

REFERENCES

- Accu Weather. (2025). *Denpasar, Bali, Indonesia Air Quality Index*. AccuWeather. <https://www.accuweather.com/en/id/denpasar/202196/air-quality-index/202196>
- Afuye, G., Nduku, L., Kalumba, A. M., Santos, C., Orimoloye, I., Ojeh, V., Thamaga, H., & Sibandze, P. (2024). Global trend assessment of land use and land cover changes: A systematic approach to future research development and planning. *Journal of King Saud University - Science*, 36, 103262. <https://doi.org/10.1016/j.jksus.2024.103262>
- Aigbokhan, O., Pelemo, O., Ogoliegbune, O., Essien, N., Ekundayo, A., & Adamu, S. (2022). Comparing Machine Learning Algorithms in Land Use Land Cover Classification of Landsat 8 (OLI) Imagery. *Asian Research Journal of Mathematics*, 62–74. <https://doi.org/10.9734/arjom/2022/v18i330367>
- Aram, F., Solgi, E., & Holden, G. (2019). The role of green spaces in increasing social interactions in neighborhoods with periodic markets. *Habitat International*, 84. <https://doi.org/10.1016/j.habitatint.2018.12.004>
- Asnawi, N. H., Lam, K. C., Che Rose, R. A., Widiawaty, M., Dede, M., & Nuralissa, F. (2024). Impacts of urban land use and land cover changes on land surface temperature in Kuala Lumpur, Malaysia. *Malaysian Journal of Society and Space*, 99–120. <https://doi.org/10.17576/geo-2024-2001-07>
- Bhungeni, O., Ramjatan, A., & Gebreslasie, M. (2024). Evaluating Machine-Learning Algorithms for Mapping LULC of the uMngeni Catchment Area, KwaZulu-Natal. *Remote Sensing*, 16(12). <https://doi.org/10.3390/rs16122219>
- Bishop, M. , C. (2006). *Pattern Recognition and Machine Learning*. Springer New York. <https://link.springer.com/book/9780387310732>
- BPS-Statistics Indonesia Bali Province. (2025, March 3). *Number of Vehicles by Type in Bali Province, 2024*. Statistics Indonesia Bali Province. Statistics Indonesia Bali Province

- Breiman, L. (2001). Random Forests. *Machine Learning*, 45(1), 5–32.
<https://doi.org/10.1023/A:1010933404324>
- Chander, G., Markham, B. L., & Helder, D. L. (2009). Summary of current radiometric calibration coefficients for Landsat MSS, TM, ETM+, and EO-1 ALI sensors. *Remote Sensing of Environment*, 113(5), 893–903.
<https://doi.org/10.1016/J.RSE.2009.01.007>
- Cheewinsiriwat, P., Duangyiwa, C., Sukitpaneenit, M., & Stettler, M. E. J. (2022). Influence of Land Use and Meteorological Factors on PM2.5 and PM10 Concentrations in Bangkok, Thailand. *Sustainability*, 14(9).
<https://doi.org/10.3390/su14095367>
- Chen, J., Hoogh, K. de, Gulliver, J., Hoffmann, B., Hertel, O., Ketzler, M., Bauwelinck, M., Donkelaar, A., Hvidtfeldt, U., Katsouyanni, K., Janssen, N., Martin, R., Samoli, E., Schwarze, P., Bellander, T., Strak, M., Wolf, K., Vienneau, D., & Hoek, G. (2019). A comparison of linear regression, regularization, and machine learning algorithms to develop Europe-wide spatial models of fine particles and nitrogen dioxide. *Environment International*, 130. <https://doi.org/10.1016/j.envint.2019.104934>
- Chowdhury, Md. S. (2023). Comparison of Accuracy and Reliability of Random Forest, Support Vector Machine, Artificial Neural Network and Maximum Likelihood method in Land use/cover Classification of Urban Setting. *Environmental Challenges*. <https://doi.org/10.1016/j.envc.2023.100800>
- Dagnachew, M., Kebede, A., Moges, A., & Abebe, A. (2020). Land use land cover changes and its drivers in gojeb river catchment, omo gibe basin, Ethiopia. *Journal of Agriculture and Environment for International Development*, 114(1), 33–56. <https://doi.org/10.12895/jaeid.20201.842>
- Fayyad, U., Piatetsky-Shapiro, G., & Smyth, P. (1996). *From Data Mining to Knowledge Discovery in Databases* (© AAAI) (Vol. 17). www.ffi.com/
- Ghobadi, M., & Ahmadipari, M. (2023). Spatial analysis of land use/land cover (LULC) changes to support sustainable land management based on landscape

- metrics. *Earth Observation and Geomatics Engineering*, 7(1).
<https://doi.org/10.22059/eoge.2023.357777.1140>
- Gislason, P. O., Benediktsson, J. A., & Sveinsson, J. R. (2006). Random Forests for land cover classification. *Pattern Recognition Letters*, 27(4), 294–300.
<https://doi.org/10.1016/J.PATREC.2005.08.011>
- Goward, S. N., Masek, J. G., Williams, D. L., Irons, J. R., & Thompson, R. J. (2001). The Landsat 7 mission: Terrestrial research and applications for the 21st century. *Remote Sensing of Environment*, 78(1–2), 3–12.
[https://doi.org/10.1016/S0034-4257\(01\)00262-0](https://doi.org/10.1016/S0034-4257(01)00262-0)
- Harindranathan Nair, M. (2015). *Impacts of Impervious Surfaces on the Environment*. www.ijesi.org||Volumewww.ijesi.org
- Hasan, S. S., Zhen, L., Miah, M., Ahamed, T., & Samie, A. (2020). Impact of land use change on ecosystem services: A review. *Environmental Development*, 34, 100527. <https://doi.org/10.1016/j.envdev.2020.100527>
- Hastie, T., Tibshirani, R., & Friedman, J. (2009). *The Elements of Statistical Learning* (2nd ed.). Springer. <https://doi.org/https://doi.org/10.1007/978-0-387-84858-7>
- Hoek, G., Beelen, R., Hoogh, K. de, Vienneau, D., Gulliver, J., Fischer, P., & Briggs, D. (2008). A review of land-use regression models to assess spatial variation of outdoor air pollution. *Atmos Environ*, 42.
<https://doi.org/10.1016/j.atmosenv.2008.05.057>
- Jadhav, T., Tanishq, T., Jagadish, S., Gaikwad, M., Wagle, S., Jayaswal, R., & Patil, S. (2023). *Predicting Urban Land Cover Using Classification: A Machine Learning Approach*. 450–454. <https://doi.org/10.1109/R10-HTC57504.2023.10461930>
- Kalphana, K. R., Ramela, K. R., Aanjankumar, S., Nagalakshmi, T., & Sakthivel, B. (2024). Review of Remote Sensing, GIS and Soft Computing Tool for Predicting the Land-use and Environment Changes. *Global Nest Journal*, 26(10). <https://doi.org/10.30955/gnj.06276>

- Kementerian Kesehatan RI. (2024, July 10). *Survei Kesehatan Indonesia (SKI) 2023 - Badan Kebijakan Pembangunan Kesehatan: BKPK Kemenkes*. Badan Kebijakan Pembangunan Kesehatan | BKPK Kemenkes. <https://www.badankebijakan.kemkes.go.id/hasil-ski-2023/>
- Khan, S., Bhardwaj, A., & Sakthivel, M. (2024). Accuracy Assessment of Land Use Land Cover Classification Using Machine Learning Classifiers in Google Earth Engine; A Case Study of Jammu District. *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences - ISPRS Archives*, 48(4), 263–268. <https://doi.org/10.5194/isprs-archives-XLVIII-4-2024-263-2024>
- Kipterer, J. K., Boitt, M. K., & Mundia, C. N. (2025). Comparative Analysis of Machine Learning Algorithms for Optimal Land Use and Land Cover Classification: Guiding Method Selection for Resource-Limited Settings in Tiatiy, Baringo County, Kenya. *Journal of Geoscience and Environment Protection*, 13(04), 393–414. <https://doi.org/10.4236/gep.2025.134021>
- Li, T., Cui, L., Wu, Y., McLaren, T. I., Xia, A., Pandey, R., Liu, H., Wang, W., Xu, Z., Song, X., Dalal, R. C., & Dang, Y. P. (2024). Soil Organic Carbon Estimation via Remote Sensing and Machine Learning Techniques: Global Topic Modeling and Research Trend Exploration. *Remote Sensing*, 16(17). <https://doi.org/10.3390/rs16173168>
- Lu, D. (2005). Urban Classification Using Full Spectral Information of Landsat ETM+ Imagery in Marion County, Indiana. *Photogrammetric Engineering and Remote Sensing*, 71. <https://doi.org/10.14358/PERS.71.11.1275>
- Mellor, A., Boukir, S., Haywood, A., & Jones, S. (2015). Exploring issues of training data imbalance and mislabelling on random forest performance for large area land cover classification using the ensemble margin. *ISPRS Journal of Photogrammetry and Remote Sensing*, 105, 155–168. <https://doi.org/10.1016/J.ISPRSJPRS.2015.03.014>
- Mercer, L. D., Szpiro, A. A., Sheppard, L., Lindström, J., Adar, S. D., Allen, R. W., Avol, E. L., Oron, A. P., Larson, T., Liu, L.-J. S., & Kaufman, J. D. (2011).

Comparing universal kriging and land-use regression for predicting concentrations of gaseous oxides of nitrogen (NO_x) for the Multi-Ethnic Study of Atherosclerosis and Air Pollution (MESA Air). *Atmospheric Environment*, 45(26), 4412–4420.
<https://doi.org/https://doi.org/10.1016/j.atmosenv.2011.05.043>

Mitchell, M. , T. (1997). *Machine Learning*. McGraw Hill.

Nation Thailand. (2023, April 1). *Chiang Mai's severe PM2.5 pollution lands thousands in hospital.* The Nation.
<https://www.nationthailand.com/thailand/general/40026231>

Nedd, R., Light, K., Owens, M., James, N., Johnson, E., & Anandhi, A. (2021). A Synthesis of Land Use/Land Cover Studies: Definitions, Classification Systems, Meta-Studies, Challenges and Knowledge Gaps on a Global Landscape. *Land*, 10(9). <https://doi.org/10.3390/land10090994>

Ngo, T. X., Phan, H. D. T., & Nguyen, T. T. N. (2023). Development of ground-level NO₂ models in Vietnam using machine learning and satellite observations with ancillary data. *Frontiers in Environmental Science*, Volume 11-2023. <https://doi.org/10.3389/fenvs.2023.1187592>

Ning, C., Subedi, R., & Hao, L. (2023). Land Use/Cover Change, Fragmentation, and Driving Factors in Nepal in the Last 25 Years. *Sustainability*, 15(8). <https://doi.org/10.3390/su15086957>

Nitze, I., Schulthess, U., & Asche, H. (2012). *Comparison of machine learning algorithms random forest, artificial neural network and support vector machine to maximum likelihood for supervised crop type classification.*

Ogunbode, T. O., Oyebamiji, V. O., Sanni, D. O., Akinwale, E. O., & Akinluyi, F. O. (2025). Environmental impacts of urban growth and land use changes in tropical cities. *Frontiers in Sustainable Cities*, Volume 6-2024. <https://doi.org/10.3389/frsc.2024.1481932>

Ouma, Y., Nkwae, B., Moalafhi, D., Odirile, P., Parida, B., Anderson, G., & Qi, J. (2022). COMPARISON OF MACHINE LEARNING CLASSIFIERS FOR

- MULTITEMPORAL AND MULTISENSOR MAPPING OF URBAN LULC FEATURES. *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences - ISPRS Archives*, 43(B3-2022), 681–689. <https://doi.org/10.5194/isprs-archives-XLIII-B3-2022-681-2022>
- Pandi Dinagarapandi and Kothandaraman, S. and K. M. V. and K. M. (2022). Assessment of Land Use and Land Cover Dynamics Using Geospatial Techniques. *Polish Journal of Environmental Studies*, 31(3), 2779–2786. <https://doi.org/10.15244/pjoes/141810>
- Peng, J., Jury, E., Dönnies, P., & Ciurtin, C. (2021). Machine Learning Techniques for Personalised Medicine Approaches in Immune-Mediated Chronic Inflammatory Diseases: Applications and Challenges. *Frontiers in Pharmacology*, 12. <https://doi.org/10.3389/fphar.2021.720694>
- Post Reporters. (2023, March 11). *Air pollution triggers respiratory diseases*. Bangkok Post. <https://www.bangkokpost.com/thailand/general/2525291/air-pollution-triggers-respiratory-diseases>
- Rimba, A. B., Atmaja, T., Mohan, G., Chapagain, S. K., Arumansawang, A., Payus, C., & Fukushi, K. (2020). IDENTIFYING LAND USE AND LAND COVER (LULC) CHANGE FROM 2000 TO 2025 DRIVEN BY TOURISM GROWTH: A STUDY CASE IN BALI. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, XLIII-B3-2020, 1621–1627. <https://doi.org/10.5194/isprs-archives-XLIII-B3-2020-1621-2020>
- Russel, J. , S., & Norvig, P. (2016). *Artificial Intelligence: A modern approach* (3th ed.). Pearson.
- Saini, R., & Rawat, S. (2023). *Land Use Land Cover Classification in Remote Sensing Using Machine Learning Techniques*. 99–104. <https://doi.org/10.1109/IHCSP56702.2023.10127126>
- Sekiya, T., Miyazaki, K., Eskes, H., Sudo, K., Takigawa, M., & Kanaya, Y. (2022). A comparison of the impact of TROPOMI and OMI tropospheric NO₂ on

- global chemical data assimilation. *Atmospheric Measurement Techniques*, 15(6), 1703–1728. <https://doi.org/10.5194/amt-15-1703-2022>
- Sharma, S., Hussain, S., & Singh, A. (2023). Impact of land use and land cover on urban ecosystem service value in Chandigarh, India: a GIS-based analysis. *Journal of Urban Ecology*, 9, 1–12. <https://doi.org/10.1093/jue/juac030>
- Solomon, N., Segnon, A., & Birhane, E. (2019). Ecosystem Service Values Changes in Response to Land-Use/Land-Cover Dynamics in Dry Afromontane Forest in Northern Ethiopia. *International Journal of Environmental Research and Public Health*, 16, 4653. <https://doi.org/10.3390/ijerph16234653>
- Su, J. G., Jerrett, M., & Beckerman, B. (2009). A distance-decay variable selection strategy for land use regression modeling of ambient air pollution exposures. *The Science of the Total Environment*, 407, 3890–3898. <https://doi.org/10.1016/j.scitotenv.2009.01.061>
- The Bali Sun. (2025, January 2). *Indonesia Welcomed Over 12 Million Tourists In 2024 As Bali Remains Top Destination*. The Bali Sun. <https://thebalisun.com/indonesia-welcomed-over-12-million-tourists-in-2024-as-bali-remains-top-destination/>
- Theys, N., Hedelt, P., De Smedt, I., Lerot, C., Yu, H., Vlietinck, J., Pedernana, M., Arellano, S., Galle, B., Fernandez, D., Carlito, C., Barrington, C., Taisne, B., Delgado Granados, H., Loyola, D., & Van Roozendaal, M. (2019). Global monitoring of volcanic SO₂ degassing with unprecedented resolution from TROPOMI onboard Sentinel-5 Precursor. *Scientific Reports*, 9. <https://doi.org/10.1038/s41598-019-39279-y>
- van Geffen, J., Eskes, H., Compernelle, S., Pinardi, G., Verhoelst, T., Lambert, J.-C., Sneep, M., ter Linden, M., Ludewig, A., Boersma, K. F., & Veeffkind, J. P. (2022). Sentinel-5P TROPOMI NO₂ retrieval: impact of version v2.2 improvements and comparisons with OMI and ground-based data. *Atmospheric Measurement Techniques*, 15(7), 2037–2060. <https://doi.org/10.5194/amt-15-2037-2022>

- Veefkind, J. P., Aben, I., McMullan, K., Förster, H., de Vries, J., Otter, G., Claas, J., Eskes, H. J., de Haan, J. F., Kleipool, Q., van Weele, M., Hasekamp, O., Hoogeveen, R., Landgraf, J., Snel, R., Tol, P., Ingmann, P., Voors, R., Kruizinga, B., ... Levelt, P. F. (2022). TROPOMI on the ESA Sentinel-5 Precursor: A GMES mission for global observations of the atmospheric composition for climate, air quality and ozone layer applications. *Remote Sensing of Environment*, 120, 70–83. <https://doi.org/10.1016/J.RSE.2011.09.027>
- Verhoelst, T., Compernelle, S., Pinardi, G., Lambert, J.-C., Eskes, H. J., Eichmann, K.-U., Fjæraa, A. M., Granville, J., Niemeijer, S., Cede, A., Tiefengraber, M., Hendrick, F., Pazmiño, A., Bais, A., Bazureau, A., Boersma, K. F., Bogner, K., Dehn, A., Donner, S., ... Zehner, C. (2021). Ground-based validation of the Copernicus Sentinel-5P TROPOMI NO₂ measurements with the NDACC ZSL-DOAS, MAX-DOAS and Pandonia global networks. *Atmospheric Measurement Techniques*, 14(1), 481–510. <https://doi.org/10.5194/amt-14-481-2021>
- Viju, T., Nambiar, A., & C., M. (2023). *Sustainable land management strategies, drivers of LULC change and degradation* (pp. 191–214). <https://doi.org/10.1016/B978-0-443-15847-6.00003-3>
- Wang, C., Wang, T., Cai, Z., Zhao, X., Wang, W., Liu, Y., & Wang, P. (2025). Analysis of Tropospheric NO₂ Observation Using Pandora and MAX-DOAS Instrument in Xianghe, North China. *Remote Sensing*, 17(10). <https://doi.org/10.3390/rs17101695>
- Wang, C., Wang, T., Wang, P., & Rakitin, V. (2020). Comparison and Validation of TROPOMI and OMI NO₂ Observations over China. *Atmosphere*, 11(6). <https://doi.org/10.3390/atmos11060636>
- WHO. (2021, September 22). *WHO global air quality guidelines: particulate matter (PM_{2.5} and PM₁₀), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide*. WHO. <https://www.who.int/publications/i/item/9789240034228>

- Wolde, B., Moges, A., & Girma, R. (2023). Assessment of the combined effects of land use/land cover and climate change on soil erosion in the Sile watershed, Ethiopian Rift Valley Lakes Basin. *Cogent Food & Agriculture*, 9. <https://doi.org/10.1080/23311932.2023.2273630>
- Workie, M., & Teku, D. (2025). Assessing soil erosion hotspots and land degradation extent in Beshilo Watershed, Northeastern Ethiopia: integrating geospatial and field survey techniques, for sustainable land management. *Frontiers in Environmental Science*, 13. <https://doi.org/10.3389/fenvs.2025.1548881>
- Wulder, M. A., Roy, D. P., Radeloff, V. C., Loveland, T. R., Anderson, M. C., Johnson, D. M., Healey, S., Zhu, Z., Scambos, T. A., Pahlevan, N., Hansen, M., Gorelick, N., Crawford, C. J., Masek, J. G., Hermosilla, T., White, J. C., Belward, A. S., Schaaf, C., Woodcock, C. E., ... Cook, B. D. (2022). Fifty years of Landsat science and impacts. *Remote Sensing of Environment*, 280, 113195. <https://doi.org/10.1016/J.RSE.2022.113195>
- Wulder, M. A., White, J. C., Goward, S. N., Masek, J. G., Irons, J. R., Herold, M., Cohen, W. B., Loveland, T. R., & Woodcock, C. E. (2008). Landsat continuity: Issues and opportunities for land cover monitoring. *Remote Sensing of Environment*, 112(3), 955–969. <https://doi.org/10.1016/J.RSE.2007.07.004>
- Zhang, T., su, J., Xu, Z., Luo, Y., & Li, J. (2021). Sentinel-2 Satellite Imagery for Urban Land Cover Classification by Optimized Random Forest Classifier. *Applied Sciences*, 11. <https://doi.org/10.3390/app11020543>