

LAPORAN PENELITIAN TERPADU
PERCEPATAN PROFESOR
KATEGORI C



DISTRIBUSI KELIMPAHAN DAN SUMBER POTENSIAL
MIKROPLASTIK DI SUNGAI KAWASAN PERKOTAAN: STUDI KASUS
SUNGAI METRO DI KOTA MALANG

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Tanggal 15 Mei 2022

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TAHUN 2022

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Judul Penelitian : Distribusi kelimpahan dan sumber potensial mikroplastik di sungai kawasan perkotaan: studi kasus Sungai Metro, kota Malang

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8. Lokasi penelitian : Kota Malang
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DAFTAR PUSTAKA

- Aiguo, Z., Di, S., Chong, W., Yuliang, C., Shaolin, X., Peiqin, L., Guohuan, X., Huijuan, T., & Jixing, Z. (2022). Characteristics and differences of microplastics ingestion for farmed fish with different water depths, feeding habits and diets. *Journal of Environmental Chemical Engineering*, 10(2), 107189. <https://doi.org/10.1016/j.jece.2022.107189>
- Alam, F. C., Sembiring, E., Muntalif, B. S., & Suendo, V. (2019). Microplastic distribution in surface water and sediment river around slum and industrial area (case study: Ciwalengke River, Majalaya district, Indonesia). *Chemosphere*, 224, 637–645. <https://doi.org/10.1016/j.chemosphere.2019.02.188>
- Amato-Lourenço, L. F., Carvalho-Oliveira, R., Júnior, G. R., dos Santos Galvão, L., Ando, R. A., & Mauad, T. (2021). Presence of airborne microplastics in human lung tissue. *Journal of Hazardous Materials*, 416(April), 126124. <https://doi.org/10.1016/j.jhazmat.2021.126124>
- Arthur, C., Baker, J., & Bamford, H. E. (2009). Proceedings of the International Research Workshop on the Occurrence, Effects, and Fate of Microplastic Marine Debris. *Proceedings of the International Research Workshop. s.l., NOAA Technical Memorandum NOS-OR&R-30, January*, 530.
- Aytan, U., Esensoy, F. B., & Senturk, Y. (2022). Microplastic ingestion and egestion by copepods in the Black Sea. *Science of The Total Environment*, 806, 150921. <https://doi.org/10.1016/j.scitotenv.2021.150921>
- Baldwin, A. K., Corsi, S. R., & Mason, S. A. (2016). Plastic Debris in 29 Great Lakes Tributaries: Relations to Watershed Attributes and Hydrology. *Environmental Science & Technology*, 50(19), 10377–10385. <https://doi.org/10.1021/acs.est.6b02917>
- Barrows, A. P. W., Christiansen, K. S., Bode, E. T., & Hoellein, T. J. (2018). A watershed-scale, citizen science approach to quantifying microplastic concentration in a mixed land-use river. *Water Research*, 147, 382–392. <https://doi.org/10.1016/j.watres.2018.10.013>
- Bian, P., Liu, Y., Zhao, K., Hu, Y., Zhang, J., Kang, L., & Shen, W. (2022). Spatial variability of microplastic pollution on surface of rivers in a mountain–plain transitional area: A case study in the Chin Ling-Wei River Plain, China. *Ecotoxicology and Environmental Safety*, 232, 113298. <https://doi.org/10.1016/j.ecoenv.2022.113298>
- Botterelli, Z. L. R., Bergmann, M., Hildebrandt, N., Krumpfen, T., Steinke, M., Thompson,

- R. C., & Lindeque, P. K. (2022). Microplastic ingestion in zooplankton from the Fram Strait in the Arctic. *Science of The Total Environment*, 831, 154886. <https://doi.org/10.1016/j.scitotenv.2022.154886>
- Buwono, N. R., Risjani, Y., & Soegianto, A. (2021). Distribution of microplastic in relation to water quality parameters in the Brantas River, East Java, Indonesia. *Environmental Technology & Innovation*, 24, 101915. <https://doi.org/10.1016/j.eti.2021.101915>
- Caldwell, A., Brander, S., Wiedenmann, J., Clucas, G., & Craig, E. (2022). Incidence of microplastic fiber ingestion by Common Terns (*Sterna hirundo*) and Roseate Terns (*S. dougallii*) breeding in the Northwestern Atlantic. *Marine Pollution Bulletin*, 177(November 2021), 113560. <https://doi.org/10.1016/j.marpolbul.2022.113560>
- Campanale, C., Massarelli, C., Bagnuolo, G., Savino, I., & Uricchio, V. F. (2022). The Problem of Microplastics and Regulatory Strategies in Italy. *Handbook of Environmental Chemistry*, 112(December), 255–276. https://doi.org/10.1007/698_2019_419
- Cooper, D. A., & Corcoran, P. L. (2010). Effects of mechanical and chemical processes on the degradation of plastic beach debris on the island of Kauai, Hawaii. *Marine Pollution Bulletin*, 60(5), 650–654. <https://doi.org/10.1016/j.marpolbul.2009.12.026>
- de Souza, S. S., Freitas, Í. N., Gonçalves, S. D. O., Luz, T. M. da, Araújo, A. P. da C., Rajagopal, R., Balasubramani, G., Rahman, M. M., & Malafaia, G. (2022). Toxicity induced via ingestion of naturally-aged polystyrene microplastics by a small-sized terrestrial bird and its potential role as vectors for the dispersion of these pollutants. *Journal of Hazardous Materials*, 434, 128814. <https://doi.org/10.1016/j.jhazmat.2022.128814>
- Effendi, H. (2003). *Telaah Kualitas Air Bagi Pengelolaan Sumber Daya dan Lingkungan Perairan*. Kanisius.
- Environmental, F. (2015). *Fundamentals of Environmental Measurements*.
- Fockema, E. M., De Gruijter, C., Mergia, M. T., Van Franeker, J. A., Murk, A. J., & Koelmans, A. A. (2013). Plastic in north sea fish. *Environmental Science and Technology*, 47(15), 8818–8824. <https://doi.org/10.1021/es400931b>
- Free, C. M., Jensen, O. P., Mason, S. A., Eriksen, M., Williamson, N. J., & Boldgiv, B. (2014). High-levels of microplastic pollution in a large, remote, mountain lake. *Marine Pollution Bulletin*, 85(1), 156–163. <https://doi.org/10.1016/j.marpolbul.2014.06.001>
- Fueser, H., Mueller, M.-T., & Traunspurger, W. (2020). Ingestion of microplastics by meiobenthic communities in small-scale microcosm experiments. *Science of The Total*

- Environment*, 746, 141276. <https://doi.org/10.1016/j.scitotenv.2020.141276>
- Geyer, R., Jambeck, J. R., & Law, K. L. (2017). Production, use, and fate of all plastics ever made. *Science Advances*, 3(7), 3–8. <https://doi.org/10.1126/sciadv.1700782>
- Han, M., Niu, X., Tang, M., Zhang, B. T., Wang, G., Yue, W., Kong, X., & Zhu, J. (2020). Distribution of microplastics in surface water of the lower Yellow River near estuary. *Science of the Total Environment*, 707. <https://doi.org/10.1016/j.scitotenv.2019.135601>
- Hankins, C., Duffy, A., & Drisco, K. (2018). Scleractinian coral microplastic ingestion: Potential calcification effects, size limits, and retention. *Marine Pollution Bulletin*, 135(July), 587–593. <https://doi.org/10.1016/j.marpolbul.2018.07.067>
- Hankins, C., Raimondo, S., & Lasseigne, D. (2022). Microplastic ingestion by coral as a function of the interaction between calyx and microplastic size. *Science of the Total Environment*, 810, 152333. <https://doi.org/10.1016/j.scitotenv.2021.152333>
- Huang, D., Li, X., Ouyang, Z., Zhao, X., Wu, R., Zhang, C., Lin, C., Li, Y., & Guo, X. (2021). The occurrence and abundance of microplastics in surface water and sediment of the West River downstream, in the south of China. *Science of the Total Environment*, 756, 143857. <https://doi.org/10.1016/j.scitotenv.2020.143857>
- Jenner, L. C., Rotchell, J. M., Bennett, R. T., Cowen, M., Tentzeris, V., & Sadofsky, L. R. (2022). Detection of microplastics in human lung tissue using μ FTIR spectroscopy. *Science of The Total Environment*, 831, 154907. <https://doi.org/10.1016/J.SCITOTENV.2022.154907>
- Jeong, H., Novirsa, R., Nugraha, W. C., Addai-arhin, S., Dinh, Q. P., Fukushima, S., Fujita, E., Bambang, W., Kameda, Y., Ishibashi, Y., & Arizono, K. (2021). The distributions of microplastics (MPs) in the Citarum River Basin, West Java, Indonesia. *Journal of Environment and Safety*, 12(2), 33–43. <https://doi.org/10.11162/daikankyo.E21RP0102>
- Kabir, A. H. M. E., Sekine, M., Imai, T., Yamamoto, K., Kanno, A., & Higuchi, T. (2021). Assessing small-scale freshwater microplastics pollution, land-use, source-to-sink conduits, and pollution risks: Perspectives from Japanese rivers polluted with microplastics. *Science of the Total Environment*, 768, 144655. <https://doi.org/10.1016/j.scitotenv.2020.144655>
- Kabir, A. H. M. E., Sekine, M., Imai, T., Yamamoto, K., Kanno, A., & Higuchi, T. (2022). Microplastics in the sediments of small-scale Japanese rivers: Abundance and distribution, characterization, sources-to-sink, and ecological risks. *Science of the Total Environment*, 812, 152590. <https://doi.org/10.1016/j.scitotenv.2021.152590>

- Kataoka, T., Nihei, Y., Kudou, K., & Hinata, H. (2019). Assessment of the sources and inflow processes of microplastics in the river environments of Japan. *Environmental Pollution*, 244, 958–965. <https://doi.org/10.1016/j.envpol.2018.10.111>
- Kemendikbud. (2013). *Pengelolaan Kualitas Air*. Kementerian Pendidikan dan Kebudayaan Republik Indonesia.
- Lahens, L., Strady, E., Kieu-Le, T.-C., Dris, R., Boukerma, K., Rinnert, E., Gasperi, J., & Tassin, B. (2018). Macroplastic and microplastic contamination assessment of a tropical river (Saigon River, Vietnam) transversed by a developing megacity. *Environmental Pollution*, 236, 661–671. <https://doi.org/10.1016/j.envpol.2018.02.005>
- Lebreton, L. C. M., Van Der Zwet, J., Damsteeg, J. W., Slat, B., Andrady, A., & Reisser, J. (2017). River plastic emissions to the world's oceans. *Nature Communications*, 8, 1–10. <https://doi.org/10.1038/ncomms15611>
- Leslie, H.A., & Depledge, M. H. (2020). Where is the evidence that human exposure to microplastics is safe? *Environment International*, 142(June), 105807. <https://doi.org/10.1016/j.envint.2020.105807>
- Leslie, Heather A., J. M. van Velzen, M., Brandsma, S. H., Vethaak, D., Garcia-Vallejo, J. J., & Lamoree, M. H. (2022). Discovery and quantification of plastic particle pollution in human blood. *Environment International*, March, 107199. <https://doi.org/10.1016/j.envint.2022.107199>
- MacArthur, E. (2017). Beyond plastic waste. *Science*, 358(6365), 843–843. <https://doi.org/10.1126/science.aao6749>
- Masura, J., Baker, J., Foster, G., Arthur, C., & Herring, C. (2015). *Laboratory Methods for the Analysis of Microplastics in the Marine Environment: Recommendations for quantifying synthetic particles in waters and sediments* (Issue July). NOAA Technical Memorandum.
- McCormick, A., Hoellein, T. J., Mason, S. A., Schlupe, J., & Kelly, J. J. (2014). Microplastic is an Abundant and Distinct Microbial Habitat in an Urban River. *Environmental Science & Technology*, 48(20), 11863–11871. <https://doi.org/10.1021/es503610r>
- Naji, A., Nuri, M., Amiri, P., & Niyogi, S. (2019). Small microplastic particles (S-MPPs) in sediments of mangrove ecosystem on the northern coast of the Persian Gulf. *Marine Pollution Bulletin*, 146(June), 305–311. <https://doi.org/10.1016/j.marpolbul.2019.06.033>
- Peraturan Pemerintah Nomor 22 Tahun 2021 tentang Penyelenggaraan Perlindungan dan Pengelolaan Lingkungan Hidup., (2021).

- Ryan, P. G., Moore, C. J., van Franeker, J. A., & Moloney, C. L. (2009). Monitoring the abundance of plastic debris in the marine environment. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364(1526), 1999–2012. <https://doi.org/10.1098/rstb.2008.0207>
- Sainio, E., Lehtiniemi, M., & Setälä, O. (2021). Microplastic ingestion by small coastal fish in the northern Baltic Sea, Finland. *Marine Pollution Bulletin*, 172(February), 112814. <https://doi.org/10.1016/j.marpolbul.2021.112814>
- Santoso, A. D. (2018). Keragaan Nilai DO, BOD dan COD di Danau Bekas Tambang Batubara Studi Kasus pada Danau Sangatta North PT. KPC di Kalimantan Timur. *Jurnal Teknologi Lingkungan*, 19(1), 89. <https://doi.org/10.29122/jtl.v19i1.2511>
- Sayekti, R. W. (2015). Studi Evaluasi Kualitas dan Status Trofik Air Waduk Selorejo Akibat Erupsi Gunung Kelud Untuk Budidaya Perikanan. *Jurnal Teknik Pengairan*, 6(mor 1).
- Sayekti, Rini Wahyu, Haribowo, R., Vivit, Y., & Prabowo, A. (2011). Studi efektifitas penurunan kadar bod, cod dan nh 3 pada limbah cair rumah sakit dengan. *Jurnal Pengairan*, Vol 2(61), 1–9.
- Sekaran, U., & Bougie, R. (2010). *Research Methods for Business: A Skill Building Approach*. John Wiley and sons, inc.
- Selvanathan, M., Jayabalan, N., Saini, G., Supramaniam, M., & Hussain, N. (2020). Employee Productivity in Malaysian Private Higher Educational Institutions. *PalArch's Journal of Archaeology of Egypt/ Egyptology*, 17, 66–79. <https://doi.org/10.48080/jae.v17i3.50>
- Standar Nasional Indonesia. (2008). *SNI 6989.57:2008 - tentang Air dan Air Limbah - Bagian 57: Metoda Pengambilan Contoh Air Permukaan*. s.l.:Standar Nasional Indonesia.
- STHDA. (2022). *t distribution table*. STHDA. <http://www.sthda.com/english/wiki/t-distribution-table>
- Suara Pembaharuan. (2018, April). *Dua Kota Indonesia Produksi 1,3 Juta Ton Sampah*.
- Suzuki, G., Uchida, N., Tuyen, L. H., Tanaka, K., Matsukami, H., Kunisue, T., Takahashi, S., Viet, P. H., Kuramochi, H., & Osako, M. (2022). Mechanical recycling of plastic waste as a point source of microplastic pollution. *Environmental Pollution*, 303(March), 119114. <https://doi.org/10.1016/j.envpol.2022.119114>
- Tancung, A. B., Kordi, K., & Ghufuran, H. (2007). *Pengelolaan Kualitas Air*. Rineka Cipta.
- Tongo, I., & Erhunmwunse, N. O. (2022). Effects of ingestion of polyethylene microplastics on survival rate, opercular respiration rate and swimming performance of African

catfish (*Clarias gariepinus*). *Journal of Hazardous Materials*, 423(PB), 127237. <https://doi.org/10.1016/j.jhazmat.2021.127237>

USGS. (2021). *Water Color*.

Uurasjärvi, E., Sainio, E., Setälä, O., Lehtiniemi, M., & Koistinen, A. (2021). Validation of an imaging FTIR spectroscopic method for analyzing microplastics ingestion by Finnish lake fish (*Perca fluviatilis* and *Coregonus albula*). *Environmental Pollution*, 288, 117780. <https://doi.org/10.1016/j.envpol.2021.117780>

van Emmerik, T., Kieu-Le, T.-C., Loozen, M., van Oeveren, K., Strady, E., Bui, X.-T., Egger, M., Gasperi, J., Lebreton, L., Nguyen, P.-D., Schwarz, A., Slat, B., & Tassin, B. (2018). A Methodology to Characterize Riverine Macroplastic Emission Into the Ocean. *Frontiers in Marine Science*, 5(OCT), 1–11. <https://doi.org/10.3389/fmars.2018.00372>

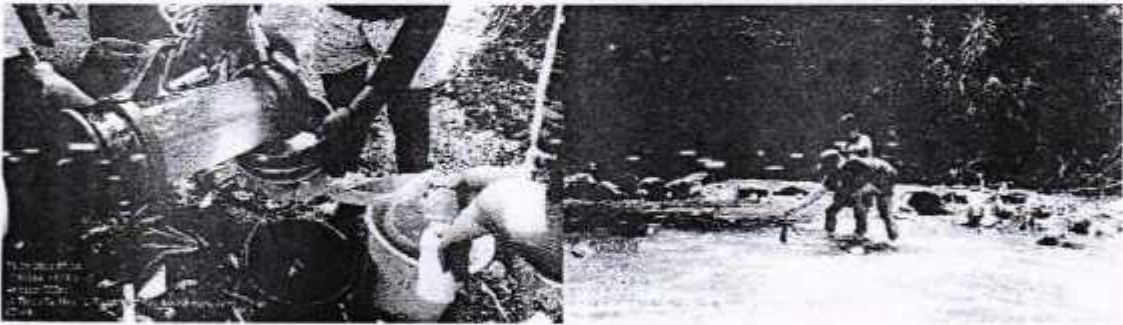
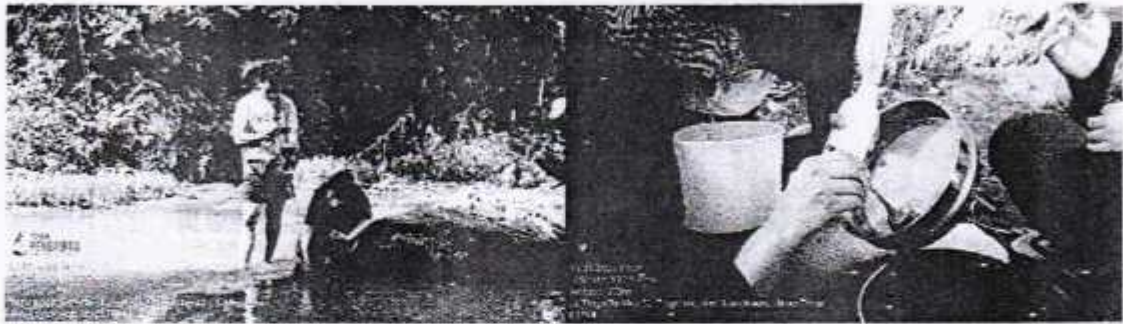
Woodall, L. C., Gwinnett, C., Packer, M., Thompson, R. C., Robinson, L. F., & Paterson, G. L. J. (2015). Using a forensic science approach to minimize environmental contamination and to identify microfibrils in marine sediments. *Marine Pollution Bulletin*, 95(1), 40–46. <https://doi.org/10.1016/j.marpolbul.2015.04.044>

World Bank. (2021). Plastic Waste Discharges from Rivers and Coastlines in Indonesia. In *Plastic Waste Discharges from Rivers and Coastlines in Indonesia (Marine Pla)*. World Bank. <https://doi.org/10.1596/35607>

Wu, C., Zhang, K., & Xiong, X. (2018). Microplastic Pollution in Inland Waters Focusing on Asia. in *Water research* (Vol. 137, pp. 85–99). https://doi.org/10.1007/978-3-319-61615-5_5

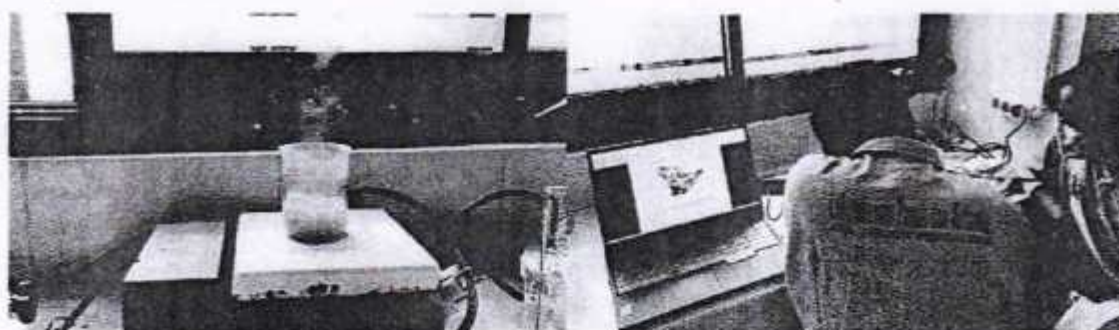
Zhang, N., Li, Y. Bin, He, H. R., Zhang, J. F., & Ma, G. S. (2021). You are what you eat: Microplastics in the feces of young men living in Beijing. *Science of The Total Environment*, 767, 144345. <https://doi.org/10.1016/j.scitotenv.2020.144345>

Pengambilan Sampel



Sumber: Dokumentasi Pribadi, 2022

Kegiatan Laboratorium



Sumber: Dokumentasi Pribadi, 2022