Energy Transition Polemic in Massive Development of Captive Power Coal-fired Powerplant
Captive power coal-fired powerplant (PLTU) is a coal powerplant owned by a company that is independent from the public power grid. This captive power PLTU is generally used for the exclusive needs of company operations in industrial areas. Its private status and being in protected industrial areas as national vital objects has made this captive power PLTU miss much attention from the public and regulations. In Indonesia, many captive power PLTUs were built by investors and developers from China as part of the Belt and Road Initiative (BRI). China itself in September 2021 announced its commitment to stop building captive power PLTUs outside China's territory as a step to advance the Green Belt and Road Initiative. However, there are still ongoing construction of captive power PLTU in Indonesia industrial area by China’s investors and do not get much attention from the public.

The construction of a captive power PLTU has negative impacts not only from an environmental standpoint but also from the economic sustainability and Indonesia’s ability to achieve the energy transition and meet the targets of the climate commitments that have been signed. Economic losses are obtained from the risk of stranded assets, increased cost of capital due to reduced investor attractiveness, as well as not accepted product by the international market. This loss will not only be suffered by Indonesia, but also on the Chinese government and investors who also potentially damaging the reputation of their energy transition commitments. So far, financial institutions in China have experienced financial losses from continuing to push for coal powerplants development.

The large potential for the development of industrial estates with renewable energy in Indonesia adds to the urgency of stopping the construction of captive power PLTUs. Weak regulations for the transition from coal are challenges to phase out captive power PLTUs in Indonesia.
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Background

At a time when PLN is experiencing the problem of excess capacity (oversupply) of electric power, there is an increasing increase in electricity capacity from the construction of captive power coal-fired powerplants (PLTUs) in Indonesia’s industrial areas. The investors who most funded the construction of this coal-fired captive power PLTU came from China, which is operating under the auspices of the Belt and Road Initiative (BRI). China itself has previously responded to diplomatic pressure regarding the construction of coal-fired power plants with President Xi Jinping officially announcing China’s commitment to stop building coal-fired power plants outside its territory in September 2021 at the United Nations General Assembly. However, it seems that this commitment has not been implemented properly considering that captive power PLTUs are still being planned and built—including in Indonesia. In fact, the construction of a captive power PLTU has negative economic, social and environmental impacts in China’s investment destination countries.

China’s commitment also conflicts with greener development programs with partner countries. On the eve of the first Belt and Road Forum (BRF) on International Cooperation held in May 2017, China published the "Guidance on Promoting Green Belt and Road" and the "Ecological Cooperation Plan" and "Belt and Road Ecological and Environmental Cooperation Plan”. According to these guidelines, the Belt and Road Initiative should follow the principles of efficient use of resources and emphasize environmental protection in all aspects and processes of its development. Therefore, measurable and tactical efforts are needed to prevent investment in coal-fired power plants—especially captive power PLTUs—which are planned in several industrial areas such as Konawe, Weda Bay, Morowali and Obi Island as well as putting pressure on Chinese and Indonesian BRI companies to not continue with coal-fired power plants (See Table 1).

Contradictions Regarding China’s Commitment Not to Build Overseas Coal Power Plants

On September 21, 2021, President Xi Jinping announced to the United Nations General Assembly that China would stop building coal-fired power plants (PLTU) outside its territory. Before this announcement, China itself received a lot of global attention from the massive development of coal-fired power plants in developing countries which are included in the Belt and Road Initiative (BRI). This announcement was followed by a statement regarding China’s commitment to supporting developing countries in pursuing green and low carbon development. UN Secretary General Antonio Guterres welcomed China’s announcement, in which this step is believed to accelerate the process of cessation of coal use globally is the most important step to be able to achieve 1.5 degree goal in Paris Agreement.
<table>
<thead>
<tr>
<th>Areas</th>
<th>Power plants</th>
<th>Capacity (in MW)</th>
<th>Status</th>
<th>Developers</th>
<th>Sources of financing</th>
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<tbody>
<tr>
<td>VDNi Industrial Zone (Delong Nickel Industrial Area)</td>
<td>Delong Nickel Phase 1</td>
<td>530</td>
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<td>Jiangsu Delong Nickel Industry Co</td>
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<td></td>
<td>Delong Nickel Phase 2</td>
<td>300, 1,700</td>
<td>Shelved, Operating</td>
<td>Xiamen Xiangyu Group, Jiangsu Delong Nickel Industry Co</td>
<td>US$2.04 billion from 8 Chinese banks</td>
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<tr>
<td>Indonesia Morowali Industrial Park (IMIP)</td>
<td>Sulawesi Labota Power Station</td>
<td>1,140</td>
<td>Construction</td>
<td>Indonesia Tsingshan Stainless Steel Company, Eternal Tsingshan Group</td>
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<td></td>
<td></td>
<td>1,140</td>
<td>Pre-permit</td>
<td>Tsingshan Holding Group</td>
<td></td>
</tr>
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<td></td>
<td>Sulawesi Mining Power Station</td>
<td>1,680, 700, 380</td>
<td>Operating, Construction</td>
<td>Dingxin Group, Bintang Delapan, Huafeng Group, Eternal Tsingshan Group</td>
<td>US$1.8 billion from 4 banks in China</td>
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<tr>
<td>Areas</td>
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<td>Capacity (in MW)</td>
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<td>Supervise Industrial Park (Obi Island)</td>
<td>Xinxing Ductile Power Station</td>
<td>114, 130</td>
<td>Operating, Shelved</td>
<td>Xinxing Ductile Iron, Harita Group, Ningbo Lygend</td>
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<td>PT Halmahera Persada</td>
<td>60, 660, 1,520</td>
<td>Operating, Construction, Pre-permit</td>
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<td></td>
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<td></td>
<td>Lygend Nickel Smelter Power Station</td>
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<td>MSP Pulau Obi Power Station</td>
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<td>PT Megah Surya Pertiwi</td>
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<td>Qingdao, Indonesia</td>
<td>Qingdao Zhongsheng captive power station</td>
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<td>Operating, Pre-permit</td>
<td>Qingdao Xiyuan Holdings, Qingdao Urban Construction Investment (Group), Shandong Taishan Steel Group</td>
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<td>Comprehensive Industrial Park</td>
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<td>130</td>
<td>Construction</td>
<td>Wanxiang Steel Indonesia</td>
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<td>Pomalaa Nickel power station</td>
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<td>Operating</td>
<td>PT Aneka Tambang</td>
<td></td>
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<td></td>
<td>Amman Minerals power station</td>
<td>300</td>
<td>Construction</td>
<td>Amman Minerals, Nusa Tenggara</td>
<td></td>
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<tr>
<td></td>
<td>Nanshan Industrial Park power station</td>
<td>90, 60, 30, 2700</td>
<td>Operating, Construction, Pre-permit, Shelved</td>
<td>Global Aluminum International, Press Metal Aluminum Holdings Berhad, Mahkota Karya Utama, China Hongqiao Group, Harita Group</td>
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<tr>
<td></td>
<td>Ketapang Smelter power station</td>
<td>270</td>
<td>Operating</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Center for Research on Energy and Clean Air, 2022 (processed)

However, there was an announcement in December 2021 that Anhui Electric Power Construction Engineering, a subsidiary of China Energy Engineering Group (CEEG), had won an equipment supply contract for the expansion of a 3 x 380 MW coal captive power PLTU in Labota, Morowali, Central Sulawesi (Biaokezhan, 2021). This coal-fired power plant is a captive power plant associated with the steel and nickel processing industry in Indonesia Morowali Industrial Park (IMIP), a Belt Road Initiative (BRI) project supported by Tsingshan Holding Group.

In addition, Tianjin Electric Power Construction in February 2022 won the tender for a 4 x 380 MW coal captive power PLTU on Obi Island, South Halmahera Regency, North Maluku
(Seetao, 2022). The owner of this project is PT Halmahera Jaya Feronikel, a joint venture between Ningbo Lygend China and the Harita Group. Tianjin Electric Power Construction is a subsidiary of China Energy Engineering Corporation (CEEC). No project technicalities have been publicly confirmed, but an initial proposal signed in 2018 by Ningbo Lygend and Harita Group for the Obi Island park includes an allocation of 4.2 GW for a coal-fired power plant (Suarez, 2022).

The similar thing also happened in Weda Bay. In July 2022, Zhejiang Thermal Power Construction announced that it had won the contract to build a steel structure for a 380 MW coal-fired power plant to be built in the Indonesia Weda Bay Industrial Park (IWIP), Halmahera Regency, North Maluku (EJAtlas, 2022). Zhejiang Thermal Power Construction is a Chinese state-owned enterprise which is also a subsidiary of CEEC. This coal power plant was built for the benefit of a nickel smelter at IWIP which is managed by PT Indonesia Weda Bay Industrial Park. PT Indonesia Weda Bay Industrial Park itself is a joint venture of three Chinese conglomerates, namely Tsingshan Holding Group, Zhejiang Huayou Cobalt Co., and Zhenshi Holding Group.

According to the CEEC press release, this coal-fired power plant is the third 380 MW captive power power plant in IWIP which will be handled by Zhejiang Thermal Power Construction. Just three months earlier, the company won the procurement contract for the “No. 6 and No. 7”. This newest captive power PLTU is the No. 8. (ChinaPower, 2022)

IWIP is currently filled with a massive series of coal captive power PLTUs built for the ferronickel industry managed by PT Indonesia Weda Bay Industrial Park. As an industrial area that is registered as a National Vital Object (obvitalnas) by the Indonesian government, there is limited information and transparency regarding corporate activities carried out in the industrial area. There are at least two other PLTU clusters within the IWIP:

1) Clusters of 6 units of 250 MW PLTU and 5 units of 380 MW PLTU which were ordered to China City Environment Protection Engineering Limited Company (CCEPC) as the main EPC contractor.

2) Cluster of 8 units of 250 MW PLTU

The CEEC project does not appear to be part of the two clusters. There is no public information regarding which nickel smelter will use these new generating units, nor is it known with certainty regarding the existence and activities of generating unit No. 1 to No. 5 handled by CEEC.

This limitation of information and transparency is not limited to the Weda Bay Industrial Estate project. The lack of transparency in the captive power PLTU development activities was also found in other industrial areas such as Konawe, Morowali and Obi Island. According to a search conducted by the Center for Research on Energy and Clean Air (CREA), there are still many captive power coal powerplant developments that are currently in the planning and construction stages (See Table 1). All industrial areas where the captive power PLTU was built are registered as obvitalnas which are strictly guarded by security forces.

The continued development and even planning for the construction of a coal captive power PLTU in Indonesia by Chinese companies is a clear contradiction to the commitment announced by President Xi Jinping in September 2021. The closed attitude of these companies and the Indonesian government itself has also become a big question regarding the seriousness of China and Indonesia in achieving the environmental and climate missions that have been signed by the two countries such as the Paris Agreement and the target of carbon neutrality.
Contradiction of BRI Scheme and China’s Green BRI Development Commitment

The BRI Initiative is an initiation by the Chinese government as a diplomatic and economic strategy through investing in infrastructure funding in more than 150 countries. From 2013 to mid-2022, BRI initiatives have funded over US$932 billion (IDR 14,500 trillion) of projects, of which US$561 billion were construction contracts and US$371 billion were investments in the non-financial sector (Wang, 2022).

The massive investment and project funding provided by China has been positively welcomed by various leaders of BRI-projects-targeted countries, including Indonesia. But while this ambitious initiative has a mission to increase China’s bargaining power in geopolitical and economic influence, the environmental and social impacts arising from BRI projects have generated a lot of criticism and concern from countries that are now heavily tied to projects and funding by China.

The magnitude of criticism and concern over the impact of BRI threatening the environment and climate change led China to publish the “Guidance on Promoting Green Belt and Road” and the “Belt and Road Ecological Cooperation Plan” and Environmental Cooperation Plan” at the first Belt and Road Forum (BRF) held in May 2017. Both publications provide guidance for governments, financiers, developers, contractors, and non-governmental organizations (NGOs) China to assist and run BRI projects in a ‘green’ and sustainable manner.

According to this guide, Chinese investors and contractors under the BRI umbrella should strengthen and promote environmental sustainability to increase understanding and support with governments, companies and residents in host countries. In this regard, they were asked to share China’s experience in green development, enhancing capacity for environmental protection, and preventing environmental risks.

Chinese developers and contractors under this guide should also comply with host country laws, regulations, policies and procedural standards regarding environmental protection. Developers and contractors are also required to prioritize local aspirations regarding environmental protection. The guide explicitly asks Chinese developers and contractors to release annual reports on environmental management.

The Chinese government itself is also required to build and develop a support system for cooperation in environmental protection and prevention of risks of environmental damage. It is hoped that the Chinese government will prioritize infrastructure projects that enhance the capabilities of energy conservation, emission reduction and environmental protection. In providing support for the BRI project, the Chinese Government was asked to encourage the application of more advanced and environmentally friendly standards. Building a platform for communication, dialogue and information support is also part of the responsibility of the Chinese Government. As engagement with stakeholders, the Government of China also includes a commitment to support civil society organizations/NGOs in implementing various environmental protection projects.

As an important point of environmental and social impact assessment, in this guide the Chinese Government commits to:

1. Understand the ecological situation and relevant requirements for environmental protection in BRI project host countries and regions.
2. Identify areas that are sensitive and vulnerable to the environment.
3. Conduct integrated environmental impact assessment (AMDAL).
4. Strengthen cooperation on early warning and environmental emergencies.
5. Sharpen environmental risk prevention capabilities.
6. Strengthening environmental management in overseas investment and developing a sustainable financial system (green financing).
7. Provide consulting services for overseas projects regarding environmental risk assessment and prevention.

Even so, the existence of these two guidance documents has not been able to overcome many environmental problems that occur in BRI partner countries. According to Institute for Energy Economics and Financial Analysis (IEEFA) report in 2019, China has provided funding through BRI projects for more than a quarter of all new coal-fired power plants being developed outside China. A study of 13,427 Chinese-funded projects published by AidData found that more than a third of BRI projects experienced major implementation problems, such as corruption or environmental protests (Malik et al., 2021).

The push of world trends towards the urgency of climate change as well as practical political and economic considerations has made China increasingly committed to making BRI initiatives greener and more sustainable. In an analysis, the International Energy Agency warned that if the world hopes to achieve net zero emissions by 2050, which are essential to achieve the Paris Agreement targets, there must be no new investment in fossil fuel supply projects or coal-fired power plants. In April 2019, President Xi Jinping stated that BRI should embrace sustainability "to protect the common home we live in."

Thus, China has not been involved in coal-related investment or construction projects since 2020. Since September 2021, the Center for Research on Energy and Clean Air (CREA) found that around 12.8 gigawatts (15 power plants) of overseas coal projects China-backed has been suspended or cancelled. Even so, several new coal captive power PLTUs are still being announced in Indonesia in 2022 as described above.

China itself currently has a very high share of PLTU still operating until at least 2050, followed by other developing countries in Asia (See Figure 1). The large amount of capital that has not yet been returned is an obstacle in planning to retire the PLTU because investors must be willing to lose a value of approximately US$ 1 trillion which will decrease significantly (IEA, 2022). This gives an urgency for China to accelerate and seriously lead the transition out of the development of coal-fired power plants, including in destination countries for BRI initiatives such as Indonesia.
Nickel Industry Investment Flow in Konawe and Morowali

The VDNi Industrial Area in Morosi, Konawe Regency, Central Sulawesi, is managed by PT Virtue Dragon Nickel Industry Park (VDNIP). In the Virtue Dragon Nickel Industrial Park, there are three BRI companies operating, namely PT Virtue Dragon Nickel Industry (VDNI), PT Obsidian Stainless Steel (OSS) and Muara Sampara Port (PMS), which is a special port owned by PT VDNIP (Ministry of Industry, 2021). VDNi is a subsidiary of Jiangsu Delong Nickel Industry, while OSS is a subsidiary of the Jiangsu Delong joint venture with Xiamen Xiangyu Group (GlobalData, 2018). The VDNi nickel industry facility is categorized as a National Vital Object (Obvitas) in the mineral and coal sub-sector based on the Decree of the Minister of Energy and Mineral Resources and as a National Strategic Project based on Presidential Regulation no. 58 of 2017.

VDNIP is led by Zhu Mingdong alias Andrew Zhu. Zhu Mingdong is the son-in-law of Dai Guofang, the founder of Jiangsu Delong Nickel Industry. At its inception, VDNi received US$1 billion in funding from China First Heavy Industries to build a smelter, port and captive power PLTU. In the second phase, VDNIP will build 11 captive power PLTU units for PT OSS operations with a total capacity of 1,840 MW. This phase II construction received funding from the Bank of China (BOC), China Development Bank (CDB), China Construction Bank, ICBC, Agricultural Bank of China, CITIC bank, China Merchants Bank and Tai Fung Bank.

In 2019, as the third phase of the VDNIP investment, Jiangsu Delong established PT Gunbuster Nickel Industri (GNI) in Bunta Village, Petasia Timur District, North Morowali Regency, Central Sulawesi (Deha, 2021). Apart from the Bunta village, PT GNI is also taking plans for
operations in the Bungintimbe and Tanauqe villages. PT GNI has planned to build 12 captive power PLTU units in Bungintimbe Village with a total capacity of 2,295 MW. Until early 2022, the first unit of this captive power PLTU is already operating and 11 other units are still in the ongoing construction stage (Global Energy Monitor, 2022).

The Morowali Industrial Area in Bahodopi District, Morowali Regency, Central Sulawesi, is managed by PT Indonesia Morowali Industrial Park (IMIP). PT IMIP is a joint venture of Shanghai Decent Investment Group (a subsidiary of Tsingshan Holding Group), PT Bintang Delapan Group, and PT Sulawesi Mining Investment. PT Sulawesi Mining Investment (SMI) itself is a joint venture company between Shanghai Decent and Bintang Delapan that has been formed since 2009. In China, Tsingshan Holding Group is a competitor of Jiangsu Delong who manages VDNIP. IMIP has an area of 3,200 hectares which uses a captive power PLTU with a capacity of up to 1.26GW (Global Energy Monitor, 2022).

Tsingshan Holding Group has previously announced that it will not build new coal power plants overseas (Tsingshan, 2021). However, just weeks before this announcement, Tsingshan signed a contract with Energy China to build a 380 MW three-generator coal-fired power plant in Morowali (Just Finance International, 2021). Furthermore, the IMIP project receives funding support from development banks in China, including the China Development Bank (CDB), Export-Import Bank of China (Chexim), Industrial and Commercial Bank of China (ICBC), and Bank of China (BOC). International banks are also included in IMIP project funding, such as HSBC (Ginting & Moore, 2021).

The International Finance Corporation (IFC), a private sector agency of the World Bank, was indirectly involved in the investment in the IMIP project. IFC has invested US$100 million in the China–ASEAN Investment Cooperation Fund (CAF), an equity fund set up by the Export-Import Bank of China (Chexim). CAF investment fund holds a 24% stake in PT Sulawesi Mining Investment (SMI).

IMIP has a power plant of 1.9 GW, which is expected to grow to 2.9 GW in the coming years. From this amount, 1.26 GW comes from coal captive power PLTU. This captive power PLTU consumes around 6 million tons of coal annually. This capacity is expected to grow with the massive development of various factories at IMIP and additional projects related to the production of lithium-ion batteries. The coal captive power power plant in the area has received financing from the China Development Bank, Chexim, Bank of China, and ICBC.

The China Development Bank (CDB) is by far the largest funder of projects under IMIP, financing more than US$5 billion in projects, including two 300 MW coal captive power plants used in industrial parks. In addition, the Export-Import Bank of China (Chexim) has also confirmed its involvement in IMIP through a US$240 million financing for a captive power PLTU in the industrial area.
The massive role of Chinese SOEs in the development of captive power power plants in Indonesia raises big questions for the credibility of the Chinese capital market to market its bonds as green bonds. ICBC, in particular, is still heavily involved in the flow of PLTU investment in Konawe and Morowali even though in 2021 it has announced to immediately switch from PLTU funding (Nyabiage, 2021). China in July 2022 published the China Green Bond Principles which stated that all funding from bonds categorized as green bonds in China was 100% for green projects.

However, it turns out that the green bonds issued by Chinese State-owned Enterprises (SOEs) have not used the principles issued by the Green Bond Standards Committee. According to data from Bloomberg analyzed by IEEFA in Figure 2, green bonds issued by Chinese SOE account for 52% of the entire green bond market in China. This portion does not include China’s financial institutions SOEs.

The irony of coal-fired power plants in the Nickel and Aluminum Industry for Electric Vehicle Batteries

Apart from being a raw material for making stainless steel, nickel is also an important raw material for the manufacture of lithium-ion batteries. Lithium-ion batteries are used in a wide variety of modern electronic equipment, such as smartphones, laptops, drones, micro-robots, medical devices and, most importantly, electric vehicles. Electric vehicles have an exponential growth trend today. As shown in Figure 3, worldwide sales of Battery Electric Vehicle (BEV) electric cars in 2011 were 40,000 units, while sales of Plug-in Hybrid Electric Vehicle (PHEV) were only 9,100 units. In 2021, sales of BEVs will reach 4,700,000 units and PHEVs of 1,900,000 units. Besides electric cars, sales of electric buses in 2011 of 2,400 units have increased to 91,800 units in 2021. Electric trucks, which sold 200 units in 2011, in 2021 sales figures reached 14,200 units (IEA, 2022).
Figure 3. Worldwide Sales of Battery Electric Vehicle (BEV) and Plug-in Hybrid Electric Vehicle (PHEV) Types of Electric Cars in 2011–2021 (in Units)

Source: International Energy Agency, 2022

This sales is projected to increase in the future. According to the Global EV Outlook 2022 prepared by the IEA, sales of BEV and PHEV electric cars will reach 15.9 million units in 2025, and reach 27.7 million units in 2030. Overall, the electric vehicle industry is projected to grow 11 times in period of 2021 to 2030. This projection is based on the Stated Policies Scenario (STEPS), in which countries in the world are assumed to continue the climate commitments that have been agreed so far. This scenario projects that 20% of all vehicles (except 2 and 4 wheelers) will be electric vehicles in 2030. However, if countries in the world achieve the latest carbon emission targets, as in the COP26 declaration, thus, sales of electric vehicles will reach 60% of all vehicle sales in the world.

Indonesia itself has built a state-owned battery holding company called Indonesia Battery Corporation (IBC). This ambitious holding, which required an investment of IDR 238 trillion, was formed by four Indonesia SOEs: Mining and Industry Indonesia (Mind ID), PT Pertamina, PT Perusahaan Listrik Negara (PLN), and PT Aneka Tambang (Antam). IBC is targeted to have a production capacity of up to 140 GW in 2030, of which 50 GW of lithium-ion batteries produced by IBC is planned to be exported overseas. Currently, worldwide battery production capacity is around 871 GW.

There are several types of lithium-ion batteries. Two of the most widely used types today are lithium nickel cobalt aluminum oxide (NCA) and lithium nickel manganese cobalt oxide (NMC). Both are widely used for the needs of various electronic equipment and electric vehicles. Another type of battery that is also promising is lithium nickel oxide (LNO), which has a high capacity without the need for cobalt. Nearly all of today’s lithium-ion battery manufacturing, especially in electric vehicles, relies on nickel.

However, at the time when the whole world is racing to transition to electric vehicles to achieve carbon neutrality, there is irony in Indonesia when the nickel used in the electric vehicle...
value chain is processed using coal captive powerplants which have very high carbon emissions. Even more ironic, captive power PLTU are increasingly being built in line with the growing demand for electric vehicle batteries in Indonesia.

The three nickel industrial areas on Obi Island, Morowali and Weda Bay have plans to have 14 captive power PLTU with 71 turbines, which have a total of 12,579 MW of electrical power. This amount is more than double the 6,109 MW capacity that has been operational in early 2022 for the entire nickel industry in Indonesia (Morse, 2022). Although previously low grade nickel processed in Indonesia was intended for stainless steel production, the massive growth in demand for nickel has made Indonesia ambitious to build many High Pressure Acid Leach (HPAL) smelters that can produce class 1 nickel which can be used for electric vehicle batteries. Since 2020, Indonesia has planned to build at least six HPAL smelters in industrial areas (Ministry of Industry, 2022).

The nickel industry in Morowali has grown in the last 15 years in response to the high demand for nickel ore from Sulawesi for the production of stainless steel and, more recently, grade one nickel used to feed electric vehicle (EV) batteries. To anticipate this production expansion, the Morowali Industrial Estate which is managed by PT IMIP plans to add 3,470 MW of coal-fired electricity (Morse, 2022).

Not only nickel, the aluminum industry in Indonesia also experiences the same irony. Aluminum is required in some high-power lithium-ion batteries such as lithium nickel cobalt aluminum oxide (NCA), which is the most popular type of battery for electric vehicles. The aluminum industry in the Galang Batang Special Economic Zone (SEZ), Bintan Regency, Riau Islands, is also massively building captive power PLTU. Bintan Island has plans for 31 captive power PLTU with a capacity of up to 3,180 MW. Most of these captive power PLTU are owned by PT Bintan Alumina Indonesia (BAI) which has a planned capacity of 2,860 MW. The amount is almost similar to the capacity of coal-fired power plants throughout France. PT BAI itself is owned by Shandong Nanshan Aluminum, a subsidiary of the Nanshan Group conglomerate (Global Energy Monitor, 2022).

Environmental Losses from the Existence of Coal Captive Power Plants in Indonesia Industrial Estates

In addition to efforts in reducing Indonesia’s carbon emissions, which are still insufficient to achieve global climate targets, the main problem that also arises from direct captive power PLTU is air pollution. Apart from sulfur dioxide and nitrogen oxides, the captive power PLTU also emits coal ash which can be inhaled by workers and residents. This coal ash is spread by the wind to settlements in areas adjacent to industrial areas. This is very detrimental to the quality of life of residents because the particles are finer than beach sand and can be very dangerous if inhaled.

Coal dust is a serious problem that makes local residents fall victim to the health risks that arise. In Konawe, black particles from burning coal were observed to spread up to a distance of three kilometers outside of Konawe Regency (Saturi, 2020). At least residents of six villages in Motui District, North Konawe Regency, were affected by the coal dust irruption. The six villages that were recorded as suffering from coal particles from the captive power PLTU were Sama Subur, Wawoluri, Puuwonggjia, Ranombopulu, Motui and Lambuluo Villages.
Table 2. Number of Patients Based on Type of Disease at Bahodopi Health Center

<table>
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<tr>
<th>Type of Disease</th>
<th>2017 (April–December)</th>
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<td>1907</td>
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<td>Gastritis</td>
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<td>Diarrhea</td>
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<td>425</td>
</tr>
<tr>
<td>Rheumatism</td>
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<tr>
<td>Hypertension</td>
<td>237</td>
<td>260</td>
</tr>
<tr>
<td>Allergic Dermatitis</td>
<td>297</td>
<td>371</td>
</tr>
<tr>
<td>Pulmonary TB</td>
<td>162</td>
<td>148</td>
</tr>
<tr>
<td>Abdominal colic</td>
<td>82</td>
<td>85</td>
</tr>
<tr>
<td>Tonsillitis</td>
<td>63</td>
<td>61</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>55</td>
<td>72</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>4,191</strong></td>
<td><strong>4,892</strong></td>
</tr>
</tbody>
</table>

Source: Bahodopi District Health Center, 2019

In Morowali, local people are increasingly suffering from acute respiratory infections (ARI). Based on records from the Community Health Center (Puskesmas) in Bahodopi District (Table 2), the number of ARI sufferers in the sub-district increased from 1,907 in April-December 2017 to nearly 2,522 throughout 2018. Data from the IMIP clinic (Table 3) present similar thing to Konawe, which breathing health problems are the most common problems suffered than other complications.

Table 3. Number of Patients Based on Type of Disease at IMIP Clinic from January to August 2019

<table>
<thead>
<tr>
<th>Type of Disease</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Rhinitis</td>
<td>26,133</td>
</tr>
<tr>
<td>Gastroenteritis</td>
<td>8,136</td>
</tr>
<tr>
<td>myalgia</td>
<td>10,314</td>
</tr>
<tr>
<td>dyspepsia</td>
<td>9,931</td>
</tr>
<tr>
<td>Type of Disease</td>
<td>Number of Patients</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>cephalgia</td>
<td>5,324</td>
</tr>
<tr>
<td>Fever of unknown origin</td>
<td>6,413</td>
</tr>
<tr>
<td>Vulnus</td>
<td>5,347</td>
</tr>
<tr>
<td>Conjunctivitis</td>
<td>4,418</td>
</tr>
<tr>
<td>Dental caries</td>
<td>1829</td>
</tr>
<tr>
<td>Lower back pain</td>
<td>2,914</td>
</tr>
</tbody>
</table>

Source: Morowali District Health Office, 2019

The Environmental Management Plan (RKL) of companies at IMIP stated that Electrostatic Precipitators (ESP) are installed at coal-fired power plants and other supporting facilities to collect coal ash. Dust suppression control technology acts as a complement in special terminals. However, these devices proved to be ineffective in controlling the spread of pollutant particles to the surrounding area. Faced with complaints from residents, several companies decided to filter the coal ash using nets, which again turned out to be ineffective because the fine particles still passed through the large holes (Sangadji et al., 2019).

**Potential Financial Losses from Continuation of Coal Captive Power Plant Projects in Indonesia**

Trends in the direction of regulation and the rapid projected development of the economic value of renewable energy show that the benefits of developing coal-fired power plants in Indonesia are decreasing in age and are very risky to produce stranded assets. Stranded assets occur when assets that have been purchased and built become abandoned due to changes in the legal and economic landscape regarding the benefits of coal energy. This is happening all over the world, where the net present value of all losses from coal stranded assets globally is predicted to reach US$1.3–$2.3 trillion in 2050 (Chen et al., 2022). In achieving the target of carbon neutrality by 2050, coal stranded assets in Indonesia are expected to peak in 2045, with a total value of US$26 billion from 53GW of PLTU (IESR, Agora Energiewende & LUT University, 2021). This stranded value may increase if more coal power plants in Indonesia are built than planned until 2025. Stranded assets are inevitable considering that renewable energy will become increasingly cheaper than coal. In 2021, the cost of electricity from building solar photovoltaic (PV) power plants will already be cheaper than building new power plants. In 2028 the cost of electricity from PV will be cheaper than electricity generated from all PLTUs that have been built (Gray et al. et al., 2018).

According to a study by Carbon Tracker (2020), the cost of new coal fire power plants is already higher than that of renewable energy power plants in many BRI countries, including Indonesia, Pakistan, Bangladesh, Philippines, Vietnam, Malaysia and Turkey. In addition, a study conducted by the Guangzhou Institute of Energy Conversion found that the use of renewable energy in the form of solar panels in tourism areas has a lower levelized cost of electricity (LCOE) than traditional coal LCOE. The use of these rooftop solar panels has the potential to
generate 141.77 GWh of electricity, which means a reduction of 63,794 tons of coal and 119,083 tons of carbon dioxide equivalent every year.

The other side that will be a big problem for Indonesia is that the products produced from the value chain of industrial estates that use captive power PLTU will find it difficult to be accepted in the international market. The growing urgency for environmental sustainability in international markets has driven global value chains to have increasingly stringent compliance and traceability standards. The European Union in February 2022 has developed a new due diligence to ensure that global value chains are more compliant with the principles of sustainability (EU, 2022). In the future, products that have a high carbon footprint from dependence on PLTU or do not meet sustainability standards will find it increasingly difficult to be traded on the international market. This is disastrous for Indonesia which plans to use its nickel output in the electric battery value chain. The high carbon footprint and environmental problems attached to captive power power plants in Indonesia nickel industrial area will become obstacles for all product derivatives to be able to compete globally.

Construction of a coal-fired power plant brings significant losses in terms of cost of capital. Currently, many sources of funding come from sustainable financing that pays attention to environmental and social aspects. An example of a sustainable financing practice is the application of an Environmental, Social, and Governance (ESG) rating. Some of the reasons that make investors, especially institutional investors, adopt ESG assessments are (1) government policies, (2) the positive influence of companies that apply ESG on financial performance, and (3) the existence of organizations that provide assessment standards (Eccles et al., 2018). Companies that proactively distance themselves from value chains that are not environmentally friendly will benefit from ESG funding which has a lower cost of capital for the company. Conversely, companies that still depend on coal-fired power plants, or even build new power plants, will find it increasingly difficult to obtain funding. This causes companies that depend on coal-fired power plants to be less competitive than companies that are progressive in making energy transitions.

The attractiveness of ESG funding by investors is not limited to companies involved in PLTU construction, but also for Indonesia and China in general. Indonesia and China risk risking their reputations and credibility in energy transition efforts. Both China and Indonesia are still considered "highly insufficient" in tackling climate issues (Climate Action Tracker, 2022), in which the energy transition is an important factor for both countries to be able to increase their contribution in achieving global climate targets. Indonesia in particular will greatly benefit from funding that promotes the energy transition by global investors such as JETP (Just Energy Transition Partnership) and CIF (Climate Investment Funds) funding.

From western countries, green funds which provide exclusive investment for the development of renewable energy in developing countries are now very massive. The Green Climate Fund, for example, has funded US$11.3 billion for 176 green projects around the world. Indonesia has so far experienced many difficulties in obtaining green funds because it cannot demonstrate a commitment to sustainability in its business ecosystem. In order for Indonesia to be able to secure more investment at a time when the world is increasingly turning to renewable energy, leaving the construction of coal-fired power plants has become a necessity that cannot be postponed.
China itself is currently focusing a lot on renewable energy investment. According to data compiled by the Natural Resources Defense Council (NRDC), China has invested in the construction of renewable energy power plants not only in the BRI destination countries, but also in countries such as Australia and the United States. This is because Chinese investors have focused on investing in renewable energy markets that provide greater policy certainty for solar and wind development, whether through incentives such as the Renewable Portfolio Standard (RPS), tax cuts, or other policy measures. In contrast, China has channeled less investment in renewable energy in countries that do not offer clear policy initiatives to switch to renewable energy.

Developments in China have shown the magnitude of the losses and economic infeasibility of the continued use of coal-fired power plants. 40% of power plants in China operate at a loss, and this figure could increase to 95% by 2040 due to the cost of complying with regulations on air pollution and rising carbon prices (Carbon Tracker, 2018). ICBC, China's largest bank which is also one of the largest providers of funds in the BRI initiative, in 2021 has canceled US$3 billion funding for PLTU construction in Zimbabwe on the basis of environmental risk considerations (Ndlovu & Gwazzin, 2021). This is a similar basis for the cancellation of funding of US$1.2 billion for the construction of a PLTU in Lamu, Kenya in 2020 by ICBC (Reed, 2020).

Indonesia should do transition to renewable energy in industrial areas to capitalize on the ulterior potential of PLTU development. Research from the Institute for Essential Services Reform (IESR) shows that there are great opportunities for energy generation and energy storage in areas of Indonesia that have industrial estates. For example, in Southeast Sulawesi, there is high potential for 200 GW of solar power generation. West Kalimantan has nearly five times that potential value. Meanwhile, Central Sulawesi has the most potential capacity for pumped storage hydropower, in which water is pushed up hills using excess energy and released when needed. However, it should be noted that each IESR scenario explores technical potential, and this large capacity will require significant land-use trade-offs to realize this. These potentials can only be maximized if Indonesia leaves its dependency on coal-fired power plants.
It is clear that investment for renewable energy development in Indonesia currently has more profitable prospects, is economically feasible, and is very important for achieving the climate targets following the Paris Agreement. To achieve this energy transition and sustainable development, Indonesia needs investment assistance from various parties and this investment can only be made if Indonesia can demonstrate its commitment to moving away from coal. Development planning in Indonesia must be forward-looking, emphasizing renewable projects that will still be profitable over coal which can result in stranded assets and ecological damage.

**Green Industrial Estate Development Plan**

The government is preparing 30,000 hectares of land in North Kalimantan to build a green industrial area, where there is a potential of 434,000 megawatts of electricity generated from hydro, geothermal, wind and solar power (Ramadhan, 2022). A green industrial area is an area that applies clean technology without coal and treats waste properly in order to reduce the impact on the surrounding environment (Laksono, 2021). The development in the Tanah Kuning area is cooperating with investors from China and the United Arab Emirates (UAE). There are two criteria for the industry to be developed, namely being able to increase the added value of the existing wealth of raw materials and placing Indonesia in a key position in the future use of technology. The development of this area also carries the spirit of downstream mineral products so as to provide greater added value than exporting raw materials. The project, targeted for completion in 2024, is estimated to require funds of up to IDR 1,848 trillion and can absorb up to 100,000 workers (Lintas, 2022).

The industrial development of this green area needs to be guarded so that it is truly in accordance with its initial goals and enthusiasm, especially regarding the use of power plants. There is concern about the development of industrial estates with power plants that are still using coal can have a negative impact, in the Malinau area for instance. In this area there is a small industrial area in the village with several business sectors such as processing forest products, handicrafts, and aquaculture (Riyanto, 2022).

However, there was a case that the coal waste processing embankment in Malinau had burst and polluted the riverbanks (Fawdi, 2022). Indeed, this disrupts the supply of clean water for some residents of Malinau Regency and makes it impossible for it to be processed into drinking water. The Kaltim Putra Utama Coal Company (KPUC) is required to replace all losses such as dead fish and making early snacks on broken embankments (Syahni, 2021). In addition, companies are also given sanctions of up to IDR 11.39 billion, although they don’t have to be closed down or have their company license revoked. Based on the information on the negative impact of coal, therefore, for industrial areas in Indonesia it is best to utilize environmentally clean energy.

Industrial estates require large and concentrated energy, but it is not easy to supply energy stably (Tang et al., 2018). In North Borneo green industrial area has been identified two primary sources of renewable energy, namely hydropower and solar panels with a power of 10 gigawatts each (Wahyudi, 2022). Investment up to 12 October 2022 has reached US$80 billion or IDR 1,121.9 trillion. It is hoped that this industrial area will also be one of the efforts to build an electric vehicle ecosystem by producing battery technology for 3 million electric cars by 2028.
Presidential Regulation 112 of 2022 Still Permits the Development of Coal Power Plants

The Indonesian government has actually shown its initiative to stop the construction of coal-fired power plants. On September 13, 2022, the government released Presidential Regulation (Perpres) Number 112 of 2022 concerning the Acceleration of Renewable Energy Development for the Provision of Electricity. Even though the purpose of this Presidential Decree is to accelerate Renewable Energy, the contents of the Presidential Decree actually raise various problems that are contradictory to efforts to achieve the Net Zero Emission target by 2060.

Article 3 paragraph 4 of Presidential Regulation 112/2022 provides space for the development of new PLTUs and operates until 2050 as long as they are “integrated with industries that are built orientated to increase the added value of natural resources or are included in National Strategic Projects that have a major contribution to job creation and and/or national economic growth”. This is irrational considering that until 2030 alone, Indonesia has made a commitment to reduce greenhouse gas emissions by 31.89% on its own and 43.2% with international support. Based on the analysis of the International Energy Agency, the world net zero emission target in 2050 can only be achieved if there is no new investment in coal-fired power projects.

Instead of helping Indonesia to achieve the energy transition and meet the carbon neutrality target, this Perpres has the potential to make Indonesia further away from the climate commitments that have been set. The planned construction of 13,819 MW of coal-fired power plants implemented in PLN’s Electricity Supply Business Plan (RUPTL) alone will add 82 million tons of greenhouse gas emissions per year (Greenpeace Indonesia, 2021). This makes it even more difficult for Indonesia to fulfill its Paris Agreement commitments. Currently, Indonesia’s Nationally Determined Contribution (NDC) of 314 million tons of CO₂ is still considered very insufficient. The Climate Action Tracker (2022) classifies this commitment as “critically insufficient” which if continued will contribute to a temperature rise of 4°C+.
Conclusion

There are several points of conclusion drawn from the study above.

1. Indonesia still has various captive power PLTU development projects in industrial areas within the framework of China’s Belt and Road Initiative (BRI) cooperation. This is contrary to the Chinese Government’s own commitment which was announced by President Xi Jinping on September 21, 2021 which stated that China would stop building coal power plants outside its territory.

2. Cooperation projects under the auspices of the BRI initiative by China should follow the guidelines for sustainable development contained in the "Guidelines for Promoting Green Belt and Road" and the "Belt and Road Ecological and Environmental Cooperation Plan.

3. There is an irony when the nickel and aluminum obtained from industrial areas in Indonesia are used in the supply chain of 'green' industries such as batteries for electric vehicles, but the nickel and aluminum are processed through coal power plants which are increasing in number. The increasing world demand for Nickel and Aluminum, the more massive the construction of coal-fired captive power PLTUs in Indonesia.

4. The losses that Indonesia must suffer by continuing the development of coal-fired power plants are not only limited to environmental and health impacts, but also the economic and investment potential that is increasingly pro-state that can provide a sustainable economic ecosystem away from coal.

5. Presidential Regulation 112 of 2022 in fact still provides a gap for the construction of PLTU which is contrary to Indonesia’s commitment to achieve the target of greenhouse gas emissions. Weak Indonesian regulations to be able to provide certainty of commitment to the energy transition will have an impact on investor distrust to invest in Indonesia.

Recommendation

Several recommendations related to the massive captive power PLTU construction can be conveyed as follows:

1. The captive power PLTU development project originating from Belt and Road Initiative funding in Indonesia must be stopped immediately because it is not in accordance with China’s commitment to stop captive power PLTU construction since September 2021. The continued development and use of coal PLTU in Indonesia will have a negative impact on the economy, the environment, and social.

2. Chinese investors and investors from other countries need to announce a moratorium on the construction of coal-fired power plants in Indonesian industrial areas to support the climate commitments of each investor’s country, as well as to show their proactiveness in supporting a sustainable industry.

3. Indonesia must immediately make an energy transition from coal to renewable energy to achieve its carbon neutrality target. Accelerating the energy transition is a crucial thing that will have a positive impact on the Indonesian economy and environment because the economic potential of investment and Indonesia’s natural resources is very high. This must be demonstrated by re-evaluating Presidential Decree 112 of 2022 which still has several articles that conflict with the goals of the energy transition.
4. The Indonesian government must immediately formulate a scheme that increases the share of renewable energy generators in industrial areas and provides incentives for investors and industrial estate management companies to build renewable energy generators.

5. To be able to achieve this energy transition, the government and investors must reject efforts to co-firing and coal gasification because they are not in accordance with the goals of carbon neutrality and the principle of sustainability.

6. The Indonesian government must impose a carbon tax on power plants in industrial areas and prevent various tax and non-tax incentives for companies in industrial areas that still rely on coal power plants.
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