UNIVERSITAS GADJAH MADA
Dinamika Sistem Pengelolaan Baterai Bekas Kendaraan Listrik pada Sektor Formal dan Informal dengan Pemodelan Berbasis Agen
Frieda Farchiyah, Prof. Ir. Bertha Maya Sopha, S.T., M.Sc., Ph.D., IPU., ASEAN.Eng.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

DAFTAR PUSTAKA

Albertsen, L., Richter, J. L., Peck, P., Dalhammar, C., & Plepys, A. (2021). Circular business models for electric vehicle lithium-ion batteries: An analysis of current practices of vehicle manufacturers and policies in the EU. *Resources, Conservation and Recycling, 172*, 105658. https://doi.org/10.1016/j.resconrec.2021.105658

An, L., Linderman, M., Qi, J., Shortridge, A., & Liu, J. (2005). Exploring complexity in a human–environment system: An agent-based spatial model for multidisciplinary and multiscale integration. *Annals of the Association of American Geographers, 95*(1), 54–79. https://doi.org/10.1111/j.1467-8306.2005.00450.x

Bocken, N. M. P., Schuit, C. S. C., & Kraaijenhagen, C. (2018). Experimenting with a circular business model: Lessons from eight cases. *Environmental Innovation and Societal Transitions, 28*, 79–95. https://doi.org/10.1016/j.eist.2018.02.001

Bonabeau, E. (2002). Agent-based modeling: Methods and techniques for simulating human systems. *Proceedings of the National Academy of Sciences, 99*(Suppl. 3), 7280–7287. https://doi.org/10.1073/pnas.082080899

Borshchev, A., & Filippov, A. (2004). From system dynamics and discrete event to practical agent based modeling: Reasons, techniques, tools. *Proceedings of the 22nd International Conference of the System Dynamics Society*. System Dynamics Society.

Chi, X., Streicher-Porte, M., Wang, M. Y. L., & Reuter, M. A. (2011). Informal electronic waste recycling: A sector review with special focus on China. *Waste Management, 31*(4), 731–742. https://doi.org/10.1016/j.wasman.2011.01.029

Chirumalla, K., Ericsson, Å., & Leiringer, R. (2024). Second-life business models for electric vehicle batteries: A review of current status and future prospects. *Journal of Cleaner Production, 434*, 140020. https://doi.org/10.1016/j.jclepro.2023.140020

Dutta, D. (2021). Informal recycling sector in India: A review of the present scenario, issues and challenges. *SAGE Open, 11*(1). https://doi.org/10.1177/2158244021997175

Ellen MacArthur Foundation, & Granta Design. (2015). *Circularity indicators: An approach to measuring circularity — Methodology*. Ellen MacArthur Foundation.

Fan, E., Li, L., Wang, Z., Lin, J., Huang, Y., Yao, Y., Chen, R., & Wu, F. (2020). Sustainable recycling technology for Li-ion batteries and beyond: Challenges and future prospects. *Chemical Reviews, 120*(14), 7020–7063. https://doi.org/10.1021/acs.chemrev.9b00535

Gabungan Industri Kendaraan Bermotor Indonesia (GAIKINDO). (2025). *Persaingan makin ketat, pangsa pasar mobil listrik di Indonesia tembus 10%*. Kontan. https://industri.kontan.co.id

UNIVERSITAS
GADJAH MADA
**Dinamika Sistem Pengelolaan Baterai Bekas Kendaraan Listrik pada Sektor Formal dan Informal dengan
Pemodelan Berbasis Agen**
Frieda Farchiyah, Prof. Ir. Bertha Maya Sopha, S.T., M.Sc., Ph.D., IPU., ASEAN.Eng.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The circular economy – A new sustainability paradigm? *Journal of Cleaner Production, 143*, 757–768. https://doi.org/10.1016/j.jclepro.2016.12.048

Gilbert, N. (2008). *Agent-based models*. SAGE Publications.

Gong, B., Chen, Z., & Gao, Y. (2024). Dynamic competition and cooperation between formal and informal sectors in EV battery reverse supply chains. *Supply Chain Management: An International Journal, 29*(1), 1–18. https://doi.org/10.1108/SCM-01-2023-0020

Gong, B., Sun, Y., Gu, Y., Li, Z., Yang, S., & Yin, Z. (2022). Can formal and informal recyclers coexist? A game-theoretic analysis of electric vehicle battery recycling. *International Journal of Logistics Research and Applications, 26*(10), 1126–1147. https://doi.org/10.1080/13675567.2022.2050443

Grimm, V., Revilla, E., Berger, U., Jeltsch, F., Mooij, W. M., Railsback, S. F., … DeAngelis, D. L. (2005). Pattern-oriented modeling of agent-based complex systems: Lessons from ecology. *Science, 310*(5750), 987–991. https://doi.org/10.1126/science.1116681

Grimm, V., Berger, U., DeAngelis, D. L., Polhill, J. G., Giske, J., & Railsback, S. F. (2010). The ODD protocol: A review and first update. *Ecological Modelling, 221*(23), 2760–2768. https://doi.org/10.1016/j.ecolmodel.2010.08.019

Regulation (EU) 2023/1542 of the European Parliament and of the Council of 12 July 2023 concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC. *Official Journal of the European Union, L 191*, 1–117.

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods, 18*(1), 59–82. https://doi.org/10.1177/1525822X05279903

Harper, G., Sommerville, R., Kendrick, E., Driscoll, L., Slater, P., Stolkin, R., Walton, A., Christensen, P., Heidrich, O., Lambert, S., Abbott, A., Ryder, K., Gaines, L., & Anderson, P. (2019). Recycling lithium-ion batteries from electric vehicles. *Nature, 575*(7781), 75–86. https://doi.org/10.1038/s41586-019-1682-5

Hinchliffe, D., Anenberg, S., & Haines, A. (2020). Partnership-based integration of informal recyclers into formal waste management systems: Lessons for urban sustainability transitions. *Resources, Conservation and Recycling, 161*, 104930. https://doi.org/10.1016/j.resconrec.2020.104930

Hou, X., Liu, C., & Zhang, Y. (2025). Agent-based modeling of smartphone recycling behavior: Integrating behavioral norms and economic decisions. *Preprints*. https://doi.org/10.20944/preprints202506.1022.v1

IEA. (2021). *Global EV outlook 2021: Accelerating ambitions despite the pandemic*. International Energy Agency. https://www.iea.org/reports/global-ev-outlook-2021

UNIVERSITAS GADJAH MADA
Dinamika Sistem Pengelolaan Baterai Bekas Kendaraan Listrik pada Sektor Formal dan Informal dengan Pemodelan Berbasis Agen
Frieda Farchiyah, Prof. Ir. Bertha Maya Sopha, S.T., M.Sc., Ph.D., IPU., ASEAN.Eng.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

IESR. (2024). *Perkembangan ekosistem kendaraan listrik di Indonesia 2024*. Institute for Essential Services Reform. https://iesr.or.id

IPCC. (2018). *Global warming of 1.5°C: An IPCC special report*. Intergovernmental Panel on Climate Change. https://www.ipcc.ch/sr15/

Indopremier. (2025). *Lewat Electrum, TOBA bidik peluang bisnis EV roda dua senilai US$7 miliar per tahun*. https://www.indopremier.com

Jiang, Z.-Z., Li, K., Tang, C. S., & Yang, S. A. (2026). Offering electric vehicle battery swapping as a service: Electric vehicle manufacturers or battery producers? *Naval Research Logistics*. https://doi.org/10.1002/nav.70065

Kementerian Perindustrian (Kemenperin). (2025). *Indonesia kebanjiran limbah baterai kendaraan listrik 3 tahun lagi*. CNN Indonesia. https://www.cnnindonesia.com

Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling, 127*, 221–232. https://doi.org/10.1016/j.resconrec.2017.09.005

Li, L., Zhang, X., Li, M., Chen, R., Wu, F., Amine, K., & Lu, J. (2020). The recycling of spent lithium-ion batteries: A review of current processes and technologies. *Electrochemical Energy Reviews, 3*(2), 322–355. https://doi.org/10.1039/C9GC02230A

Liang, Y., Liu, C., & Lim, M. K. (2022). Dual-channel reverse logistics network design for end-of-life lithium-ion batteries. *International Journal of Production Economics, 252*, 108563. https://doi.org/10.1016/j.ijpe.2022.108563

Lin, Z., Wang, Y., & Chen, X. (2026). Joint environmental policies for EV battery recycling under carbon neutrality targets. *Resources, Conservation and Recycling, 205*, 107520. https://doi.org/10.1016/j.resconrec.2025.107520

Lindhqvist, T. (2000). *Extended Producer Responsibility in Cleaner Production: Policy Principle to Promote Environmental Improvements of Product Systems* [Doctoral dissertation, Lund University]. IIIEE, Lund University.

Liu, C., Lin, J., Cao, H., Zhang, Y., & Sun, Z. (2022). Recycling of spent lithium-ion batteries in view of lithium recovery: A critical review. *Energy Reports, 8*, 7792–7805. https://doi.org/10.1016/j.egyr.2022.03.016

Macal, C. M., & North, M. J. (2010). Tutorial on agent-based modelling and simulation. *Journal of Simulation, 4*(3), 151–162. https://doi.org/10.1057/jos.2010.3

Mahanani, & Kristianingsih, (2024). *E-waste management in Indonesia* [Materi presentasi]. https://www.usascp.org

Nauri, A., Trihadiningrum, Y., & Trihadiningrum, Y. (2024). Pengelolaan baterai kendaraan listrik sebagai limbah B3 di Indonesia. *Jurnal Teknologi Lingkungan, 25*(1), 45–56.

UNIVERSITAS
GADJAH MADA
**Dinamika Sistem Pengelolaan Baterai Bekas Kendaraan Listrik pada Sektor Formal dan Informal dengan
Pemodelan Berbasis Agen**
Frieda Farchiyah, Prof. Ir. Bertha Maya Sopha, S.T., M.Sc., Ph.D., IPU., ASEAN.Eng.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Novizayanti, T., Sopha, B. M., Kusumastuti, R. D., & Imtiyaz, S. (2021). Agent-based model for EV adoption in Indonesia. *World Electric Vehicle Journal, 12*(2), 73. https://doi.org/10.3390/wevj12020073

OECD. (2024). *Extended Producer Responsibility: Basic Facts and Key Principles* (OECD Environment Policy Papers No. 41). OECD Publishing. https://doi.org/10.1787/67587b0b-en

Peraturan Menteri Lingkungan Hidup dan Kehutanan Republik Indonesia Nomor 12 Tahun 2021 tentang Baku Mutu Emisi Daur Ulang Baterai Litium.

Peraturan Menteri Lingkungan Hidup dan Kehutanan Republik Indonesia Nomor P.75 Tahun 2019 tentang Peta Jalan Pengurangan Sampah oleh Produsen.

Peraturan Pemerintah Republik Indonesia Nomor 22 Tahun 2021 tentang Penyelenggaraan Perlindungan dan Pengelolaan Lingkungan Hidup.

Peraturan Pemerintah Republik Indonesia Nomor 81 Tahun 2012 tentang Pengelolaan Sampah Rumah Tangga dan Sampah Sejenis Sampah Rumah Tangga.

Peraturan Presiden Republik Indonesia Nomor 55 Tahun 2019 tentang Percepatan Program Kendaraan Bermotor Listrik Berbasis Baterai (*Battery Electric Vehicle*) untuk Transportasi Jalan.

Purwani, A., Hidayat, T., & Pratama, Y. (2025). Informal sector participation in end-of-life EV battery collection in Jakarta. *IOP Conference Series: Earth and Environmental Science, 1490*(1), 012009. https://doi.org/10.1088/1755-1315/1490/1/012009

Readers.id. (2026). *Electrum rasakan dampak positif dari penggunaan motor listrik ojol*. https://www.readers.id

Ribeiro da Silva, J. L., de Siqueira Braga, S. L., Rodrigues, M. T., & Pimentel, M. F. (2023). Circular economy and sustainability in EV battery management. *Sustainable Energy Technologies and Assessments, 56*, 103089. https://doi.org/10.1016/j.seta.2023.103089

Rykiel, E. J. (1996). Testing ecological models: The meaning of validation. *Ecological Modelling, 90*(3), 229–244. https://doi.org/10.1016/0304-3800(95)00152-2

Salim, H. K., Stewart, R. A., Sahin, O., & Dudley, M. (2023). Circular economy pathways for lithium-ion battery recycling. *Frontiers in Sustainability, 1*(1), 3. https://doi.org/10.55670/fpll.fusu.1.1.3

Sargent, R. G. (2013). Verification and validation of simulation models. *Journal of Simulation, 7*(1), 12–24. https://doi.org/10.1057/jos.2012.20

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs, H., & Jinks, C. (2018). Saturation in qualitative research: Exploring its conceptualization and operationalization. *Quality & Quantity, 52*(4), 1893–1907. https://doi.org/10.1007/s11135-017-0574-8

Dinamika Sistem Pengelolaan Baterai Bekas Kendaraan Listrik pada Sektor Formal dan Informal dengan
Pemodelan Berbasis Agen
Frieda Farchiyah, Prof. Ir. Bertha Maya Sopha, S.T., M.Sc., Ph.D., IPU., ASEAN.Eng.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Simon, H. A. (1955). A behavioral model of rational choice. *The Quarterly Journal of Economics, 69*(1), 99–118. https://doi.org/10.2307/1884852

Sistem Informasi Pengelolaan Sampah Nasional (SIPSN) KLHK. (2024). *Capaian kinerja pengelolaan sampah nasional*. https://sipsn.menlhk.go.id

Sopha, B. M., & Sakti, I. L. (2020). *Pemodelan dan simulasi berbasis agen*. UGM Press. https://ugmpress.ugm.ac.id/id/product/teknik/pemodelan-dan-simulasi-berbasis-agen

Sopha, B. M., Trisnawati, H., & Novizayanti, T. (2022). Circular economy strategies for EV battery management: A system thinking perspective. *Sustainability, 14*(10), 5950. https://doi.org/10.3390/su14105950

Sterman, J. D. (2000). *Business Dynamics: Systems Thinking and Modeling for a Complex World*. Irwin/McGraw-Hill.

Sudiantini, D., Kusumastuti, R. D., & Novizayanti, T. (2025). Optimal reverse logistics network design for EV batteries in Jakarta: A mixed-integer linear programming approach. *World Electric Vehicle Journal, 16*(8), 476. https://doi.org/10.3390/wevj16080476

Suganya, S., Ramkumar, R., & Muthukumar, P. (2024). A comprehensive review on lithium-ion battery technology: Recent advances and challenges. *Results in Engineering, 22*, 103047. https://doi.org/10.1016/j.rineng.2024.103047

Syahr, R. H., & Putra, A. R. (2023). Formal and informal sector interaction in end-of-life EV battery management in Indonesia: A policy analysis. *AIP Conference Proceedings, 2806*(1), 050006. https://doi.org/10.1063/5.0174797

Tang, Y., Zhang, Q., Li, Y., Li, H., Pan, X., & McLellan, B. (2023). The social-economic-environmental impacts of recycling retired EV batteries under reward-penalty mechanism. *Journal of Cleaner Production, 389*, 135269. https://doi.org/10.1016/j.jclepro.2022.135269

ten Broeke, G., van Voorn, G., & Ligtenberg, A. (2016). Which sensitivity analysis method should I use for my agent-based model? *Journal of Artificial Societies and Social Simulation, 19*(1), 5. https://doi.org/10.18564/jasss.2857

Tian, X., Liu, C., Lim, M. K., & Liang, Y. (2024). GIS-based agent-based modeling for cross-regional EV battery recycling network. *Journal of Cleaner Production, 434*, 141054. https://doi.org/10.1016/j.jclepro.2024.141054

Undang-Undang Republik Indonesia Nomor 18 Tahun 2008 tentang Pengelolaan Sampah.

United Nations Environment Programme (UNEP). (2023). *Indonesia: Pollution — Interactive country fiches*. https://dicf.unepgrid.ch

United Nations University (UNU). (2020). *Global e-waste statistics partnership: Monitoring, statistics and the circular economy*. UNU Publications. https://collections.unu.edu/eserv/UNU:7737/GeSI_2020.pdf

UNIVERSITAS
GADJAH MADA
**Dinamika Sistem Pengelolaan Baterai Bekas Kendaraan Listrik pada Sektor Formal dan Informal dengan
Pemodelan Berbasis Agen**
Frieda Farchiyah, Prof. Ir. Bertha Maya Sopha, S.T., M.Sc., Ph.D., IPU., ASEAN.Eng.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Wang, B., Liu, Z., Cao, L., & Qu, J. (2022). Collaboration between formal and informal sectors in EV battery recycling: Evidence from Guiyu, China. *Sustainability, 14*(3), 1792. https://doi.org/10.3390/su14031792

Wang, L., Wang, X., & Yang, W. (2020). Optimal design of electric vehicle battery recycling network: From the perspective of electric vehicle manufacturers. *Applied Energy, 275*, 115341. https://doi.org/10.1016/j.apenergy.2020.115124

Wang, Y., Hao, H., & Liu, Z. (2024). Competition and cooperation between formal and informal recyclers in electric vehicle battery supply chains under different market structures. *Computers & Industrial Engineering, 188*, 110294. https://doi.org/10.1016/j.cie.2024.110294

Wang, Z., Gu, F., & Zhang, W. (2025). Coevolution of consumers and recyclers in EV battery reverse supply chains. *Applied Energy, 377*, 125235. https://doi.org/10.1016/j.apenergy.2024.125235

Wei, F., Zhao, X., & Wang, Y. (2022). Tripartite evolutionary game analysis of EV battery recycling: Government, manufacturers, and consumers. *Frontiers in Environmental Science, 10*, 1071688. https://doi.org/10.3389/fenvs.2022.1071688

Widmer, R., Oswald-Krapf, H., Sinha-Khetriwal, D., Schnellmann, M., & Böni, H. (2005). Global perspectives on e-waste. *Environmental Impact Assessment Review, 25*(5), 436–458. https://doi.org/10.1016/j.eiar.2005.04.001

Xiao, Z., Chen, Y., & Li, M. (2024). Information sharing and subsidy policy in EV battery reverse supply chains. *Omega, 125*, 103001. https://doi.org/10.1016/j.omega.2024.103001

Zeng, X., Li, J., & Singh, N. (2014). Recycling of spent lithium-ion battery: A critical review. *Critical Reviews in Environmental Science and Technology, 44*(10), 1129–1165. https://doi.org/10.1080/10643389.2013.763578

Zhang, L., Huang, J., & Yang, C. (2023). State-of-health estimation and remaining useful life prediction for lithium-ion batteries. *Journal of Energy Storage, 64*, 106210. https://doi.org/10.1016/j.est.2022.106210

Zhang, X., Liu, C., & Gu, F. (2024). Policy constraints in EV battery reverse logistics optimization. *International Journal of Production Research, 62*(5), 1890–1908. https://doi.org/10.1080/00207543.2023.2280012

Zhao, X., Li, Y., & Zhang, W. (2025). Recycling strategies for electric vehicle batteries under dynamic evolutionary game theory. *World Electric Vehicle Journal, 16*(11), 625. https://doi.org/10.3390/wevj16110625

Zhu, X., Chen, Y., & Zhao, R. (2024). Critical materials and circular economy in EV battery life cycles. *Cell Reports Physical Science, 5*(3), 100238. https://doi.org/10.1016/j.xcrp.2024.100238