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THE IMPACT OF MINING DOWNSTREAMING ON ECONOMIC GROWTH AND THE ENVIRONMENT: A PERSPECTIVE OF SUSTAINABLE ECONOMIC TRANSFORMATION BASED ON THE PRISM METHOD

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ABSTRACT
Mining downstreaming in Indonesia aims to add value to mineral resources, reduce raw material exports, and strengthen the national industry. This policy faces several challenges, such as environmental impacts, global trade pressures, capital constraints, and dependence on foreign technology. This research looks at the impact of downstream mining on economic growth and the environment, as well as the role of universities in supporting sustainable economic change. The method used is PRISMA-based Systematic Literature Review (SLR), by reviewing studies from SINTA published between 2020 and 2025. This research covers economic, environmental, and higher education policy aspects. The results show that downstream mining increases investment, exports of processed products, and employment. However, there are challenges such as international trade pressure, foreign technology dependence, and environmental damage. In conclusion, downstream mining contributes to economic growth. However, sustainable policies are needed that balance the interests of industry, environmental protection, and an increased role for academia in developing research-based technologies and policies.

Key words: downstream mining, environmental sustainability, economic growth, universities, PRISMA

INTRODUCTION

Downstream mining is a central strategy in Indonesia to enhance the value of mineral resources, aiming to reduce raw material export dependency and boost domestic finished goods production for greater industrial competitiveness (Wau et al., 2024). While it offers economic benefits like increased revenue and job creation, its implementation faces challenges, including environmental degradation and human rights concerns in sectors like nickel processing (Wibisono, 2024). Although successful in increasing exports of value-added products like iron and steel (Khaldun, 2024) optimal development requires the structured integration of small and medium industries (SMEs) (Abubakar & Handayani, 2024). A holistic policy approach is needed, one that considers social, economic, technological, environmental, and legal aspects to ensure sustainable resource management and equitable economic distribution (Hanan et al., 2024). The pursuit of economic growth through industrialization, including downstreaming, often coincides with environmental pressures such as deforestation and greenhouse gas emissions (Mazwan & Tain, 2024). The Environmental Kuznets Curve (EKC) theory posits that while initial economic growth may worsen environmental quality, beyond a certain income threshold, stricter regulations and cleaner technologies can lead to improvement (El Khoury et al., 2025; Li et al., 2024). This highlights the potential for downstreaming to drive growth while adopting better environmental practices. Concurrently, Indonesia is exploring green and blue economy models as sustainable solutions that address social, economic, and environmental challenges simultaneously (Anwar, 2022), though their implementation faces obstacles like ecosystem degradation and funding issues (Faisal et al., 2023).

This research analyzes the impact of mine downstreaming from a multi-faceted perspective, integrating economic, environmental, and social dimensions, including human rights. Using the PRISMA method for a systematic review and meta-analysis, it aims to synthesize comprehensive, evidence-based findings. The study seeks to explore downstreaming's effect on domestic economic growth, its environmental impact in mining regions, and the role of universities in supporting a sustainable economic transformation. Its significance lies in its academic contribution to enriching downstreaming literature with green and blue economy approaches, providing a practical reference for policymakers and industry players to formulate holistic and collaborative strategies for a sustainable mining sector transformation.

METHOD

This study adopts a Qualitative Systematic Literature Review (SLR) using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to ensure transparency, consistency, and replicability in identifying, screening, and evaluating relevant literature (Sastypratiwi et al., 2020). PRISMA provides standardized flowcharts and checklists to document each phase of the review—from source identification to data synthesis—thereby strengthening methodological rigor, accountability, and credibility while allowing replication by other researchers (Asar et al., 2016). The research focuses on analyzing the impact of mining

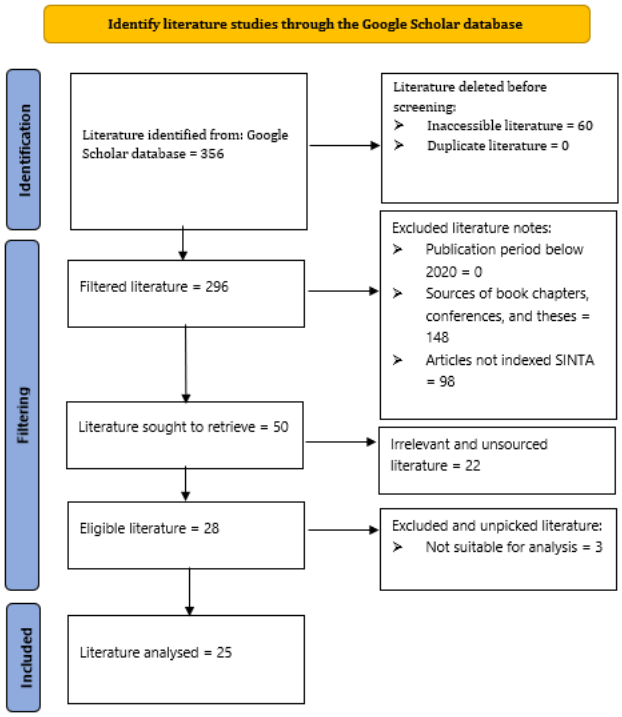
downstreaming on economic growth and environmental sustainability within the context of sustainable economic transformation. Scientific studies related to downstream mining and its economic and ecological implications are systematically examined. Strict inclusion and exclusion criteria are applied to ensure relevance and quality, requiring careful interpretation of each study's characteristics and findings to maintain alignment with the research objectives.

Table 1. Inclusion and Exclusion Criteria

Criterion	Inclusion	Exceptions
Year of Publication	2020–2025	Before 2020
Document Type	Research Articles	Not a research article; Books, chapters, thesis, proceedings, etc.
Access	Open	Closed
Indexing	SINTA	Not SINTA
Publication Language	Indonesian and English	Not Indonesian and English
Topic	Mining sector drying, sustainable economy, drying, drying, environmental impact of drying.	Non-Hirilization of the mining sector, sustainable economy, irrigation policy, environmental impact of irrigation
Purpose	The Relationship and Impact of Mining Drilling on Economic and Environmental Growth	It does not discuss the linkages and impacts of mining drilling on economic and environmental growth

Source: Research Results, 2025

The literature search was conducted systematically using the Google Scholar database, applying specific keywords and Boolean operators to compile an initial list of relevant publications. The process included identifying available studies, screening titles and abstracts for relevance, and assessing methodological rigor and scholarly contribution. The final selection comprised articles that met the predefined criteria, which were then analyzed thematically to identify dominant trends and research gaps, providing a comprehensive understanding of the study domain.



Source: Search Process Results, 2025

Figure 1. PRISMA Diagram

The systematic literature selection process, illustrated in the PRISMA diagram (Figure 1), began with 356 publications identified from Google Scholar via Publish or Perish. After removing 60 inaccessible documents, 296 records remained, of which 50 were selected for full-text review. Following the eligibility assessment, 28 publications met the inclusion criteria, and a final set of 25 high-quality articles was established after excluding 148 non-journal sources, 98 non-SINTA-indexed papers, 22 irrelevant studies, and 3 upon final re-evaluation. This refined corpus provides a robust foundation for analyzing the interconnections between mining downstreaming, economic growth, and environmental sustainability within the context of sustainable economic transformation.

RESULTS AND DISCUSSION

Based on the research results categorized in Table 2, the impact of mining downstreaming on domestic economic growth was examined by 12 authors, while its environmental and social impacts were studied by another 12 authors. In contrast, the role of universities in sustainable economic transformation was addressed by only 3 authors. This distribution indicates that while the economic, environmental, and social aspects of mining downstreaming have received significant scholarly attention, the involvement of universities in supporting sustainable economic change remains substantially understudied and requires more comprehensive investigation.

Table 2. Findings of Research Results

Yes	Research Results	Author, Research Year
1	The impact of mining downstream on domestic economic growth	(Gonzales, 2022), (Tangkudung & Kaseger, 2024), (Jamil, 2022),(Angelina & Purba, 2024),(Yanto et al., 2023), (Nurhaliza Botutihe and Kusuma Paksi, 2024),(Arif Deddy et al., 2023), (Prabowo & Rahmat Purnama, 2024), (Wambrauw et al., 2023),(Rosada et al., 2023),(Riedho, 2024),(Agung M & Adi, 2022)
2	The environmental and social impact of downstream mining	(Gonzales, 2022), (Al Idrus, 2022),(Wibisono, 2024),(Stiawan et al., 2023)(Ridwan et al., 2024),(Pratama et al., 2025),(Rivaldi Gumilar & Dirkareshza, 2024),(Agung M & Adi, 2022)(Bakri et al., 2024), (Kurdi & Syafitri, 2024),(Aprillia et al., 2024),(Cutler J. Cleveland, 2004)
3	The role of universities in supporting sustainable economic transformation through mining downstream	(Khoiro et al., 2024), (Gonzales, 2022),(Navisa Suwarno et al., 2024)

Source: Research Results, 2025

3.1. Impact on Indonesia's Economic Growth

Mining downstreaming significantly boosts Indonesia's economy by increasing added value, creating jobs, and attracting investment, with the nickel sector alone generating USD 10 billion in foreign exchange (Gonzales, 2022; Nurhaliza Botutihe dan & Kusuma Paksi, 2024). The export ban on raw nickel ore since 2020 has spurred domestic smelter construction, increased production of value-added products like stainless steel, and elevated export value by 745% (Angelina & Purba, 2024; Tangkudung & Kaseger, 2024). This policy, solidified by Law Number 3 of 2020, has accelerated economic transformation and attracted massive foreign direct investment, particularly from partnerships with China and South Korea in the electric vehicle battery industry(Arif Deddy et al., 2023; Riedho, 2024; Wambrauw et al., 2023). However, challenges persist, including high investment costs, dependence on foreign technology, international trade disputes with the EU at the WTO, and potential environmental degradation (Prabowo & Rahmat Purnama, 2024; Rosada et al., 2023). Furthermore, the recentralization of mining authority has potentially weakened local oversight and created imbalances in the distribution of economic benefits (Jamil, 2022; Yanto et al., 2023).

3.2. Impact on the Environment and Social Life

While downstreaming reduces raw material exports and supports domestic industry, it introduces significant environmental and social challenges (Agung M & Adi, 2022; Gonzales, 2022). The establishment of smelters raises concerns about air pollution and industrial hazards, necessitating rigorous safety training (Ridwan et al., 2024). Mining activities often lead to prolonged environmental and land degradation, with impacts felt for years (Bakri et al., 2024; Pratama et al., 2025). Socially, downstreaming can trigger community unrest, including psychological impacts from increased truck transportation and the proliferation of issues like legalized alcohol, often overlooking the social rights and human rights of local communities (Kurdi & Syafitri, 2024; Wibisono, 2024). Conversely, the push for electric vehicles, supported by downstreaming, aligns with global commitments like the Paris Agreement to reduce emissions, reflecting the Environmental Kuznets Curve theory where economic growth eventually fosters greater environmental awareness and improvement (Cutler J. Cleveland, 2004; Siti Aprillia et al., 2024).

3.3. The Role of Higher Education

Universities play a critical role in supporting sustainable mining downstreaming by acting as centers for knowledge generation, innovation, and technological advancement (Khoiro et al., 2024; Navisa Suwarno et al., 2024). Their function extends beyond education to include research that yields practical applications for the mining sector. Higher education institutions are pivotal in developing a skilled workforce by providing training in all mining stages—from exploration and construction to processing and refining—thereby supplying expert labor

(Gonzales, 2022). Furthermore, they instill principles of environmental stewardship and sustainable business practices, actively contributing to job creation and supporting both local and national economic growth.

CONCLUSION

This study concludes that mining downstreaming, particularly the nickel ore export ban, has significantly driven Indonesia's economic growth through increased investment, job creation, and higher export value, thereby strengthening GDP and foreign reserves. However, these economic gains are challenged by high investment costs, technological dependence, trade pressures, and severe environmental impacts such as land degradation, pollution, and ecological damage. The study emphasizes the vital role of universities in fostering green innovation and calls for stronger collaboration among government, industry, and academia to achieve a balance between economic growth and environmental sustainability. Future efforts should focus on developing eco-friendly technologies, enhancing post-mining reclamation, ensuring fair profit-sharing, and adopting adaptive policies in response to global trade dynamics to promote a more sustainable and inclusive downstream mining framework in Indonesia.

REFERENCES

Abubakar, L., & Handayani, T. (2024). *Kebijakan Integratif Dalam Transformasi Industri Kecil Menengah Untuk Mendukung Hilirisasi Industri Strategis* (Vol. 53, Issue 3).

Agung M, & Adi, E. A. W. (2022). *Peningkatan Investasi Dan Hilirisasi Nikel Di Indonesia*.

Al Idrus, N. F. (2022). Dampak Politik Hukum Dan Respon Masyarakat Atas Pembaharuan Undang-Undang Minerba. *Jurnal Penegakan Hukum Dan Keadilan*, *3*(2), 114–127. Https://Doi.Org/10.18196/Jphk.V3i2.14898

Angelina, J., & Purba, A. (2024). Batasan Untuk Keamanan: Analisis Kebijakan Pembatasan Ekspor Nikel Indonesia Menggunakan Pendekatan Poskolonialisme. In *Jessica Angelina Anggraeni Purba Jurnal Hubungan Internasional* □ (Vol. 17, Issue 1).

Anwar, M. (2022). *Green Economy Sebagai Strategi Dalam Menangani Masalah Ekonomi Dan Multilateral*.

Arif Deddy, M., Adriyanto, A., Djoko Andreas, R. N., Ekonomi Pertahanan, P., & Manajemen Pertahanan, F. (2023). Strategi Hilirisasi Di Indonesia Dalam Menghadapi Kebijakan Larangan Ekspor Bijih Nikel Terhadap Tingkat Pengangguran Dan Cadangan Devisa Negara. *Jurnal Ilmu Sosial Dan Pendidikan (Jisip)*, *7*(3). Https://Doi.Org/10.58258/Jisip.V7i1.5137/Http

Asar, S., Jalalpour, S., & Razaeian, M. (2016). *Prisma; Preferred Reporting Items For Systematic Reviews And Meta-Analyses*.

Bakri, S., Ardianto Budiman, A., Asmiani, N., & Studi Teknik Pertambangan Fakulktas, P. (2024). Pemetaan Sumberdaya Bahan Galian Pasir Silika Di Desa Pattappa Kecamatan Pujananting Kabupaten Barru Untuk Masterplane Geowisata. In *Communnity Development Journal* (Vol. 5, Issue 4).

Cutler J. Cleveland. (2004). *Encyclopedia Of Energy*.

El Khoury, R., Min Du, A., Nasrallah, N., Marashdeh, H., & Atayah, O. F. (2025). Towards Sustainability: Examining Financial, Economic, And Societal Determinants Of Environmental Degradation. *Research In International Business And Finance*, *73*. Https://Doi.Org/10.1016/J.Ribaf.2024.102557

Faisal, M., Latif, A., Nur'aina Wafa, S., & Alia, S. (2023). *Jurnal Perpajakan Dan Keuangan Publik Analisis Kebijakan Blue Economy Di Indonesia*.

Gonzales, R. (2022). Memaksimalkan Potensi Generasi Muda Di Industri Pertambangan Untuk Meningkatkan Ekonomi Indonesia Menuju Indonesia Emas 2045: Generasi Muda Untuk Bangsa Maximizing The Potential Of Young Generations In The Mining Industry To Improve Indonesia's Economy Towards A Golden Indonesia 2045: Young Generations For The Nation. In *Jurnal Himasapta* (Vol. 7, Issue 1).

Hanan, A., Bunga Swastika, M., & Mustafidah Rohmawati, H. (2024). *Strategi Kebijakan Hilirisasi Migas Dan Minerba Yang Efektif Untuk Indonesia*.

Jamil, N. R. (2022). *Problematika Penerapan Izin Usaha Pertambangan Undang-Undang Nomor 3 Tahun 2020 Tentang Pertambangan Mineral Dan Batubara Serta Dampak Pada Otonomi Daerah Abstract: Mineral And Coal Mining Raises Problems In The Application Of Mining Business Permits To Regional Autonomy And Central And Regional Financial Relations Resulting From Mining Business Permits* (Vol. 2, Issue 2).

Khaldun, I. (2024). Institut Teknologi Dan Sains Mandala 153. In *Jurnal Ekonomi: Vol. Xx* (Issue 1).

Khoiro, U. E. E., Edueco, J., Ummah, E. El, Politeknik, K., & Surabaya, N. (2024). *Kebijakan Hilirisasi Sumber Daya Alam Mineral Di Indonesia: Analisis Bibliometrik*.

Kurdi, & Syafitri, C. Z. (2024). *358 Prinsip Esg Dalam Regulasi Hukum Kpbu: Upaya Peningkatan Efektivitas Pembangunan Infrastruktur Di Indonesia*. *10*, 358–389. Https://Doi.Org/10.21787/Jbp.06.2014.Hlm

Li, R. , Wang, Q., & Guo, J. (2024). Revisiting The Environmental Kuznets Curve (Ekc) Hypothesis Of Carbon Emissions: Exploring The Impact Of Geopolitical Risks, Natural Resource Rents, Corrupt Governance, And Energy Intensity. *J. Environ. Manag*, *351*(119663).

Mazwan, M. Z., & Tain, A. (2024). Analisis Environmental Kuznets Curve (Menyeimbangkan Industri Hijau Dan Degradasi Lingkungan Di Indonesia). *Jurnal Ilmiah Membangun Desa Dan Pertanian*, *9*(6), 561–572. Https://Doi.Org/10.37149/Jimdp.V9i6.1627

Navisa Suwarno, K., Ayu Mentari, I., Fauziah, F., Herliana Pratiwi, V., Ali Syahbana, M., Nor Ichsan, M., Pratika, R., Nur Junnah, R., Nur Amilia, A., Mariana Kustiawan, P., Kalimantan Timur, M., Ekonomi, F., Dan Politik, B., & Muhammadiyah Kalimantan Timur Penulis Korespondensi, U. (2024). *Selaparang: Jurnal Pengabdian Masyarakat Berkemajuan Eksplorasi Potensi Bisnis Perguruan Tinggi Melalui Hilirisasi Riset Dan Inovasi*. *8*(2), 1727–1733.

Nurhaliza Botutihe Dan, A., & Kusuma Paksi, A. (2024). Dampak Strategi Investasi Nikel Indonesia Terhadap Pertumbuhan Ekonomi Di Dalam Negeri. In *Iltizam Journal Of Shariah Economic Research* (Vol. 8, Issue 2).

Prabowo, H., & Rahmat Purnama, H. (2024). *Alternatif Penyelesaian Sengketa Larangan Ekspor Nikel Indonesia Di Wto*.

Pratama, F. W. N., Annisadina, T., & Fernanda, B. (2025). Peninjauan Perencanaan Spasial Dan Tata Kelola Pemerintahan Dalam Pengembangan Kota Tambang: Studi Kasus Kabupaten Musi Banyuasin. *Tunas Agraria*, *8*(1), 54–75. Https://Doi.Org/10.31292/Jta.V8i1.395

Ridwan, M., Frinaldi, A., & Lanin, D. (2024). *Evaluasi Kebijakan Publik Dalam Penanggulangan Kebakaran Industri: Studi Kasus Smelter Morowali*.

Riedho, M. R. Z. (2024). Strategi Tiongkok Dalam Memanfaatkan Momentum Kebijakan Larangan Ekspor Bijih Nikel Oleh Pemerintah Indonesia. *Jurnal Ilmiah Hubungan Internasional*, *20*(1), 74–95. Https://Doi.Org/10.26593/Jihi.V20i1.7156.74-95

Rivaldi Gumilar, E., & Dirkareshza, R. (2024). Disharmonisasi Pengaturan Pengelolaan Wilayah Izin Usaha Pertambangan Khusus Bagi Organisasi Masyarakat Keagamaan Di Indonesia. *Jurnal Interpretasi Hukum*, *5*(3), 1292–1301. Https://Doi.Org/10.22225/Juinhum.5.3.2024.1292-1301

Rosada, F., Wibisana, R. A. A., & Paksi, A. K. (2023). The Impact Of Indonesia-China Nickel Cooperations On Indonesia's Economy And Environment. *Nation State: Journal Of International Studies*, *6*(2), 96–116. Https://Doi.Org/10.24076/Nsjis.V6i2.1270

Sastypratiwi, H., Dwi, R., & #2, N. (2020). Analisis Data Artikel Sistem Pakar Menggunakan Metode Systematic Review. *Jepin (Jurnal Edukasi Dan Penelitian Informatika)*.

Siti Aprillia, I., Vianney Lourdes Sugara, M., Kheista, K., Abigael Rhemrev, E., Komala Sari, E., Christie Universitas Tarumanagara, M., & Author, C. (2024). Kebijakan Mobil Listrik Di Indonesia: Tantangan Dan Peluang Dalam Mewujudkan Mobilitas Ramah Lingkungan. *Jurnal Pendidikan Sejarah Dan Riset Sosial Humaniora*, *4*(3).

Stiawan, Y. B., Amir, A., & Isnaeni, N. (2023). *Analisis Perspektif Maqashid Syari'ah Dampak Pertambangan Batubara Dari Aspek Sosial Ekonomi Dan Lingkungan (Studi Kasus Di Kecamatan Mandiangin, Kabupaten Sarolangun)*. *4*(3), 155–165. Https://Doi.Org/10.22437/Jief.V4i3.26494

Tangkudung, A. G., & Kaseger, J. Y. (2024). Hilirisasi Nikel Sebagai Nilai Tambah Dalam Penguatan Perekonomian Indonesia. In *Syntax Admiration* (Vol. 5, Issue 10).

Wambrauw, M. S. F., Buiney, M. E., & Gani, N. N. (2023). Diplomasi Indonesia Dan Korea Selatan Dalam Pembangunan Pabrik Mobil Listrik Di Indonesia. *Jurnal Dinamika Global*, *8*(2).

Wau, F. T., Kiton, M. A., Wau, M., & Fau, J. F. (2024). Analisis Strategis Kebijakan Hilirisasi Mineral: Implikasi Ekonomi Dan Pengaruhnya Terhadap Perekonomian Indonesia. *Journal Publicuho*, *7*(3), 1215–1224. Https://Doi.Org/10.35817/Publicuho.V7i3.481

Wibisono, R. B. (2024). Keadilan Iklim Dan Ham Di Indonesia: Mewujudkan Pembangunan Berkelanjutan Melalui Perlindungan Lingkungan. *Jurnal Politik Pemerintahan Dharma Praja*, *17*(2), 95–125. Https://Doi.Org/10.33701/Jppdp.V17i2.5017

Yanto, A., Fadila, S., & Sitakar, R. C. (2023). *Implikasi Resentralisasi Kewenangan Pertambangan Timah Ter*.