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DAFTAR PUSTAKA

Abdurrachman, H., Hamzani, A. I., & Mariyono, J. (2021). Environmental Crime and Law Enforcement in Indonesia: Some Reflections on Counterproductive Approaches. *Environmental Policy and Law*, *51*(6), 409–416. https://doi.org/10.3233/EPL-210024

Aczel, M., Heap, R., Workman, M., Hall, S., Armstrong, H., & Makuch, K. (2022). Anticipatory Regulation: Lessons from fracking and insights for Greenhouse Gas Removal innovation and governance. *Energy Research & Social Science*, *90*, 102683. https://doi.org/10.1016/j.erss.2022.102683

Al Mamun, A., Abbas Uddin, M., Abu Sayeed Shohag, M., Mohammad Bappy, M., & Talukder, A. (2024). Energy consumption modeling in industrial sewing operations: A case study on carbon footprint measurement in the apparel industry. *Manufacturing Letters*, *41*, 1635–1644. https://doi.org/10.1016/j.mfglet.2024.09.190

Alıcı, H., Yiğit, B. N., Menemencioğlu, B., Tümay Ateş, K., Demirdelen, Ö., Demirdelen, T., & Kıvanç, Z. (2024). Analysis of Carbon Footprint Including Process-Level Calculation and Its Influencing Factors of Process for Low-Carbon and Sustainable Textile Industry. *Sustainability*, *16*(23), 10168. https://doi.org/10.3390/su162310168

Allen, D. T. (2016). Emissions from oil and gas operations in the United States and their air quality implications. *Journal of the Air & Waste Management Association*, *66*(6), 549–575. https://doi.org/10.1080/10962247.2016.1171263

Anindhita, Santosa, J., & Tokimatsu, K. (2024). Comparative analysis of Indonesia's energy system scenarios: Assessing emissions reduction strategies and cost-effectiveness. *IOP Conference Series: Earth and Environmental Science*, *1395*(1), 012033. https://doi.org/10.1088/1755-1315/1395/1/012033

Artanti, C. V. (2022). *Strategi Kebijakan Pengembangan Energi Terbarukan di Daerah Istimewa Yogyakarta* [Tesis]. Universitas Gadjah Mada.

Asmara, A., Purnamadewi, Y. L., & Meiri, A. (2014). Struktur Biaya Industri dan Pengaruhnya Terhadap Kinerja Industri Tekstil dan Produk Tekstil Indonesia. *Jurnal Manahemen & Agribisnis*, *11*(2), 110–118.

Astria, Z. (2024). *Analisis Strategi Diversifikasi PLN dalam Pengembangan PLTS sebagai Pengganti Energi Fosil Menuju Energi Bersih 2060* [Tesis]. Universitas Gadjah Mada.

Badan Kebijakan Fiskal. (2013). *Laporan Akhir Konversi Mitan ke LPG 3 kg*. Kementerian Keuangan.

Badan Pusat Statistik. (2023). *Neraca Energi Indonesia 2018-2022 Volume 25, Nomor 2, 2023* [Dataset].

Badan Pusat Statistik. (2024a). *Direktori Industri Manufaktur Indonesia Tahun 2024*. Badan Pusat Statistik.

Badan Pusat Statistik. (2024b). *Perkembangan Indeks Produksi Industri Manufaktur 2023 Volume 13 2024*. Badan Pusat Statistik.

UNIVERSITAS GADJAH MADA
Optimasi Pengendalian Gas Rumah Kaca Berdasarkan Skenario Emisi Konsumsi Bahan Bakar Industri Manufaktur di Indonesia Tahun 2025-2060
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Badan Pusat Statistik. (2024c). *Proporsi Nilai Tambah Sektor Industri Manufaktur Terhadap PDB*. https://www.bps.go.id/id/statistics-table/2/MTIxNCMy/proporsi-nilai-tambah-sektor-industri-manufaktur-terhadap-pdb.html

Badan Pusat Statistik. (2024d). *Statistik Industri Manufaktur Indonesia tahun 2022 Volume 11 2024*. Badan Pusat Statistik.

Bernard, J.-T., & Cote, B. (2005). The measurement of the energy intensity of manufacturing industries: A principal components analysis. *Energy Policy*, *33*, 221–233.

Blyde, J. (2025). The ISO 14001 Environmental Standard and Exports. *The International Trade Journal*, *39*, 115–128. https://doi.org/10.1080/08853908.2022.2155270

Bond, B. H., & Espinoza, O. (2016). A Decade of Improved Lumber Drying Technology. *Current Forestry Reports*, *2*(2), 106–118. https://doi.org/10.1007/s40725-016-0034-z

Brugnoli, F., Sena, K., Zugno, L., & Oggioni, A. (2025). A global study on the Life Cycle Assessment (LCA) of the modern cow leather industry. *Discover Sustainability*, *6*(1), 80. https://doi.org/10.1007/s43621-025-00798-6

Butler, M. A., Colucci, S. R., & P.E. (2008). Steam Humidification in pharmaceutical facilities. *Engineered Systems Magazine*.

Calvert, K. (2011). Geomatics and bioenergy feasibility assessments: Taking stock and looking forward. *Renewable and Sustainable Energy Reviews*, *15*(2), 1117–1124. https://doi.org/10.1016/j.rser.2010.11.014

Calvin, K., Dasgupta, D., Krinner, G., Mukherji, A., Thorne, P. W., Trisos, C., Romero, J., Aldunce, P., Barrett, K., Blanco, G., Cheung, W. W. L., Connors, S., Denton, F., Diongue-Niang, A., Dodman, D., Garschagen, M., Geden, O., Hayward, B., Jones, C., … Péan, C. (with Lee, H.). (2023). *IPCC, 2023: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland.* (Intergovernmental Panel On Climate Change (IPCC), Ed.; First). Intergovernmental Panel on Climate Change (IPCC). https://doi.org/10.59327/IPCC/AR6-9789291691647

Cao, G., Guo, X., Feng, C., Li, T., Cui, F., Xu, Y., Yang, S., Wang, Q., Chen, L., Yuan, X., & Chen, G. (2023). Carbon footprint accounting for cigar production processes: A life cycle assessment perspective. *Chinese Journal of Population, Resources and Environment*, *21*(4), 231–238. https://doi.org/10.1016/j.cjpre.2023.11.004

Cheng, N., Jing, D., Zhang, C., Chen, Z., Li, W., Li, S., & Wang, Q. (2021). Process-based VOCs source profiles and contributions to ozone formation and carcinogenic risk in a typical chemical synthesis pharmaceutical industry in China. *Science of The Total Environment*, *752*, 141899. https://doi.org/10.1016/j.scitotenv.2020.141899

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Optimasi Pengendalian Gas Rumah Kaca Berdasarkan Skenario Emisi Konsumsi Bahan Bakar Industri Manufaktur di Indonesia Tahun 2025-2060
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Chermack, T. J., & Kasshanna, B. K. (2007). The Use and Misuse of SWOT Analysis and Implications for HRD Professionals. *Human Resource Development International*, *10*(4), 383–399. https://doi.org/10.1080/13678860701718760

ClimateWorks Centre. (2025). *Dekarbonisasi pada sektor manufaktur Indonesia: Studi kasus subsektor makanan dan minuman, tekstil dan kimia*. ClimateWorks Centre.

Cuadras, À., Ovejas, V. J., & Serrano, M. (2025). The entropy cost of the use of houses in ecological economy. *Journal of Cleaner Production*, *533*, 146991. https://doi.org/10.1016/j.jclepro.2025.146991

Cucinotta, F., Guglielmino, E., & Sfravara, F. (2017). Life cycle assessment in yacht industry: A case study of comparison between hand lay-up and vacuum infusion. *Journal of Cleaner Production*, *142*, 3822–3833. https://doi.org/10.1016/j.jclepro.2016.10.080

D'Arcy, J. B., Dasch, J. M., Gundrum, A. B., Rivera, J. L., Johnson, J. H., Carlson, D. H., & Sutherland, J. W. (2016). Characterization of process air emissions in automotive production plants. *Journal of Occupational and Environmental Hygiene*, *13*(1), 9–18. https://doi.org/10.1080/15459624.2015.1076161

Denis, D. (2016). *Skenario Manajemen Energi Rendah Emisi di Kota Semarang* [Tesis]. Universitas Gadjah Mada.

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). (2021). *Projections of Greenhouse Gas Emissions and Removals_An Introductory Guide for Practitioners*. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

Dewi, R. G., Zunita, M., Sevie, G. N., & Kurniawati, F. W. (2019). AIM/End-use Model for Selecting of Low-Carbon Technology in Indonesia's Iron and Steel Industry. *IOP Conference Series: Earth and Environmental Science*, *363*(1), 012018. https://doi.org/10.1088/1755-1315/363/1/012018

Díaz, R., & Villamarín, S. (2020). Combinatorial micro–macro dynamical systems. *São Paulo Journal of Mathematical Sciences*, *14*(1), 66–122. https://doi.org/10.1007/s40863-018-0103-2

Direktorat Jenderal Ketenagalistrikan Kementerian ESDM. (2018). *Pedoman Penghitungan dan Pelaporan Inventarisasi Gas Rumah Kaca Bidang Energi-Sub Bidang Ketenagalistrikan*. Kementerian ESDM.

Eastern Research Group. (1998, Desember 18). *Preferred and Alternative Methods for Estimating Air Emissions from Plastic Products Manufacturing*. US-EPA.

Eastern Research Group. (1999, Februari 24). *Preferred and Alternative Methods for Estimating Air Emissions from Semiconductor Manufacturing*. US-EPA.

Eastern Research Group. (2001a). *Preferred and Alternative Methods for Estimating Air Emissions from Secondary Metal Processing*. US-EPA.

Eastern Research Group. (2001b). *Preferred and Alternative Methods for Estimating Air Emissions from Surface Coating Operations*. US-EPA.

Eastern Research Group. (2002, Mei 8). *Preferred and Alternative Methods for Estimating Air Emissions from the Printing, Packaging, and Graphic Arts Industry*. US-EPA.

UNIVERSITAS GADJAH MADA
Optimasi Pengendalian Gas Rumah Kaca Berdasarkan Skenario Emisi Konsumsi Bahan Bakar Industri Manufaktur di Indonesia Tahun 2025-2060
Annisa Ayu Fawzia, Dr. Emilya Nurjani, S.Si., M.Si., Dr. Rika Harini, S.Si., MP.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Eastern Research Group. (2007). *Methods for Estimating Air Emissions from Chemical Manufacturing Facilities*. US-EPA.

Euratex. (2023). EU Textile & Clothing Industry Outlook 2024-2025. *The European Apparel And Textile Confederation*. https://euratex.eu/news/eu-textile-clothing-outlook-2024-2025/

Filonchyk, M., Peterson, M. P., Zhang, L., Hurynovich, V., & He, Y. (2024). Greenhouse gases emissions and global climate change: Examining the influence of CO2, CH4, and N2O. *Science of The Total Environment*, *935*, 173359. https://doi.org/10.1016/j.scitotenv.2024.173359

Firmansyah, V., Adinarayana, M. K., Tetrisyanda, R., & Wibawa, G. (2023). Scenario of renewable energy transition from fossil energy resources towards net zero emission in Indonesia. *E3S Web of Conferences*, *467*, 04005. https://doi.org/10.1051/e3sconf/202346704005

Gielen, D., Boshell, F., Saygin, D., Bazilian, M. D., Wagner, N., & Gorini, R. (2019). The role of renewable energy in the global energy transformation. *Energy Strategy Reviews*, *24*, 38–50. https://doi.org/10.1016/j.esr.2019.01.006

Girod, B., Wiek, A., Mieg, H., & Hulme, M. (2009). The evolution of the IPCC's emissions scenarios. *Environmental Science & Policy*, *12*(2), 103–118. https://doi.org/10.1016/j.envsci.2008.12.006

Gowreesunker, B. L., Tassou, S., & Atuonwu, J. (2018). Cost-Energy Optimum Pathway for the UK Food Manufacturing Industry to Meet the UK National Emission Targets. *Energies*, *11*(10), 2630. https://doi.org/10.3390/en11102630

Grossman, G. (1994). *Economic Growth and The Environment* [Working Paper].

Groves, D. G., Syme, J., Molina-Perez, E., Calvo, C., Víctor-Gallardo, L., Godinez-Zamora, G., Quirós-Tortós, J., León, F. D., & Murillo, A. M. (2020). *The Benefits and Costs of Decarbonizing Costa Rica's Economy*.

Guchhait, R., & Sarkar, B. (2023). Increasing Growth of Renewable Energy: A State of Art. *Energies*, *16*(6), 2665. https://doi.org/10.3390/en16062665

Güldürek, M., & Esenboğa, B. (2024). Assessment of Corporate Carbon Footprint and Energy Analysis of Transformer Industry. *Sustainability*, *16*(13), 5800. https://doi.org/10.3390/su16135800

Gunawan, H., Bressers, H., Megantara, E. N., Kurnani, T. B. A., Hoppe, T., Mohlakoana, N., & Parikesit. (2019). A governance of climate change mitigation in transport sector and selected co-benefits in Indonesia: The case of Bandung City. *IOP Conference Series: Earth and Environmental Science*, *306*(1), 012015. https://doi.org/10.1088/1755-1315/306/1/012015

Gürel, E. (2017). SWOT Analysis: A Theoritical Review. *Journal of International Social Research*, *10*(51), 994–1006. https://doi.org/10.17719/jisr.2017.1832

Hakim, D. L. (2017). *Pemodelan dan Proyeksi Permintaan Energi Indonesia dengan Pendekatan Ekonometrik 2000-2030* [Tesis]. Universitas Gadjah Mada.

Hariwan, P., Juanda, B., Mulatsih, S., & Hariyoga, H. (2021). Analysis of Energy Efficiency on the Manufacturing Industry in Indonesia. *International Journal*

UNIVERSITAS GADJAH MADA
Optimasi Pengendalian Gas Rumah Kaca Berdasarkan Skenario Emisi Konsumsi Bahan Bakar Industri Manufaktur di Indonesia Tahun 2025-2060
Annisa Ayu Fawzia, Dr. Emilya Nurjani, S.Si., M.Si., Dr. Rika Harini, S.Si., MP.
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of Energy Economics and Policy, *11*(5), 28–36. https://doi.org/10.32479/ijeep.11395

He, B.-J., Prasad, D., Pignatta, G., & Jupesta, J. (Ed.). (2022). *Climate Change and Environmental Sustainability*. Springer International Publishing. https://doi.org/10.1007/978-3-031-12015-2

He, K., Dong, X., Gong, C., Yu, Q., Ye, Q., Guo, Q., Varbanov, P. S., & Wang, X.-C. (2024). Spatiotemporal prediction of greenhouse gas emissions from rubber wood industry, taking Hainan as the case. *Journal of Cleaner Production*, *480*, 144049. https://doi.org/10.1016/j.jclepro.2024.144049

Health Effect Institute. (2024). *State of Global AIR/2024* [Special Report]. Health Effect Institute.

Hernández, K. D., & Fajardo, O. A. (2021). Estimation of industrial emissions in a Latin American megacity under power matrix scenarios projected to the year 2050 implementing the LEAP model. *Journal of Cleaner Production*, *303*, 126921. https://doi.org/10.1016/j.jclepro.2021.126921

Herrmann, C., Blume, S., Kurle, D., Schmidt, C., & Thiede, S. (2015). The Positive Impact Factory–Transition from Eco-efficiency to Eco–effectiveness Strategies in Manufacturing. *Procedia CIRP*, *29*, 19–27. https://doi.org/10.1016/j.procir.2015.02.066

Hibiki, A. (2024). Choice of Policy Instruments: Tax, Regulation or Subsidy. Dalam *Introduction to Environmental Economics and Policy in Japan*. Springer Nature Singapore. https://doi.org/10.1007/978-981-97-2187-0

Hirz, M., & Nguyen, T. T. (2022). Life-Cycle CO2-Equivalent Emissions of Cars Driven by Conventional and Electric Propulsion Systems. *World Electric Vehicle Journal*, *13*(4), 61. https://doi.org/10.3390/wevj13040061

Hu, H., & Kavan, P. (2014). Energy Consumption and Carbon Dioxide Emissions of China's Non-Metallic Mineral Products Industry: Present State, Prospects and Policy Analysis. *Sustainability*, *6*(11), 8012–8028. https://doi.org/10.3390/su6118012

Hu, Y.-C., & Jiang, P. (2017). Forecasting energy demand using neural-network-based grey residual modification models. *Journal of the Operational Research Society*, *68*(5), 556–565. https://doi.org/10.1057/s41274-016-0130-2

Huang, B., Zhao, J., Geng, Y., Tian, Y., & Jiang, P. (2017). Energy-related GHG emissions of the textile industry in China. *Resources, Conservation and Recycling*, *119*, 69–77. https://doi.org/10.1016/j.resconrec.2016.06.013

Huang, R., Riddle, M., Graziano, D., Warren, J., Das, S., Nimbalkar, S., Cresko, J., & Masanet, E. (2016). Energy and emissions saving potential of additive manufacturing: The case of lightweight aircraft components. *Journal of Cleaner Production*, *135*, 1559–1570. https://doi.org/10.1016/j.jclepro.2015.04.109

Imani, L. (2021). *Analisis Proyeksi Listrik dan Potensi Mitigasi Emisi CO2 dengan Koreksi Faktor Pandemi berdasarkan Pembangkit Listrik di Indonesia*

UNIVERSITAS GADJAH MADA
Optimasi Pengendalian Gas Rumah Kaca Berdasarkan Skenario Emisi Konsumsi Bahan Bakar Industri Manufaktur di Indonesia Tahun 2025-2060
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Memanfaatkan Energi Terbarukan dan Nuklir [Tesis]. Universitas Gadjah Mada.

Imelda, H., & Soejachmoen, M. H. (2023). *Mengenal Nationally Determined Contribution (NDC)*. Indonesia Research Institute for Decarbonization.

Indonesia Corruption Watch. (2023, Februari 7). *Research Brief: Konflik Kepentingan: Legislatif dan SDA* [Kajian]. Indonesia Corruption Watch. https://antikorupsi.org/id/studi-konflik-kepentingan-anggota-legislatif-terkait-bisnis-sumber-daya-alam

Intergovernmental Panel On Climate Change (IPCC) (Ed.). (2021). *Annex VII: Glossary [Matthews, J.B.R., V. Möller, R. van Diemen, J.S. Fuglestvedt, V. Masson-Delmotte, C. Méndez, S. Semenov, A. Reisinger (eds.)]. In Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]*. (hlm. 2215–2256). Cambridge University Press. https://dx.doi.org/10.1017/9781009157896.022

International Energy Agency. (2020). *Technology needs for net-zero emissions*. https://www.iea.org/reports/energy-technology-perspectives-2020/technology-needs-for-net-zero-emissions

International Energy Agency. (2022). *An Energy Sector Roadmap to Net Zero Emissions in Indonesia*. OECD. https://doi.org/10.1787/4a9e9439-en

International Energy Agency. (2024). *Global Energy and Climate Model Documentation 2024*. International Energy Agency.

International Organization of Standardization. (2015). *ISO 14001:2015*. International Organization of Standardization. https://www.iso.org/standard/60857.html

IPCC. (2006a). *2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Chapter 1* (Vol. 2).

IPCC. (2006b). *2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Chapter 2* (Vol. 2). IPCC.

Jaseem, M., Kumar, P., & John, R. M. (t.t.). An overview of waste management in pharmaceutical industry. *The Pharma Innovation*, *6*(3), 158–161.

Kamar Dagang Indonesia. (2024). Peran Kadin dalam Pengurangan Emisi Karbon dan Transisi Energi. *https://kadin.id*. https://kadin.id/info-advokasi/peran-kadin-dalam-pengurangan-emisi-karbon-dan-transisi-energi/#:~:text=Salah%20satu%20inisiatif%20utama%20Kadin,Net%20Zero%20Hub%20(NZH).

Kanungo, A. K. (2012). China's Textiles Sector: Performance and Challenges. *Transnational Corporations Review*, *4*(2), 61–89. https://doi.org/10.1080/19186444.2012.11658327

Kawengian, G. P. (2019). Partisipasi Masyarakat dalam Pengelolaan dan Pelestarian Lingkungan Hidup. *Lex Et Societatis*, *VII*(6), 55–62.

UNIVERSITAS GADJAH MADA
Optimasi Pengendalian Gas Rumah Kaca Berdasarkan Skenario Emisi Konsumsi Bahan Bakar Industri Manufaktur di Indonesia Tahun 2025-2060
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Kementerian Energi dan Sumberdaya Mineral. (2020). *Inventarisasi Emisi GRK Bidang Energi*. Kementerian Energi dan Sumberdaya Mineral.

Kementerian Energi dan Sumberdaya Mineral. (2025). *Handbook of Energy and Economic Statistics of Indonesia*. Kementerian Energi dan Sumberdaya Mineral.

Kementerian Koordinator Perekonomian Republik Indonesia. (2024). *Purchasing Managers Index Indonesia April 2024*. Kementerian Koordinator Perekonomian Republik Indonesia.

Kementerian Lingkungan Hidup. (2025). *Laporan Kinerja Direktorat PPSA Tahun 2024*. Direktorat Pengaduan, Pengawasan, dan Sanksi Administrasi LHK, Direktorat Jenderal Penegakan Hukum, Kementerian Lingkungan Hidup dan Kehutanan.

Kementerian Lingkungan Hidup dan Kehutanan. (2024a). *Laporan Kinerja Kementerian Lingkungan Hidup dan Kehutanan Tahun 2023*. Kementerian Lingkungan Hidup dan Kehutanan.

Kementerian Lingkungan Hidup dan Kehutanan. (2024b, Januari 25). *KLHK Dorong Perusahaan Peringkat Merah dan Ditangguhkan Tahun 2023 untuk Lakukan Perbaikan Laporan* [Institusi]. https://ppkl.menlhk.go.id/website/index.php?q=1217&s=76fbdd2b2ea23e13a5b1dbcf7900b3d92134f3a1

Kementerian Perindustrian. (2024a). *Data Industri SIINAS*. https://www.kemenperin.go.id/data-industri/data_industri_nasional.php

Kementerian Perindustrian. (2024b). *Laporan Kinerja Pemerintah Kementerian Perindustrian Tahun 2023*. Kementerian Perindustrian.

Kementerian Perindustrian. (2025). *Peta Jalan Dekarbonisasi 9 Subsektor Industri 2023-2050*.

Kementerian PPN/Bappenas, & Economic Research Institute for ASEAN and East Asia. (2021). *Kajian Sektor Manufaktur Indonesia Tahun 2021*. Kementerian PPN/Bappenas : Economic Research Institute for ASEAN and East Asia.

Kim, D.-H., Lee, H., Kim, K., Kim, S., Kim, J. H., Ko, Y. W., Hawes, I., Oh, J.-E., & Kim, J.-T. (2024). Persistent organic pollutants in the Antarctic marine environment: The influence impacts of human activity, regulations, and climate change. *Environmental Pollution*, *363*, 125100. https://doi.org/10.1016/j.envpol.2024.125100

Kolmasiak, C. (2024). Decarbonization of Production Systems in Foundries. *Archives of Foundry Engineering*. https://doi.org/10.24425/afe.2024.149276

Kristian, I. (2023). *KEBIJAKAN PUBLIK DAN TANTANGAN IMPLEMENTASI DI INDONESIA*. *21*(2), 88–98.

Krones, M., & Müller, E. (2014). Structuring energy efficiency measures in manufacturing industry. *Proceedings of the 24th International Conference on Flexible Automation & Intelligent Manufacturing*, 241–248. https://doi.org/10.14809/faim.2014.0241

UNIVERSITAS GADJAH MADA
Optimasi Pengendalian Gas Rumah Kaca Berdasarkan Skenario Emisi Konsumsi Bahan Bakar Industri Manufaktur di Indonesia Tahun 2025-2060
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Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Kuparinen, K., Vakkilainen, E., & Tynjälä, T. (2019). Biomass-based carbon capture and utilization in kraft pulp mills. *Mitigation and Adaptation Strategies for Global Change*, *24*(7), 1213–1230. https://doi.org/10.1007/s11027-018-9833-9

Lamberts-Van Assche, H., Lavrutich, M., Compernolle, T., Thomassen, G., Thijssen, J. J. J., & Kort, P. M. (2023). CO 2 storage or utilization? A real options analysis under market and technological uncertainty. *Journal of Environmental Economics and Management*, *122*, 102902. https://doi.org/10.1016/j.jeem.2023.102902

Lattimore, B., Smith, C. T., Titus, B. D., Stupak, I., & Egnell, G. (2009). Environmental factors in woodfuel production: Opportunities, risks, and criteria and indicators for sustainable practices. *Biomass and Bioenergy*, *33*(10), 1321–1342. https://doi.org/10.1016/j.biombioe.2009.06.005

Lin, C.-C., Chen, M.-R., Chang, S.-L., Liao, W.-H., & Chen, H.-L. (2015). Workplace of manufacturing physical fitness. *Industrial Health*, *53*, 78–84.

Lin, Q., Gao, Z., Zhu, W., Chen, J., & An, T. (2023). Underestimated contribution of fugitive emission to VOCs in pharmaceutical industry based on pollution characteristics, odorous activity and health risk assessment. *Journal of Environmental Sciences*, *126*, 722–733. https://doi.org/10.1016/j.jes.2022.03.005

Linkosalmi, L., Husgafvel, R., Fomkin, A., Junnikkala, H., Witikkala, T., Kairi, M., & Dahl, O. (2016). Main factors influencing greenhouse gas emissions of wood-based furniture industry in Finland. *Journal of Cleaner Production*, *113*, 596–605. https://doi.org/10.1016/j.jclepro.2015.11.091

Liu, L., Liu, C., Wei, J., & Ge, J. (2025). Prospects of CCUS technology under resource utilization and environmental risks. *iScience*, *28*(10), 113608. https://doi.org/10.1016/j.isci.2025.113608

Liu, T.-C., Wu, Y.-C., & Chau, C.-F. (2023). An Overview of Carbon Emission Mitigation in the Food Industry: Efforts, Challenges, and Opportunities. *Processes*, *11*(7), 1993. https://doi.org/10.3390/pr11071993

Mali, A., Zhen, X., & Bakshi, B. R. (2025). Bridging net-zero, nature-positive, and people-positive goals: A case study in the polyester industry. *Computers & Chemical Engineering*, *202*, 109276. https://doi.org/10.1016/j.compchemeng.2025.109276

Mamalova, K., Galazova, Z., & Gafarov, E. (2024). *CLIMATE AGENDA: THE ROLE OF INTERNATIONAL AGREEMENTS IN COMBATING GLOBAL WARMING*. *19*.

Marchi, B., Zanoni, S., & Zavanella, L. E. (2017). An Integrated Supply Chain Model with Excess Heat Recovery. Dalam H. Lödding, R. Riedel, K.-D. Thoben, G. von Cieminski, & D. Kiritsis (Ed.), *Advances in Production Management Systems. The Path to Intelligent, Collaborative and Sustainable Manufacturing* (hlm. 479–487). Springer International Publishing.

UNIVERSITAS GADJAH MADA
Optimasi Pengendalian Gas Rumah Kaca Berdasarkan Skenario Emisi Konsumsi Bahan Bakar Industri Manufaktur di Indonesia Tahun 2025-2060
Annisa Ayu Fawzia, Dr. Emilya Nurjani, S.Si., M.Si., Dr. Rika Harini, S.Si., MP.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Margareta, Y. (2018). *Analisis Pengaruh Konsumsi Energi Terbarukan dan Tidak Terbarukan Terhadap Pertumbuhan Ekonomi di ASEAN Periode 2001-2015* [Skripsi]. Universitas Gadjah Mada.

Martawardaya, B., Nugroho, A. S., Listiyanto, E., Junifta, D. Y., & Pulungan, A. M. (2023). *Menolak Kutukan Deindustrialisasi: Menuju pengarusutamaan industrialisasi hijau*. Institute for Development of Economics and Finance (INDEF).

Martins, T., Barreto, A. C., Souza, F. M., & Souza, A. M. (2021). Fossil fuels consumption and carbon dioxide emissions in G7 countries: Empirical evidence from ARDL bounds testing approach. *Environmental Pollution*, *291*, 118093. https://doi.org/10.1016/j.envpol.2021.118093

McKibbin, W. J., Pearce, D., & Stegman, A. (2009). Climate change scenarios and long term projections. *Climatic Change*, *97*(1–2), 23–47. https://doi.org/10.1007/s10584-009-9621-3

Micieta, B., Markovic, J., & Binasova, V. (2016). Advances in Sustainable Energy Efficient Manufacturing System. *MM Science Journal*, *2016*(02), 918–926. https://doi.org/10.17973/MMSJ.2016_06_201615

Mujiyanto, S., & Tiess, G. (2013). Secure energy supply in 2025: Indonesia's need for an energy policy strategy. *Energy Policy*, *61*, 31–41. https://doi.org/10.1016/j.enpol.2013.05.119

Mulatsih, S. (2022). Industrial development and greenhouse gas emissions in Indonesia. *IOP Conference Series: Earth and Environmental Science*, *950*(1), 012064. https://doi.org/10.1088/1755-1315/950/1/012064

Munandar, A. I., Darjono, A. H., & Aprilasani, Z. (2019). *Pembangunan Berkelanjutan: Studi Kasus di Indonesia*. Bypass.

Mutaqin, D. J., Nurhayani, F. O., & Rahayu, N. H. (2022). Performa Industri Hutan Kayu dan Strategi Pemulihan Pascapandemi Covid-19. *Bappenas Working Papers*, *5*(1), 48–62. https://doi.org/10.47266/bwp.v5i1.111

Noor, Z. Z. (2025). Sustainable Production Management in Circular Economy Supply Chains. *International Journal of Industrial Engineering and Management*, *16*(2), 204–215. https://doi.org/10.24867/IJIEM-384

Nordhaus, W. (2013). *The Climate Casino- Risk, Uncertainty, and Economics for a Warming World*. Yale University Press.

Nugroho, W., & Surono, A. (2018). Rekonstruksi Hukum Pembangunan dalam Kebijakan Pengaturan Lingkungan Hidup dan Sumber Daya Alam. *Jurnal Hukum Lingkungan*, *4*(2), 77–109.

Orynycz, O., Wasiak, A., Tucki, K., & Wiszowata, K. (2021). Management of the atmospheric pollution mitigation through investment into modernization of heat generation units. *Journal of Physics: Conference Series*, *1736*(1), 012003. https://doi.org/10.1088/1742-6596/1736/1/012003

Oshita, K., Okumura, T., Takaoka, M., Fujimori, T., Appels, L., & Dewil, R. (2014). Methane and nitrous oxide emissions following anaerobic digestion of sludge

UNIVERSITAS GADJAH MADA
Optimasi Pengendalian Gas Rumah Kaca Berdasarkan Skenario Emisi Konsumsi Bahan Bakar Industri Manufaktur di Indonesia Tahun 2025-2060
Annisa Ayu Fawzia, Dr. Emilya Nurjani, S.Si., M.Si., Dr. Rika Harini, S.Si., MP.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

in Japanese sewage treatment facilities. *Bioresource Technology*, *171*, 175–181. https://doi.org/10.1016/j.biortech.2014.08.081

Panagiotopoulou, V. C., Stavropoulos, P., & Chryssolouris, G. (2022). A critical review on the environmental impact of manufacturing: A holistic perspective. *The International Journal of Advanced Manufacturing Technology*, *118*(1–2), 603–625. https://doi.org/10.1007/s00170-021-07980-w

Panjaitan, T. W. S., Dargusch, P., Wadley, D., & Aziz, A. A. (2020). Toward the best practice emissions reduction in an emerging economy: An analysis of cement manufacturing in Indonesia. *Entrepreneurship and Sustainability Issues*, *8*(1), 103–122. https://doi.org/10.9770/jesi.2020.8.1(7)

Pedersen, S. T. J., Duarte Santos, F., Van Vuuren, D., Gupta, J., Encarnação Coelho, R., Aparício, B. A., & Swart, R. (2021). An assessment of the performance of scenarios against historical global emissions for IPCC reports. *Global Environmental Change*, *66*, 102199. https://doi.org/10.1016/j.gloenvcha.2020.102199

Pemerintah Republik Indonesia. (2021). *Peraturan Pemerintah Republik Indonesia Nomor 28 Tahun 2021 tentang Penyelenggaraan Bidang Perindustrian*.

Pemerintah Republik Indonesia. (2022). *Enhanced Nationally Determined Contribution Republic of Indonesia*. Pemerintah Republik Indonesia.

Peraturan Menteri Perindustrian Nomor 8 Tahun 2023 tentang Organisasi dan Tata Kerja Kementerian Perindustrian (2023).

Peraturan Pemerintah Nomor 29 Tahun 2018 tentang Pemberdayaan Industri (2018).

Peraturan Presiden Nomor 22 Tahun 2017 tentang Rencana Umum Energi Nasional (2017).

Pierrat, E., Rupcic, L., Hauschild, M. Z., & Laurent, A. (2021). Global environmental mapping of the aeronautics manufacturing sector. *Journal of Cleaner Production*, *297*, 126603. https://doi.org/10.1016/j.jclepro.2021.126603

Prananingtyas, P. (2014). Asosiasi Usaha dalam Tinjauan Hukum Persaingan Indonesia. *MMH Jilid 43 No.4*, 607–617.

Pribadi, K. D. (2017). *Optimasi Sistem Hybrid Pembangkit Listrik Tenaga Angin Dan Pembangkit Listrik Tenaga Ombak* [Tesis]. Universitas Gadjah Mada.

Puyt, R. W., Lie, F. B., & Wilderom, C. P. M. (2023). The origins of SWOT analysis. *Long Range Planning*, *56*(3), 102304. https://doi.org/10.1016/j.lrp.2023.102304

Rahman, F. A., Aziz, M. M. A., Saidur, R., & Bakar, W. A. W. A. (2018). *A review of methods for measuring the gas emission for combustion analysis in industrial sector*. 020291. https://doi.org/10.1063/1.5066932

Román, Á. F. G., & Kabir, G. (2024). Assessing Carbon Dioxide Emissions in Manufacturing Industries: A Systematic Review. *Energies*, *17*(20), 5119. https://doi.org/10.3390/en17205119

Rubianca Benavidez, Frances J Charters, Bethanna Jackson, Thuy Thi Nguyen, & Markus Pahlow. (2022). Implementation and application of an urban pollutant load modelling tool within an ecosystem services assessment modelling

UNIVERSITAS GADJAH MADA
Optimasi Pengendalian Gas Rumah Kaca Berdasarkan Skenario Emisi Konsumsi Bahan Bakar Industri Manufaktur di Indonesia Tahun 2025-2060
Annisa Ayu Fawzia, Dr. Emilya Nurjani, S.Si., M.Si., Dr. Rika Harini, S.Si., MP.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

framework to assess water purification capabilities of blue-green infrastructure under climate change. *Urban Water Journal*, *19.0*(9), 945–961. https://doi.org/10.1080/1573062x.2022.2105724

Rusch, G. M. (2018). The development of environmentally acceptable fluorocarbons. *Critical Reviews in Toxicology*, *48*(8), 615–665. https://doi.org/10.1080/10408444.2018.1504276

Saidur, R., Atabani, A. E., & Mekhilef, S. (2011). A review on electrical and thermal energy for industries. *Renewable and Sustainable Energy Reviews*, *15*(4), 2073–2086. https://doi.org/10.1016/j.rser.2011.01.008

Salonitis, K., & Ball, P. (2013). Energy Efficient Manufacturing from Machine Tools to Manufacturing Systems. *Procedia CIRP*, *7*, 634–639. https://doi.org/10.1016/j.procir.2013.06.045

Samanaseh, V., Noor, Z. Z., Norasyiqin, S., Hafizan, C., Mazlan, M. A., & Michael, F. L. (2023). A review of scenario planning for emissions in environmental assessments. *Journal of Forecasting*, *42*(4), 924–936. https://doi.org/10.1002/for.2918

Samuelson, R. D. (2014). The unexpected challenges of using energy intensity as a policy objective: Examining the debate over the APEC energy intensity goal. *Energy Policy*, *64*, 373–381. https://doi.org/10.1016/j.enpol.2013.09.020

Santi, S., Pierobon, F., Corradini, G., Cavalli, R., & Zanetti, M. (2016). Massive wood material for sustainable building design: The Massiv–Holz–Mauer wall system. *Journal of Wood Science*, *62*(5), 416–428. https://doi.org/10.1007/s10086-016-1570-7

Sari, M. (2023). Pengaruh Biaya Lingkungan Terhadap Kinerja Keuangan Perusahaan dengan Kinerja Lingkungan sebagai Variabel Intervening (Studi Empiris pada Perusahaan Pertambangan yang Terdaftar di Bursa Efek Indonesia periode 2017-2022). *Jurnal Riset Akuntansi Tirtayasa*, *8*(2), 100. https://doi.org/10.35448/jratirtayasa.v8i2.27327

Sekretariat Jenderal Dewan Energi Nasional. (2024). *Outlook Energi Indonesia 2024*. Dewan Energi Nasional.

Sekretariat Nasional SDGs. (2024). *Indikator SDGs* [Dataset]. https://sdgs.bappenas.go.id/metadata-indikator-sdgs

Seputar Birokrasi. (2023, Oktober). Birokrasi Pemerintah Dalam Menangani Masalah Lingkungan: Antara Harapan dan Kenyataan. *Seputar Birokrasi- Artikel Seputar Pemerintahan*. https://seputarbirokrasi.com/birokrasi-pemerintah-dalam-menangani-masalah-lingkungan-antara-harapan-dan-kenyataan/

Siagian, U., Yuwono, B., Fujimori, S., & Masui, T. (2017). Low-Carbon Energy Development in Indonesia in Alignment with Intended Nationally Determined Contribution (INDC) by 2030. *Energies*, *10*(1), 52. https://doi.org/10.3390/en10010052

Simangunsong, B. C., & Wulandari, R. A. (2016). Analisis Daya Saing Produk Pulp dan Kertas Indonesia di Pasar Dunia. *Jurnal Ilmu Teknologi Kayu Tropis*, *14*(1), 87–101.

UNIVERSITAS GADJAH MADA
Optimasi Pengendalian Gas Rumah Kaca Berdasarkan Skenario Emisi Konsumsi Bahan Bakar Industri Manufaktur di Indonesia Tahun 2025-2060
Annisa Ayu Fawzia, Dr. Emilya Nurjani, S.Si., M.Si., Dr. Rika Harini, S.Si., MP.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Sinaga, C. (2021). *Kombinasi Instrumen Sukarela dan Instrumen Command and Control Terhadap Penataan Lingkungan pada Kegiatan Perhotelan*. *12*.

Soeder, D. J. (2021). Greenhouse gas sources and mitigation strategies from a geosciences perspective. *Advances in Geo-Energy Research*, *5*(3), 274–285. https://doi.org/10.46690/ager.2021.03.04

Song, B., Ao, Y., Xiang, L., & Lionel, K. Y. N. (2018). Data-driven Approach for Discovery of Energy Saving Potentials in Manufacturing Factory. *Procedia CIRP*, *69*, 330–335. https://doi.org/10.1016/j.procir.2017.11.143

Sovacool, B. K. (2021). Decarbonizing the food and beverages industry: A critical and systematic review of developments, sociotechnical systems and policy options. *Renewable and Sustainable Energy Reviews*, 1–35.

Subianto, P., & Raka, G. (2024). *Visi, Misi dan Program Prabowo Gibran*. Indonesia Maju.

Sumarsid, S., Asti, E. G., Pangestuti, R. S., & Tartiani, Y. A. T. (2023). *Manajemen Strategi: Pendekatan secara Teori dan Kajian Kasus*. Penerbit Mitra Wacana Media.

Supriyono, H. (2011). *Kajian Yuridis Sistem Penaatan dan Penegakan Hukum Lingkungan Administratif dalam Pengendalian Dampak Lingkungan* [Disertation]. Universitas Indonesia.

Suratmo, F. G. (2000). Prospek dan Tantangan pengembangan Industri Pulp dan Kertas Indonesia dalam Era Ekolabeling dan Otonomi Daerah. *Jurnal Manajemen Hutan Tropika*, *6*(2), 71–75.

Surianti, Utami, A. N., Permatasari, M. A., Bendiyasa, I. M., Astuti, W., & Petrus, H. T. B. M. (2020). Valuable Metals Precipitation of Low Grade Nickel Ore Leachate Using Sodium Hydroxide. *IOP Conference Series: Materials Science and Engineering*, *742*(1), 012043. https://doi.org/10.1088/1757-899X/742/1/012043

Telle, K. (2013). Monitoring and enforcement of environmental regulations. *Journal of Public Economics*, *99*, 24–34. https://doi.org/10.1016/j.jpubeco.2013.01.001

Tuononen, E., & Soukka, R. (2022). *Roadmap Towards Carbon Neutrality in Heavy Machinery Manufacturing and Global Service Operations- Case: Ponsse Plc.* [Tesis]. Lahti University of Technology.

Undang-Undang Nomor 16 Tahun 2016 tentang Pengesahan Paris Agreement to the United Nations Framework Convention on Climate Change (Persetujuan Paris Atas Konvensi Kerangka Kerja Perserikatan Bangsa-Bangsa Mengenai Perubahan Iklim) (2016).

Undang-Undang Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup (2009).

Undang-Undang Nomor 59 Tahun 2024 tentang Rencana Pembangunan Jangka Panjang Nasional Tahun 2025-2045 (2024).

United Nations. (1992). *Rio Declaration 1992*. United Nations.

UNIVERSITAS GADJAH MADA
Optimasi Pengendalian Gas Rumah Kaca Berdasarkan Skenario Emisi Konsumsi Bahan Bakar Industri Manufaktur di Indonesia Tahun 2025-2060
Annisa Ayu Fawzia, Dr. Emilya Nurjani, S.Si., M.Si., Dr. Rika Harini, S.Si., MP.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Veven, M. (2023). *Kajian Optimasi Potensi Energi Terbarukan dalam Rangka Transisi Energi Periode 2023-2033 (Studi Kasus Provinsi Bengkulu)* [Tesis]. Universitas Gadjah Mada.

Victor-Gallardo, L., Roccard, J., Campos, P., Malley, C. S., Lefevre, E. N., & Quiros-Tortos, J. (2022). Identifying cross-sectoral policy synergies for decarbonization: Towards short-lived climate pollutant mitigation action in Costa Rica. *Journal of Cleaner Production*, *379*, 134781. https://doi.org/10.1016/j.jclepro.2022.134781

Wang, C., Sun, H., & Wang, Y. (2025). Synergy and Effectiveness Evaluation of Carbon Policy and Government Subsidies: Variational Inequality Model Based on Supply Chain Network. *Mathematics*, *13*(7), 1099. https://doi.org/10.3390/math13071099

Wang, W., Wang, Y., Zhang, X., & Zhang, D. (2021). Effects of Government Subsidies on Production and Emissions Reduction Decisions under Carbon Tax Regulation and Consumer Low-Carbon Awareness. *International Journal of Environmental Research and Public Health*, *18*(20), 10959. https://doi.org/10.3390/ijerph182010959

Wibisana, A. G. (2019). Instrumen Ekonomi, Command and Control, dan Instrumen Lainnya: Kawan atay Lawan? Suatu Tinjauan Berdasarkan Smart Regulation. *Bina Hukum Lingkungan*, *4*(1), 172. https://doi.org/10.24970/bhl.v4i1.104

Wicaksono, C. A. (2024). Pengaruh Biaya Lingkungan, Kinerja Lingkungan, dan Kepemilikan Asing Terhadap Kinerja Keuangan Perusahaan. *Ekonomi, Keuangan, Investasi dan Syariah (EKUITAS)*, *5*(4), 627–635. https://doi.org/10.47065/ekuitas.v5i4.5066

Wicaksono, H. B., & Hadiyanto, H. (2023). Pemodelan Proyeksi Supply and Demand Energi di Kota Semarang Tahun 2020-2030 Menggunakan Perangkat Lunak Low-Emission Analysis Platform (LEAP). *Jurnal Energi Baru dan Terbarukan*, *4*(1), 15–41. https://doi.org/10.14710/jebt.2023.16900

Willyard, K. A. (2020). A license to pollute? Opportunities, incentives, and influences on oil and gas venting and flaring in Texas. *Energy Research & Social Science*, *62*, 101381. https://doi.org/10.1016/j.erss.2019.101381

Wiśniewski, P., & Kistowski, M. (2020). Greenhouse Gas Emissions from Cultivation of Plants Used for Biofuel Production in Poland. *Atmosphere*, *11*(4), 394. https://doi.org/10.3390/atmos11040394

World Resources Institute. (2024, Juli 31). Faktor Emisi Nasional yang Terstandardisasi sebagai Fondasi Perjalanan Dekarbonisasi. *WRI Indonesia*. https://wri-indonesia.org/id/wawasan/faktor-emisi-nasional-yang-terstandardisasi-sebagai-fondasi-perjalanan-dekarbonisasi

Xu, B., & Lin, B. (2022). Exploring the spatial distribution of distributed energy in China. *Energy Economics*, *107*, 105828. https://doi.org/10.1016/j.eneco.2022.105828

Xu, D., Abbas, S., Rafique, K., & Ali, N. (2023). The race to net-zero emissions: Can green technological innovation and environmental regulation be the potential

UNIVERSITAS GADJAH MADA
Optimasi Pengendalian Gas Rumah Kaca Berdasarkan Skenario Emisi Konsumsi Bahan Bakar Industri Manufaktur di Indonesia Tahun 2025-2060
Annisa Ayu Fawzia, Dr. Emilya Nurjani, S.Si., M.Si., Dr. Rika Harini, S.Si., MP.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

pathway to net-zero emissions? *Technology in Society*, *75*, 102364. https://doi.org/10.1016/j.techsoc.2023.102364

Xu, X., & Chen, Y. (2016). Air emissions from the oil and natural gas industry. *International Journal of Environmental Studies*, *73*(3), 422–436. https://doi.org/10.1080/00207233.2016.1165483

Yuliando, D. T. (2017). *Strategi Pengendalian Pencemaran Gas Karbon Monoksida (CO) oleh Aktivitas Transportasi di Kota Padang, Sumatera Barat* [Tesis]. Institut Teknologi Sepuluh Nopember.

Zaekhan, Djalal Nachrowi, N., Hartono, D., & Rosita, T. (2022). What drivers the decoupling of CO_2 emissions in the Indonesian manufacturing industry? An analysis of firm level factors. *International Journal of Sustainable Energy*, *41*(6), 538–555. https://doi.org/10.1080/14786451.2021.1945602

Zahroh, U. A., & Najicha, F. U. (2022). Problems and Challenges on Environmental Law Enforcement in Indonesia: AMDAL in the Context of Administrative Law. *Indonesian State Law Review (ISLRev)*, *5*(2), 53–66. https://doi.org/10.15294/islrev.v5i2.46511

Zhang, B., Peng, S., Xu, X., & Wang, L. (2011). Embodiment Analysis for Greenhouse Gas Emissions by Chinese Economy Based on Global Thermodynamic Potentials. *Energies*, *4*(11), 1897–1915. https://doi.org/10.3390/en4111897

Zhang, Q., Wang, Y., & Liu, L. (2023). Carbon Tax or Low-Carbon Subsidy? Carbon Reduction Policy Options under CCUS Investment. *Sustainability*, *15*(6), 5301. https://doi.org/10.3390/su15065301

Zhou, A., Zhou, J., Si, J., & Wang, G. (2023). Study on Embodied CO2 Emissions and Transfer Pathways of Chinese Industries. *Sustainability*, *15*(3), 2215. https://doi.org/10.3390/su15032215

Zhu, Y., Li, G., Liu, S., Yu, S., Hou, G., Zha, Z., Zhang, Q., Liu, S., Jing, C., & Chu, J. (2024). Hollow waveguide CO2 laser sensing system for rapid detection of trace sulfur hexafluoride (SF6) gas. *Infrared Physics & Technology*, *136*, 105045. https://doi.org/10.1016/j.infrared.2023.105045