue to substitute for the country’s exports of nickel ore that had been previously shipped to smelters or directly to stainless steel producers, particularly in China. Recent increases in nickel prices and the growth in nickel demand for EV batteries may continue to incentivize foreign investment in Indonesia to develop HPAL facilities to process nickel ore, although some projects have been delayed due to the Covid-19 pandemic and Indonesia’s recent decision to restrict new mines from disposing of waste in the sea. Analysts predict that Indonesia will account for almost all of the growth in global nickel supply over the next decade, overwhelming output from new mines in Canada and Australia, and this output should continue to feed Indonesia’s downstream projects.

Sources: Indonesia Ministry Of Energy And Mineral Resources, [“Mineral and Coal Performance Report 2020”](#) and [“Energy Minister Delivers Performance Report Of 2020.”](#) WTO, [“Indonesia—Measures Relating to Raw Materials.”](#) Kyle, James, [“Nickel laterite processing technologies— where to next?”](#) Financial Times, [“Tesla’s nickel quest highlights metal’s environmental burden.”](#) Fraser, Jake et al., [“Study on future demand and supply security of nickel for electric vehicle batteries.”](#) Nornickel, [“Quintessentially Nickel.”](#)

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