

The Influence of International Knowledge Structure in Indonesia's Nickel Downstream Policy

Nabillah Audia Putri Utami

International Relations, Faculty of Social and Political Sciences, Universitas Indonesia

*Corresponding Author

Email: Nabillahaudia.pu@gmail.com

Abstract

Indonesia introduced a controversial nickel downstreaming policy in 2020 despite limited technological and managerial capacities, triggering both domestic concerns and international disputes, including with the European Union at the World Trade Organization. This article examines the factors underlying the emergence of this policy, focusing on the role of the international knowledge structure. This study employs a qualitative approach using document-based analysis of secondary data from official reports, government publications, and digital sources. Through an interpretive framework, the concept of international knowledge structure is used as a sensitizing lens to analyze how global knowledge dynamics shape state behavior. The findings show that the international knowledge structure indirectly influences economic policy by generating new industrial demands through technological development and innovation. In this case, the growing global demand for electric vehicles creates opportunities for resource-rich countries like Indonesia to leverage nickel in global value chains. This article concludes that the international knowledge structure plays a significant role in shaping policy direction and provides strategic opportunities for developing countries to pursue economic upgrading. The study highlights the importance of aligning national strategies with global knowledge dynamics.

Keywords: *International knowledge structure, Indonesia, Nickel, Downstream*

INTRODUCTION

Indonesia is one of the countries with great economic potential. From the proportion of human resources, Indonesia has a population of 279.97 million people with about 60% of them being in the productive age group. On the one hand, Indonesia also has very rich natural resources. Indonesia is a country with the largest nickel reserves in the world with an estimated accumulation of 50% of the global reserves. Indonesia also has other important minerals such as tin, bauxite, gold, and copper. Indonesia is also a producer of agricultural resources from various products such as palm oil, rubber, cocoa, coffee, rice, and spices with value (Statista, 2024)(Statista, 2024)gross production in 2021 it amounted to \$US 106.54 million. This makes Indonesia one of the largest agricultural countries in the world. Apart from its wealth of natural resources, Indonesia also has a strategic geographical location; namely located in Southeast Asia which is the geographic center of the Indo-Pacific. The Indo-Pacific itself is a large economic region that accounts for 60% of the contribution to global growth, with 25% of maritime trade crossing the Strait of Malacca (German Federal Foreign Office, 2023) and where one-third of global trade flows take place (Jochheim & Lobo, 2023). Being in the geographical center of this strategic area and having large resources is certainly advantageous for Indonesia.(Statista, 2023)

However, in the midst of this potential, Indonesia still cannot get out of the level of a developing country to a developed country. This can be seen from Indonesia, which still relies on the agricultural sector as the main support of its entire economy. This can be seen from the large contribution of the agriculture and other natural sectors to GDP, which is Rp 2.43 quadrillion, this is very far compared to the manufacturing sector which contributes Rp 3,591 trillion. The agricultural sector also absorbs the largest number of workers in Indonesia, reaching 39 million people. On the one hand, a country can be said to be economically advanced if its industry and economy are diversified into many well-developed sectors. In 2023, the contribution of the agricultural sector to GDP has decreased due to Indonesia's policy of switching to

industrialization. This cannot be said to be entirely good, because even though it is developing other sectors, it is hoped that the previous sector will not need to experience setbacks. (Statista, 2023) (Statista, 2023)(Statista, 2024)(Statista, 2023)

In the midst of these conditions, Indonesia still aspires to level up and dares to make controversial policies, namely downstreaming, especially regarding nickel resources. The downstream policy has actually existed since 2009 when Law 4/2009 was issued which requires mining companies to increase the economic value of mining products before exporting. The law also issued a policy that requires the reduction of foreign investors' shares in Indonesian mining companies. In 2014, the government again issued a stricter policy on nickel resources by banning the export of nickel ore even though it is not mandatory to build (Chryshna, 2023) (Chryshna, 2023)Smelter (Chryshna, 2023). The last policy that was officially implemented in January 2020 was the ban on the export of nickel ore with a level below 1.7% through Presidential Regulation Number 55 of 2019 concerning the Acceleration of the Battery-Based Electric Motor Vehicle Program issued in August 2019.(Chryshna, 2023)

This policy is considered quite bold considering Indonesia's low capabilities in terms of human resources and technology. In 2024, the score *Human Development Index* (HDI) Indonesia ranks 112th out of 193 countries. HDI itself describes the accumulation of values from the dimensions of health, education, and living standards. Although this value has increased significantly by 35.6% since 1990, it still shows a low level of competitiveness. On the other hand, in terms of technological capabilities and capacity, Indonesia is ranked 85th in 2023 out of 166 countries. The ranking even decreased 3 levels from 2021 based on the value of (UNDP, 2024) (UNDP, 2024)Frontier technologies readiness index (UNCTAD, 2023). The index measures the accumulation of capabilities in terms of technological infrastructure, innovation capabilities, skilled human resources in the technology, science, and engineering sectors, policies and regulations, business and investment environment, and the use of technology in the community's economy.(UNCTAD, 2023)

In the midst of these conditions, Indonesia then looked for a way by opening up investment and international cooperation to overcome its shortcomings. This can be seen from the data on the increase in investment value in the downstream sector which reached IDR 375.4 trillion in 2023, with the largest flow in the mineral sector of IDR 216.87 trillion. Investment for the construction of nickel smelters is the largest, namely IDR 136.6 trillion, then copper smelters of IDR 70.5 trillion, and bauxite of IDR 9.7 trillion. Investment in the electric vehicle ecosystem sector, which is also a series of nickel downstream policies, reached IDR 9.7 trillion, although it is not the largest but shows positive conditions. Currently, investors from China are the most in the nickel sector, where 137 out of 248 (Annur, 2024)(Annur, 2024)(Annur, 2024)Smelter in Indonesia comes from China. This investment is expected to help Indonesia develop the nickel industry.

Seeing this, there are many pro and con views on this policy. The pro view sees that Indonesia has done the right thing if you see quite satisfactory results. This can be seen from the increase in nickel commodity exports which reached \$US 14.53 billion and the total trade balance of upstream, intermediate, and downstream nickel products also experienced a surplus of up to \$US 13.76 billion in 2022. This is also accompanied by the growth of the industrial ecosystem (Coordinating Ministry for the Economy, 2023) *Stainless Steel* (Kemenko Perekonomian, 2023)which illustrates the magnitude of the impact of this downstream. On the one hand, the view of the counter is that Indonesia is increasingly dependent due to existing foreign investment. This is seen from facts such as the large control of Tsinghsan's shares in PT Indonesia Morowali Industrial Park (IMIP) which indirectly reaches 66.25%. On the one hand, in 2023, Tsinghsan also indirectly controls 46% of PT IWIP's shares and the other 6% is held by a Chinese manufacturer, namely Contemporary Amperex Technology. A number of other companies such as Zhenshi Holding Group and Huayou Holding Group each hold 24% of shares indirectly. This

amount of foreign investor control can of course be dangerous if the investor's country of origin experiences economic instability.(Singgih, 2024)(Singgih, 2024)(Singgih, 2024)

If referring to a number of previous studies, articles that discuss mining policies have indeed focused a lot on environmental and social issues. Some of them are those written by Kathryn Robinson in 1985 regarding the impact of nickel mining which has adverse consequences on public health in Indonesia. These adverse impacts are mainly in terms of water and sanitation, nutrition, and health services. The article explains that health problems arise due to national development strategies that are too dependent on private investment and infrastructure. In addition to environmental issues, other articles also discuss the bad social impacts of mining investments as Gordon and Webber wrote in 2008. Both raise the problem created by Canadian mining companies in Latin America using David Harvey's framework of thought (Robinson, 1985) (Robinson, 1985)*accumulation by dispossession*. (Gordon & Webber, 2008)The Canadian company was found to have committed violence against the lives of indigenous people until resistance arose against the company. An article discussing similar resistance was also written by Sarangi in 2004 by taking the case of India. In addition to environmental issues, there is also an article that discusses the strategies of multinational companies that place developing countries as their production sites.(Gordon & Webber, 2008)(Bradbury, 1985)

Based on a number of previous articles, it is still difficult to find articles that focus on discussing the factors that shape the country's decision to open up opportunities for foreign investment through downstream programs. Most articles focus on the impact, especially the adverse impact of these policies. Indonesia itself in its mining policy, especially nickel, made a bold decision, because it carried out downstream in the midst of many shortcomings. This case is quite unique when compared to the case of mining issues in other developing countries that do have operating permits for the exploitation of raw materials. Indonesia in this case includes making breakthroughs among other developing countries.

The author also finds it necessary to look at another point of view that is rarely discussed in the study of political economy and mining issues in socio-political studies, namely the role of international knowledge structures in determining the behavior of countries and other international actors. Previous studies have emphasized that global knowledge flows, technological development, and innovation significantly influence state strategies and economic decision-making (Balaam & Dillman, 2014) (Strange, 1994) (Amsden, 1991) (Simmons, Dobbin, & Garrett, 2006). This is important because the development of science, technology, and innovation is a phenomenon that is inseparable from the current period that has a major role in the development of the world's political economy. Ignoring this is the same as ignoring the most influential things for human life today. Therefore, this article will dissect how the structure of international knowledge plays a role in determining Indonesia's bold attitude. This analysis is aimed at clarifying the flow of the model of the influence of international knowledge structures on state behavior.

The main argument of this study is that the structure of international knowledge has indirectly influenced the behavior of countries in making their economic decisions through the existence of opportunities for free markets and technology and innovation transfer to increase their economic growth. To develop this argument, the study first examines the components of international knowledge structures, including information flows, technological development, and global innovation (Balaam & Dillman, 2014) (Skare & Soriano, 2021) (Costantini & liberati, 2014). To arrive at this argument, this study first dissects the conditions of international knowledge structures consisting of information flows, technological developments, and global innovations; then look at the connections between each of these elements and define the main actors and players. The analysis is then continued by defining the flow of these three elements to global economic and market conditions and their influence on the behavior of developing countries.

This research is then expected to clarify the important role of international knowledge structures and the opportunities it creates, especially for developing countries that want to progress. This research is also expected to help policymakers see the opportunities that exist.

RESEARCH METHODS

This research will use a qualitative approach, which is an approach that is more focused on words than numbers (Bryman, 2012). The cumulative approach has three main characteristics that distinguish it from the practice of quantitative approaches; *first*, qualitative research tends to be inductive, namely trying to build theories instead of testing theories; *second*, epistemologically, this approach is carried out with an interpretivist approach which is an attempt to understand the world through the interpretation of the researcher; *third*, ontologically this approach understands social property as a result of construction and not a phenomenon that is born by itself (Bryman, 2012). Therefore, this approach is appropriate to understand the downstream phenomenon which is seen not as a natural result but to understand the construction factors behind it.

This study uses secondary data sources taken from a variety of official internet sites such as Statista and government websites, a number of official report documents, and electronic magazines and digital news. This research thus conducts document study data collection techniques.

In the qualitative approach, there are various research methods such as ethnography, interviews, *focus group discussions*, and discourse analysis; however, this research will use the method of interpreting texts and documents (Bryman, 2012). To conduct this analysis in a qualitative approach, a conceptual framework is used instead of theory. This conceptual framework is not used as a tool that limits the analysis with its definitions and dimensions, but to provide general guidance on what to look for and help uncover existing phenomena as a stepping stone (Bryman, 2012). This is called the concept of *sensitizing* which is different from the definitive concept in quantitative research. In this article, the concept of international knowledge structure will be used to see the details of phenomena and flows that occur to affect state behavior, which then helps the formation of the final model of research based on the liberal economic paradigm.

RESULTS AND DISCUSSION

Result

The role of global information flows in energy transition campaigns

Environmental issues have long been a concern of the international community. The Stockholm Declarations (1972) and Rio (1992) are some of the earliest evidences of the global community's concern for this issue. Long before that, this awareness was built on the foundation of a number of previous studies that found the greenhouse effect (1824), the effect of CO₂ emissions on global warming (1896), and the increase in CO₂ concentrations in the atmosphere (1950). The concern of the international community continued until its formation (Handl, 2012) Intergovernmental Panel on Climate Change (IPCC) by the United Nations and the World Meteorological Organization (WMO), to assess scientific information related to climate change in 1988. (IPCC, 1988)

This concern for the environment continued until the importance of making an energy transition was realized. In 1970, the oil crisis hit the world due to the Yom-Kippur war in 1973 and the Iranian revolution in 1979. This triggered the awareness of industrial countries about

their dependence on oil energy which would be detrimental to them in the event of a crisis. In that year, interest in research and development of renewable energy also began to emerge such as seawater wave power, wind, and solar. During this period, the Earth conference in Rio in 1992 also voiced the importance of the energy transition. Furthermore, in the 2000s, global campaigns continued through other media such as films (Energy Education, 2024)(CorPower Ocean, 2024)*An Inconvenient Truth* which invites governments and the private sector to increase renewable energy investment. It also shows the involvement of other groups such as creative industry players in the global knowledge structure that accelerates the process of disseminating information. In 2015, *Paris Agreement* was created to again encourage countries to accelerate their respective energy transitions. In the same year, the call to adopt the Sustainable Development Goals (SDGs) to achieve sustainable development, including the clean energy transition was also echoed and adopted by all UN member states.

The magnitude of the global campaign carried out by various parties also has an impact on the creation of a number of new policies in each country and region. Taking an example, ASEAN has made a number of efforts since this issue was first raised, such as the establishment of the ASEAN Sub-regional Environment Programme (ASEP) to increase cooperation in the environmental field in 1981 and the ASEAN Declaration on the Environment in 1985. A number of new efforts in recent years are the creation of the ASEAN Plan of Action for Energy Cooperation (APAEC) 2010-2015 which includes cooperation in the field of renewable energy and energy efficiency in 2010 and the ASEAN Regional Action Plan for Combating Marine Debris for the period 2021-2025. (ASEAN Centre for Energy, 2010)(ASEAN Secretariat, 2021)

This article presents a brief history of energy transition campaigns carried out by various international actors to show the important role of scientific research supported by the rapid flow of information and globalization in promoting an issue. And this is in fact able to move every actor in the international structure. This in the next section will also be explained has influenced the creation of new technologies that help economic growth.

Global technological developments: efforts to tackle climate change

After a global campaign on the importance of stopping climate change and the energy transition is getting bigger, a number of international actors have begun to develop various technologies to address this. One of the emerging technologies is biodiesel. This technology allows the use of oil energy sources that do not rely entirely on petroleum but can be blended from vegetable oils. This technology will reduce vehicle pollution compared to vehicles that use petroleum entirely as a fuel. In 1991 Austria became the first country to adopt the standard for biodiesel for commercial use. Subsequently, a number of other countries such as the United States and European countries also began to adopt policies supporting the production and use of biodiesel. In 2009 the European Union (Gerpen, 2024) (Gerpen, 2024)(Gerpen, 2024)The European Union adopts *Directive on Renewable Energy (RED)*, which sets targets for the use of renewable energy including biodiesel. (European Union, 2009)

Another unique technology that is also present to address climate and energy issues is the offshore carbon capture and storage (CCS) project in Sleipner, Norway in 2008. Then came the technology (Hauber, 2023)lithium-ion batteries and solid-state batteries. This invention of these batteries contributes to the energy transition through their ability to override energy with higher capacities; for example, lithium-ion batteries are used to store energy from renewable sources such as solar and wind and a number of medical devices such as pacemakers. In its development, these batteries played a huge role in the creation of electric vehicle innovations to reduce pollution and energy transition.

Global innovation: the electric vehicle industry and the global economy

In recent years, the involvement of global corporations in the mission to reduce global warming and support the energy transition has also begun to be seen in the emergence of innovations to make electric vehicles that emit zero emissions. The popularity of these electric

vehicles increased in 2008 after Tesla Inc. led the electric vehicle revolution with the launch of the Tesla Roadster on the world market.(Tesla, 2010)

As the thesis of liberals who believe that free trade stimulates industrial growth, encourages innovation, and increases production; we can see this in the case of the electric vehicle industry. The competitive conditions in the motor vehicle market since the presence of Tesla have triggered competitors to create technological innovations so as not to lose to global competition. Since the release of its first car in 2008, senior automotive companies such as Chevrolet have also started producing their electric cars and introduced a new product in 2010 called the Volt, and continued to develop its electric car technology in 2016 by making the Chevrolet Bolt with a range of more than 200 miles. Other companies such as Nissan also released its electric vehicle product in 2010 called the Nissan Leaf; unlike Tesla which produced the Roadster in minimal quantities, Nissan produced the Leaf in mass quantities and sold it worldwide so that it became the best-selling electric vehicle in the world. In addition, BMW also decided to enter the electric vehicle market in the 2010s by releasing the i3 in 2013 and i8 in 2014. Other western companies that are also included in this industry are Volkswagen and Rivian. On the one hand, vehicle manufacturers from the Asian continent also do not want to be left behind. The Chinese company BYD is also the largest EV producer in the world by producing various types of electric vehicles from buses, to electric trucks. Then Hyundai, a company from South Korea, also launched the Hyundai Kona Electric in 2018 after previously introducing the Hyundai Ioniq Electric in 2016. (Voelcker, 2019)(Nissan Global, 2020)

Thanks to the emergence of massive global innovations in the motor vehicle industry, currently electric vehicle users have increased. In 2023, the estimated sales of plug-in electric vehicles worldwide have reached 13.7 million units. On the one hand, the market size for this industry is also increasing, which in 2023 will reach \$US 561.3 billion and is expected to continue to grow to \$US 906.7 billion in 2028. In 2022, a number of countries with the largest expenditure on electric vehicles are occupied by China which has spent \$US 23 billion, Europe \$US 16 billion, and the United States \$US 2 billion. On the one hand, in terms of government spending in terms of subsidies for electric vehicles, Norway is the country with the highest subsidy value, reaching \$US 20,360. In second and third place are Singapore and the United States. China itself is in the 8th largest subsidy provider. The increase in public demand and the amount of government support for the electricity industry then created a new urgent need for manufacturing raw materials. One of the main elements that is urgently needed is electric batteries that require nickel raw materials. (Statista, 2024)(Statista, 2024)(Statista, 2023)

Discussion

Opportunities for developing countries: an example of the case of Indonesia

Developing countries such as Indonesia are mostly based on the strength of natural resources to support the economy. Seeing this, of course, taking advantage of the main potential that it already has is the first form of opportunity that can be taken. In the case of Indonesia, the global market needs of the increasing market for the electric vehicle industry are in line with its ability in terms of nickel resources. Seeing this opportunity, Indonesia certainly took the best steps to take advantage of it. However, the uniqueness of this step is that it seeks to go further than just selling ore or raw materials even though it has been opposed by many European countries and lost in a court at the WTO. If, referring to the thesis of international knowledge structures, the reason behind Indonesia's behavior is due to the efforts of developing countries that are trying to catch up and do not hesitate to oppose common norms that are no longer fair and profitable. The author himself sees that the reason behind this behavior is because Indonesia has long been open to the flow of information and global knowledge, this has indirectly educated Indonesia to see opportunities and options for other forms of policy.

The author also argues that the level of technological ability plays a role in this. Because knowledge and information itself are not spared from the use of technology. This is seen from

comparing Indonesia with the Philippines, which is the second country in ASEAN with the largest nickel reserves, but its policies and behaviors take advantage of different situations. This is because the structure of technology development, especially in education, is different. This can be seen from the data that during the pandemic and its recovery, Indonesia was the country with the highest online access capability for its students in ASEAN, which was up to the range of 79%-80%. This is very inversely proportional to the condition in the Philippines where only 21% of students can access online schools.(UNDP, 2022)

The second opportunity created from the existence of this international knowledge structure is through Indonesia's openness to the free market. Indonesia sees investment as an opportunity for technology transfer. This can be seen from a number of Indonesian foreign cooperation that emphasizes the construction of smelters and furthermore that Indonesia also has the ambition to attract investment in efforts to develop the domestic electric car industry. If referring to the thesis of international knowledge structure, Indonesia's efforts are a form of state policy to be able to have "the ability to control knowledge in the field of production, create, and finance, as well as market new products, as well as those who master the distribution of knowledge-based goods and services".

CONCLUSION

This study concludes the model of the influence of international knowledge structures on downstream policies as follows:

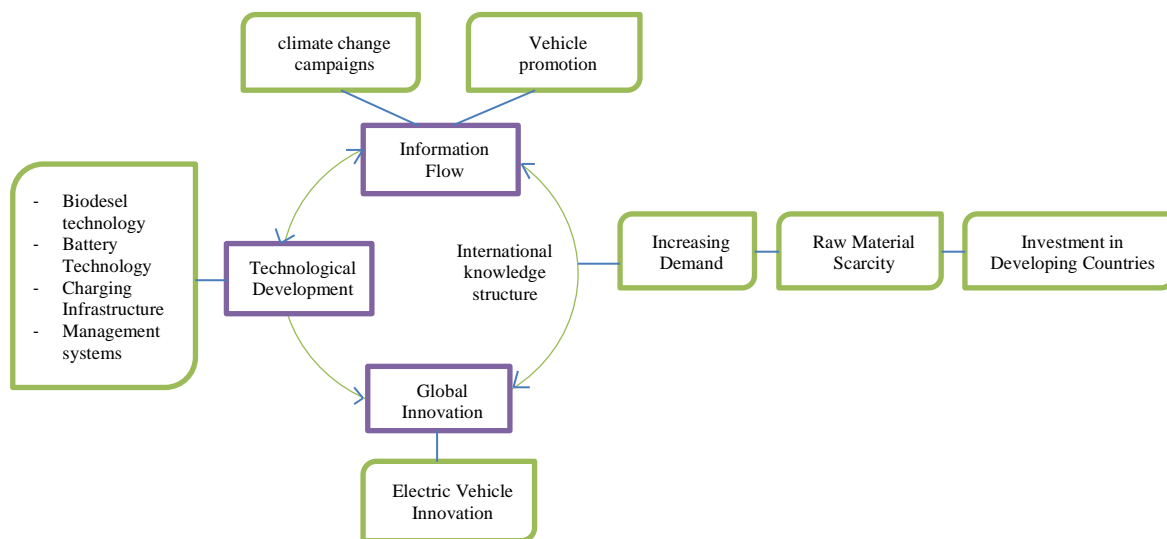


Figure1. Model of the Influence of International Knowledge Structures on State Policies
Source: created by researcher

Based on the previous presentation, this article draws the conclusion that the structure of international knowledge has indirectly influenced the behavior of countries in making their economic decisions through the dissemination of information flows, technological developments, and global innovations. These three things then create new needs whose sources can be met by developing countries. In the case raised in this article, there is a new need for the electric vehicle industry that requires mineral resources in its production. This opportunity can only be created from developments in terms of international knowledge structures.

REFERENCES

- Annur, C. M. (2024, Januari 25). *Ekonomi makro: Investasi Hilirisasi 2023 Tembus Rp375 Triliun, Terbesar untuk Smelter Mineral*. Retrieved from databoks: <https://databoks.katadata.co.id/datapublish/2024/01/25/investasi-hilirisasi-2023-tembus-rp375-triliun-terbesar-untuk-smelter-mineral>
- ASEAN Centre for Energy. (2010). *ASEAN Plan of Action for Energy Cooperation (APAEC) 2016-2025 Phase II: 2021-2025*. Retrieved from ASEAN: <https://asean.org/book/asean-plan-of-action-for-energy-cooperation-apaec-2016-2025-phase-ii-2021-2025/>
- ASEAN Secretariat. (2021). *ASEAN Regional Action Plan for Combating Marine Debris in the ASEAN Member States (2021 – 2025)*. Retrieved from ASEAN: <https://asean.org/book/asean-regional-action-plan-for-combating-marine-debris-in-the-asean-member-states-2021-2025-2/>
- Bradbury, J. H. (1985). International Movements and Crises in Resource Oriented Companies: The Case of Inco in The Nickel Sector. *Economic Geography*, 61(2), 129-143.
- Chryshna, M. (2023, Maret 31). *Industri Nikel Indonesia: Sejarah, Produksi, Kebijakan, dan Tantangan*. Retrieved from Kompas Pedia: <https://kompaspedia.kompas.id/baca/paparan-topik/industri-nikel-indonesia-sejarah-produksi-kebijakan-dan-tantangan>
- CorPower Ocean. (2024). *An overview of wave energy*. Retrieved from CorPower Ocean: <https://corpowersocean.com/a-short-history-of-wave-energy/>
- Energy Education. (2024). *Oil crisis of the 1970s*. Retrieved from Energy Education: https://energyeducation.ca/encyclopedia/Oil_crisis_of_the_1970s
- European Union. (2009). *Energy, Climate Change, Environment*. Retrieved from European Union: https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-directive_en
- Gerpen, J. V. (2024). *History of Biodiesel*. Retrieved from Farm Energy: <https://farm-energy.extension.org/history-of-biodiesel/>
- Gordon, T., & Webber, R. J. (2008). Imperialism and Resistance: Canadian Mining Companies in Latin America. *Third World Quarterly*, 29(1), 63-87.
- Handl, G. (2012, Mei). *Deklarasi Konferensi PBB tentang Lingkungan Hidup Manusia dan Deklarasi Rio tentang Lingkungan Hidup dan Pembangunan*. Retrieved from Audiovisual Library of International Law: <https://legal.un.org/avl/ha/dunche/dunche.html>
- Hauber, G. (2023, Juni 14). *Norway's carbon capture and storage projects augur geological risks in global aspirations to bury carbon dioxide*. Retrieved from Institute for Energy Economics and Financial Analysis: <https://ieefa.org/articles/norways-carbon-capture-and-storage-projects-augur-geological-risks-global-aspirations-bury>
- IPCC. (1988). *About the IPCC*. Retrieved from IPCC: <https://www.ipcc.ch/about/>
- Kemenko Perekonomian. (2023, Oktober 10). *Siaran Pers: Menko Airlangga: Indonesia Bertekad Menjadi Global Key Player Industri Hilirisasi Berbasis Komoditas*. Retrieved from kementerian Koordinator Bidang Perekonomian Republik Indonesia: <https://www.ekon.go.id/publikasi/detail/5420/menko-airlangga-indonesia-bertekad-menjadi-global-key-player-industri-hilirisasi-berbasis-komoditas>

- Nissan Global. (2020, Desember 4). *A decade of innovation – the LEAF’s incredible journey*. Retrieved from Nissan Global: <https://www.nissan-global.com/EN/STORIES/RELEASES/nissan-leaf-10years/>
- Robinson, K. (1985). THE SOROAKO NICKEL PROJECT: A HEALTHY DEVELOPMENT? *International Journal of Health Services*, 15(2), 301-319.
- Singgih, V. (2024, Januari 29). *Setumpuk masalah di balik investasi China - 'Demam nikel membuat pemerintah kehilangan akal sehat'*. Retrieved from BBC News Indonesia: <https://www.bbc.com/indonesia/articles/cw4m1k0j7vro>
- Statista. (2023, Desember 21). *Agriculture in Indonesia - statistics & facts*. Retrieved from Statista: <https://remote-lib.ui.ac.id:6499/topics/7732/agriculture-industry-in-indonesia/#topicOverview>
- Statista. (2023, September 27). *Agriculture: Gross production value at current prices of agricultural production in Indonesia from 2012 to 2021*. Retrieved from Statista: <https://remote-lib.ui.ac.id:6499/statistics/587273/indonesia-value-of-agricultural-production/>
- Statista. (2023, Juli 10). *Economy: Gross domestic product (GDP) from agriculture, forestry, and fishing in Indonesia from 2014 to 2022(in quadrillion Indonesian rupiah)*. Retrieved from Statista: <https://remote-lib.ui.ac.id:6499/statistics/1018464/indonesia-gdp-agriculture-forestry-fishing/>
- Statista. (2023, September 21). *Economy: Gross domestic product at current market prices from the manufacturing sector in Indonesia from 2014 to 2022(in trillion Indonesian rupiah)*. Retrieved from Statista: <https://remote-lib.ui.ac.id:6499/statistics/1018642/indonesia-gdp-manufacturing/>
- Statista. (2023, Mei 31). *Government spending on electric vehicles in 2022, by vehicle type and selected countries and regions(in billion current U.S. dollars)*. Retrieved from Statista: <https://remote-lib.ui.ac.id:6499/statistics/1387718/global-spending-on-electric-cars-by-spender/>
- Statista. (2024, Maret 15). *Economy: Number of workers aged 15 years and above in Indonesia in 2023, by sector(in millions)*. Retrieved from Statista: <https://remote-lib.ui.ac.id:6499/statistics/994498/employment-numbers-by-industry-indonesia/>
- Statista. (2024, Juni 16). *Estimated plug-in electric light vehicle sales worldwide from 2015 to 2023*. Retrieved from Statista: <https://remote-lib.ui.ac.id:6499/statistics/665774/global-sales-of-plug-in-light-vehicles/>
- Statista. (2024, April 29). *Fossil Fuels: Natural resources in Indonesia - Statistics & Facts*. Retrieved from Statista: <https://remote-lib.ui.ac.id:6499/topics/4690/natural-resources-in-indonesia/#topicOverview>
- Statista. (2024, Mei 22). *Global revenue for electric vehicles between 2016 and 2022, with a forecast through 2028(in billion U.S. dollars)*. Retrieved from Statista: <https://remote-lib.ui.ac.id:6499/statistics/271537/worldwide-revenue-from-electric-vehicles-since-2010/>
- Statista. (2024, April 16). *Indonesia - Statistics & Facts*. Retrieved from Statista: <https://remote-lib.ui.ac.id:6499/topics/2398/indonesia/#topicOverview>
- Tesla. (2010, April 20). *Tesla Motors Announces 2008 Roadster Production Schedule and Achievement of Critical Milestones on Crash Tests and Range Testing*. Retrieved from

Tesla: <https://www.tesla.com/blog/tesla-motors-announces-2008-roadster-production-schedule-and-achievement-critic>

UNCTAD. (2023, Maret 16). *Technology and Innovation Report 2023*. Retrieved from UN Trade and Development: 2023

UNDP. (2022). *Reducing Inequality in the Decade of Action to Achieve the SDGs and Accelerate Post-Pandemic Recovery*. Bangkok: UNDP Bangkok Regional Hub.

UNDP. (2024, Maret 13). *Indonesia*. Retrieved from UNDP Human Development Reports: <https://hdr.undp.org/data-center/specific-country-data#/countries/IDN>

Voelcker, J. (2019, Maret 28). *10 Lesson from the short life of the Chevy Volt*. Retrieved from Green Car Reports: https://www.greencarreports.com/news/1122269_10-lessons-from-the-short-life-of-the-chevy-volt-2011-2019