

SYNERGY OF LAW STUDENTS, OCCUPATIONAL SAFETY AND HEALTH AND CIVIL ENGINEERING FOR SUSTAINABLE ECOTOURISM DEVELOPMENT

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Abstract. Meranti Etam Tourism is a community-based agrotourism and ecotourism area located in North Balikpapan, within the Sungai Manggar Protected Forest zone. The area holds significant ecological functions as a water catchment zone and buffer for the Manggar watershed system, while simultaneously offering potential as a natural tourism destination. However, its management still faces several challenges, including low implementation of Occupational Health and Safety standards, limited awareness of environmental protection regulations, and suboptimal technical planning of tourism infrastructure. This community service program aimed to enhance the capacity of the local community in managing the tourism area based on occupational safety, environmental legal compliance, and sustainable civil engineering principles. The program was implemented through three stages, namely pre-implementation, implementation, and evaluation, employing methods of socialization, training, and technical assistance. Key interventions included workplace hazard identification, development of simple standard operating procedures (SOPs), PPE usage simulation, environmental law counselling, installation of prohibition signage, and technical evaluation of tracking trails, camping areas, and drainage systems. The results demonstrated an increase in community awareness regarding occupational accident risks, the importance of PPE usage, and a better understanding of prohibitions against environmental destruction and protected forest regulations. The multidisciplinary approach integrating legal and civil engineering aspects proved effective in promoting ecotourism management that is safe, orderly, and sustainable.

Keywords: environmental law, occupational health and safety, sustainable ecotourism

Abstrak. Wisata Meranti Etam merupakan kawasan agrowisata dan ekowisata berbasis masyarakat di Balikpapan Utara yang termasuk dalam kawasan Hutan Lindung Sungai Manggar. Kawasan ini memiliki fungsi ekologis penting sebagai daerah resapan air dan penyangga Daerah Aliran Sungai Manggar, sekaligus berpotensi sebagai destinasi wisata alam. Namun, pengelolaannya masih menghadapi permasalahan berupa rendahnya penerapan standar keselamatan dan kesehatan kerja, kurangnya kesadaran terhadap regulasi perlindungan lingkungan, serta belum optimalnya perencanaan teknis infrastruktur wisata. Kegiatan pengabdian masyarakat ini bertujuan meningkatkan kapasitas masyarakat dalam pengelolaan kawasan wisata yang berbasis keselamatan kerja, kepatuhan hukum lingkungan, dan prinsip teknik sipil berkelanjutan. Program dilaksanakan melalui tiga tahap, yakni pra-pelaksanaan, pelaksanaan, dan evaluasi, dengan metode sosialisasi, pelatihan, dan pendampingan teknis. Intervensi yang dilakukan meliputi identifikasi bahaya kerja, penyusunan SOP sederhana, simulasi penggunaan APD, penyuluhan hukum lingkungan, pemasangan plang larangan, serta evaluasi teknis jalur tracking, area perkemahan, dan sistem drainase. Hasil kegiatan menunjukkan peningkatan kesadaran masyarakat terhadap risiko kecelakaan kerja, pentingnya penggunaan APD, serta pemahaman mengenai larangan perusakan lingkungan dan kawasan hutan lindung. Pendekatan multidisiplin yang mengintegrasikan aspek hukum dan teknik sipil terbukti efektif dalam mendorong pengelolaan ekowisata yang aman, tertib, dan berkelanjutan.

Kata Kunci: ekowisata berkelanjutan, keselamatan dan kesehatan kerja, hukum lingkungan

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INTRODUCTION

Meranti Etam Tourism is an agrotourism and natural ecotourism area located in North Balikpapan and has been managed independently by the community since 2021. Community-based tourism management has been proven to strengthen local participation in maintaining environmental sustainability and improving the economic welfare of the surrounding



community (Beall et al., 2022). This area covers approximately 20 hectares of land, surrounded by approximately 50 hectares of water, and connected to a wider forest area of approximately 30 hectares. The dominant vegetation in this area includes meranti trees (*Shorea johorensis* Foxw) and teak (*Gmelina arborea* Roxb). Meranti Etam Tourism not only offers natural green forest panoramas and educational activities such as forest trekking and camping, but also has a very important ecological function for the City of Balikpapan (Nugroho et al., 2023; Sitaresmi et al., 2023; Alif & Saputra, 2025; Kiswanto et al., 2025). In terms of spatial planning, this area is included in the Manggar River Protected Forest as stipulated in the Balikpapan City Spatial Plan 2012–2032 (Balikpapan City Government, 2012). It is a strategic area for the city due to its role in maintaining ecological functions and environmental carrying capacity. Meranti Forest functions as a water catchment area for the Manggar River Basin and is a source of raw water for the Balikpapan City Water Company (PDAM) (Sulistyo & Abrar, 2017; Dwicahyo et al., 2024). Thus, the existence of this area not only has economic value as a tourist destination, but also has ecological and social values that are vital for the survival of the city's residents. (Fandeli, 2002).

However, in the management process, there are still a number of problems that require serious attention. From the aspect of environmental protection, practices that have the potential to damage the ecosystem are still found, such as fishing activities using toxic materials around the water area (Kolawole & Iyiola, 2023). These actions are contrary to the principles of environmental protection and management as stipulated in Law Number 32 of 2009, which emphasizes the obligation of every person to maintain the sustainability of environmental functions and prohibits actions that result in pollution and/or environmental damage. In addition, as part of a protected forest area, the management of Meranti Tourism is also subject to the provisions of Law Number 41 of 1999 concerning Forestry, which prohibits any activity that can damage the primary function of protected forests as a life support system.

In terms of Occupational Safety and Health, area management activities such as simple facility construction, track maintenance, area cleaning, and camping activities have not fully implemented occupational safety standards (Booty, 2006). The use of Personal Protective Equipment (PPE), such as safety helmets, work gloves, and safety shoes, has not become standard procedure in all work activities (Buhler et al., 2025). The use of Personal Protective Equipment (PPE) has consistently been shown to reduce the risk of injury in fieldwork activities (ILO, 2022). Yet, the obligation to ensure workplace safety is regulated by Law Number 1 of 1970 concerning Occupational Safety, which requires every workplace manager to protect workers and others in the work environment. Meanwhile, from a civil engineering perspective, the development of tourism support infrastructure, such as pedestrian paths, wooden bridges, piers, and other public facilities, still requires more comprehensive technical planning (Ibrahim, 2025). Some facilities have not fully considered structural strength, soil bearing capacity, drainage systems, and material resistance to humid and erosion-prone environmental conditions (Eze et al., 2025). Without careful planning, infrastructure development has the potential to disrupt land stability and degrade the ecological function of protected forest areas (DeFries et al., 2007).

Based on these conditions, the development of Meranti Etam Tourism requires a multidisciplinary approach that integrates environmental law, occupational safety, and civil engineering aspects in an integrated manner (Mahadewi et al., 2025). Synergy between law, occupational safety, and civil engineering students is crucial in realizing ecotourism management that is not only oriented towards improving the community's economy but also upholds the principles of sustainability, legal compliance, and the safety and security of all parties involved (Hariram et al., 2023). With this approach, Meranti Etam Tourism is expected to develop as a model of sustainable ecotourism that harmonizes ecological, social, and technical aspects of development.

METHOD

Based on its implementation, the community service activities to be carried out in Kampung Semarang RT 27 and 32 of the Meranti Forest Area, Karang Joang Village, are divided

into three general stages: pre-implementation, implementation, and evaluation. These stages are systematically arranged so that the program can be structured, measurable, and have clear outcomes in supporting the management of Meranti Etam Tourism based on occupational safety, environmental law compliance, and sustainable infrastructure planning.

Pre-Implementation

The community service activity begins with the search and identification of potential partners through field surveys, problem identification, team consolidation, consolidation with selected partners, and intervention program design (Samino Garcia, 2023). This stage aims to ensure that the designed solutions truly address real-world challenges, particularly those related to the implementation of Occupational Safety and Health (OHS), compliance with environmental regulations, and the need for technical evaluation of tourism infrastructure (Ashari, 2022).

Field Survey

The search for potential partners began with a field survey conducted at several locations identified as having significant potential for community-based tourism development. Based on the survey results, Jalan Giri Rejo, RT 27 and 32, Hutan Meranti, Karang Joang Village, KM 15, was selected as the community service partner. Observations conducted at the site revealed that the tourist area holds considerable potential for the development of an ecotourism-based tourism sector, making it a worthy candidate for more structured and sustainable development (Cvetković et al., 2023).

Nevertheless, the survey also uncovered several issues that require serious attention. In terms of occupational safety, the implementation of Health, Safety, and Environment (HSE) standards in tourism facility construction and maintenance activities was found to be suboptimal, as evidenced by the inconsistent use of Personal Protective Equipment (PPE) among workers (Al-Bayati et al., 2023). Furthermore, certain practices with the potential to cause environmental damage were still observed, most notably the use of water resources through methods that are not environmentally friendly (Makanda et al., 2022). An equally pressing concern pertains to the condition of supporting tourist infrastructure, including hiking trails, wooden bridges, and public facilities, which have not yet fully accounted for structural strength, soil bearing capacity, or adequate drainage systems in their construction (McClelland, 1998). As a preventive measure, signage will be installed in the reservoir area, including barriers and prohibition signs for visitors, to ensure safety and minimize the risk of accidents within the zone (Pradipta, 2025). These findings collectively serve as the foundation for designing community service programs that are both educational and preventive in nature, intending to foster tourism area management that is safer, more responsible, and environmentally conscious (Jamal et al., 2011).

Team Consolidation

Following the identification of potential partners, a consolidation was conducted involving a community service team comprising personnel from the fields of law, occupational health and safety and civil engineering (WHO, 2022). The consolidation results confirmed that the community service location held significant potential for tourism development but required support in three key areas: increasing awareness and implementation of occupational health and safety standards, strengthening legal understanding related to environmental protection and protected forest area management, and conducting evaluation and technical planning of safe and sustainable tourism infrastructure (Jamil et al., 2024). Based on these findings, a community service program was designed encompassing three main activities, namely environmental law counselling to promote legal literacy and regulatory compliance, basic occupational health and safety training to instil a culture of workplace safety and proper use of protective equipment, and technical assistance for the evaluation of existing tourism infrastructure to ensure it meets sound engineering standards (Chis et al., 2025). These program components reflect an integrated approach to empowering the local community in developing their tourism area in a responsible and sustainable manner.

Partner Consolidation

The results of the problem identification were then consulted and discussed with community service partners. At this stage, the planned program was socialized, including an explanation of the importance of implementing OHS standards, complying with environmental regulations, and the need for technical improvements to tourism infrastructure (McCray et al., 2010). Through this consolidation, a shared understanding was reached regarding the urgency of improving occupational safety, preserving protected forests, and developing tourism facilities that are safe and do not damage the environment (Budowski, 1976).

Program Design and Testing

At this stage, extension and training materials are designed, including the preparation of simple modules regarding the use of PPE and identification of work risks, prohibition of environmental destruction and the legal consequences of pollution and the basic principles of simple, safe and environmentally friendly construction (Voskresenskaya et al., 2018). In addition, simulations or trials of the implementation of safe work procedures (simple SOPs) were carried out to ensure that the program could be implemented realistically and easily understood by the community.

Implementation of Activities

The implementation phase is the implementation of the planning undertaken in the pre-implementation phase, adapting the results of program evaluations and trials. During this phase, the team conducts outreach activities, training, and direct technical assistance to partner communities.

Program Socialization

The socialization activity was carried out in the form of counselling sessions and interactive discussions with the local community. The materials presented covered three principal topics: the importance of implementing occupational health and safety standards in every aspect of tourism management, legal responsibilities in preserving protected forests and the prohibition of environmentally destructive practices, and the application of principles for constructing tourism infrastructure that is safe, efficient, and sustainable. In addition to the structured presentations, the activity also provided space for a sharing session, allowing community members to openly convey the challenges and experiences they had encountered throughout their involvement in managing the tourism area. This interactive format was intended to foster two-way communication, ensuring that the program not only delivered knowledge but also accommodated the voices and practical insights of the community as active stakeholders in the development process.

Training and Technical Assistance

At this stage, practical training is carried out on correct use of Personal Protective Equipment (PPE) in field work activities, identify potential hazards and develop simple safe work procedures and conducting a simple technical evaluation of the tracking path, road markings, wooden bridges, and other supporting facilities, including the Reservoir area, by providing a basic introduction to the strength and stability of light structures, soil bearing capacity conditions, and drainage functions and systems to prevent flooding, erosion, and potential construction damage. In addition, physical barriers and prohibition signs were installed in the Reservoir area as a preventive measure to limit access to risk zones, prevent accidents, and improve visitor safety in accordance with the safety principles of environmentally-based tourism areas. This assistance aims to ensure that the community not only understands theoretically, but is also able to apply the principles of occupational safety and sustainable development in the practice of managing Meranti Etam Tourism.

RESULTS AND DISCUSSION

Community service activities in Kampung Semarang RT 27 and 32 KM 15 of the Meranti Forest Tourism area implemented an integrated approach based on occupational safety and health, strengthening environmental law, and technical assistance for simple sustainable infrastructure. In the OHS aspect, hazard identification is carried out, including the risk of being hit by debris or falling tree trunks, slipping on damp paths, injuries due to the use of manual

work tools, and the risk of being stung by dangerous animals such as insects and small wildlife. The implementation of hazard identification *carried out* at an early stage has been proven to help the community recognize potential risks before working (Li & Liu, 2023). Based on this identification, safe work SOPs are developed, and the distribution and use of PPE, including safety helmets, work gloves, safety shoes, and reflective vests, are carried out as mandated by Law Number 1 of 1970. In addition, the consistent use of PPE is part of an effective occupational safety management system in reducing the risk of accidents (ILO, 2022). The distribution and simulation of the use of PPE was carried out directly in the field work area to ensure the community's understanding of its application.



Figure 1. Handover of PPE at the Meranti Forest Tourism location

In terms of environmental law, education was provided regarding the obligation to preserve protected forest areas and prohibitions on actions that damage ecosystems, including the use of toxic materials in water areas and illegal logging. The material referred to Law No. 32 of 2009 and Law No. 41 of 1999. As a real implementation, the team together with the community designed and installed a sign that contains a prohibition on damaging the environment and protected forest areas, a prohibition on the use of poison in waters, a warning of danger of being hit by falling tree trunks or debris, a warning of potential stings from dangerous animals and an obligation to use PPE while working. The signs are designed using weather-resistant materials and placed at strategic points such as the entrance to the area, tracking paths, woodworking areas, and the Master Point area.



Figure 2. The installation of environmental damage prohibition and occupational safety signage, along with the painting of tracking path markings along the roadside at the Meranti Forest Tourism location.

To implement the casting of the Occupational Safety and Health Law sign, the work was carried out by a competent civil engineering team supported by relevant technical personnel (Törner & Pousette, 2009). Activities included preparation, measuring and determining coordinates, installing formwork, reinforcing steel as needed for the lightweight structure, and the concrete casting and curing process to ensure the strength and durability of the foundation

(O'Brien, 1989). The painting of the tracking path markings on the sides of the road also adheres to technical construction standards and Occupational Safety and Health regulations, including the use of special road marking paint with high adhesion and good visibility in wet conditions (Babic et al., 2022). This aims to improve visitor safety, particularly on paths adjacent to the reservoir edge and downhill areas.

From a civil engineering perspective, the team also conducted simple technical evaluations of the tracking path, wooden bridge, camping area, and drainage system to minimise the risk of waterlogging and soil erosion (Harbor, 1999). Technical assistance emphasised the principles of soil bearing capacity, the stability of lightweight wood- or steel-based construction, the selection of materials resistant to moisture and termites, and the safe distance between the construction and potential decaying trees at risk of falling (Shukla & Kaul, 2024). In addition, simple reinforcements were recommended at landslide-prone areas using low-scale slope stabilization methods and the construction of surface water channels to control rainwater runoff (Parkash & Kathait, 2014). These measures aim to create a safer, more organized, and more sustainable ecotourism area from a civil engineering perspective.

Partner Roles and Participation

Partners play an active role in all stages of the activity, from identifying field risks and developing warning signs to installing them in strategic locations. The community is also committed to implementing safe work procedures (SOPs) and refraining from activities that could potentially damage the environment. This participation strengthens the synergy between the community service team and the community in building a safe, legally compliant, and sustainable tourism management system.

Implementation of Activities

The program began with an interactive outreach session on the risks of work accidents in forest areas, including the potential for being struck by falling tree debris and being stung by dangerous animals (Knecht, et al., 2024). The discussion also highlighted the legal consequences of environmental damage and occupational safety violations. Following the outreach session, hands-on PPE use and a simple risk management simulation were conducted in the field. The activity then continued with the collaborative installation of warning signs. As a form of program continuity, it was agreed that there would be routine community service every Sunday, which includes cleaning and painting of the tracking line, inspection of trees at risk of falling, wood care and checking the condition of warning signs. Monitoring of activities that have the potential to damage the environment.



Figures 3. Routine community service activities and distribution of PPE in RT 27

The results of the activities demonstrated increased public awareness of work safety risks in forest areas, particularly the dangers of falling tree trunks, slippery soil conditions during the rainy season, and stings from dangerous animals. The use of Personal Protective Equipment (PPE) has been gradually implemented in fieldwork activities, such as clearing tourist trails and

maintaining campsites. From an environmental law perspective, the installation of prohibition signs and regulatory-based education strengthens public understanding of the obligation to preserve the area, including prohibitions on forest destruction, littering, and activities that damage aquatic ecosystems. This approach fosters collective awareness that ecotourism management must align with environmental protection principles (Castillo-Salazar et al., 2025).

Meanwhile, from a civil engineering perspective, activities such as cleaning and repairing drainage, repainting faded road markings, and installing warning signs and safety barriers in vulnerable areas such as reservoir edges and downhill paths have significantly improved visitor safety and comfort. These simple infrastructure improvements help reduce the risk of accidents, improve area accessibility, and support more structured ecotourism development. Overall, the approach that integrates aspects of occupational health and safety, environmental law, and civil engineering has proven effective in building a safer, more orderly, and more sustainable ecotourism management system in the Meranti Etam Forest area (Dey & Arunachalam, 2024). The activity began with the identification of potential hazards *in the field*, including the risk of being struck by falling tree trunks, injuries due to the use of work tools, slipping on damp paths, and the potential for being bitten by dangerous animals. Based on these findings, safe work procedures (simple SOPs) were developed, and the distribution and use of Personal Protective Equipment (PPE) were carried out. This implementation is in line with the provisions of Law Number 1 of 1970, which emphasises the obligation to protect the safety of every worker and person in the work environment. The results of the activity showed an increase in public awareness in using PPE when carrying out construction activities and maintaining tourist facilities (Simpeh & Amoah, 2023).

From an environmental law perspective, outreach and interactive discussions provide a more comprehensive understanding of the obligation to preserve protected forest areas and the prohibition on environmental damage (Das, 2024). The material presented refers to Law No. 32 of 2009 and Law No. 41 of 1999, which emphasise the community's responsibility to prevent forest pollution and damage. Concrete implementation is carried out through the installation of signs prohibiting environmental damage, prohibiting the use of poisons in waters, and warnings about occupational hazards at strategic points in the area (Tank & Sharma, 2025). The presence of these signs serves as both an educational medium and a preventative instrument to build a culture of legal awareness.

CONCLUSION

Community service activities in Kampung Semarang RT 27 and 32 KM 15 of the Meranti Forest Tourism area demonstrate that a multidisciplinary approach integrating occupational safety and health, environmental law, and simple civil engineering aspects can have a real impact on improving the quality of community-based tourism management. The initial problems identified were low awareness of work risks, minimal understanding of environmental regulations, and suboptimal attention to technical aspects of infrastructure, which became the basis for formulating a systematic and applicable program. Simple civil engineering assistance also strengthens the safety and sustainability of the tourist area. Evaluations of the tracking path, camping area, and drainage system are conducted to ensure construction stability, material resistance to moisture, and prevention of erosion and waterlogging. This approach emphasizes the principle of lightweight construction that adapts to environmental conditions and does not disrupt the area's ecological function as a water catchment area.

Furthermore, the community's commitment to regular community service every Sunday is an indicator of the program's success in fostering active participation. These activities not only focus on area cleanliness but also include inspections of trees at risk of falling, maintenance of woodworking facilities, and monitoring of activities that could potentially damage the environment. Thus, the program's sustainability doesn't stop at the outreach stage but rather transforms into a collective habit. Overall, this community service activity successfully raised

occupational safety awareness, strengthened compliance with environmental regulations, and encouraged the implementation of simple, sustainable civil engineering principles. The synergy between the community service team and the community is a crucial foundation for building a safe, orderly, environmentally friendly, and sustainable ecotourism management model. This program demonstrates that community-based tourism development will be more effective when grounded in the principles of prudence, legal responsibility, and a shared commitment to safety and environmental sustainability.

REFERENCES

- Al-Bayati, A. J., Renner, A. T., Listello, M. P., & Mohamed, M. (2023). PPE non-compliance among construction workers: An assessment of contributing factors utilizing fuzzy theory. *Journal of safety research*, 85, 242-253. <https://doi.org/10.1016/j.jsr.2023.02.008>
- Alif, B. I. N., & Saputra, Y. W. (2025). Analysis of the Development of Wanadesa Bamboe Forest Tourism as Ecotourism in Balikpapan City. *Jurnal Penelitian Geografi*, 13(1), 51-62. DOI: <https://doi.org/10.23960/jpg.v13.i1.33538>
- Ashari, M. R. (2022). Occupational disease prevention strategies through ohs interventions: global evaluation and challenges. *Journal of Health Literacy and Qualitative Research*, 2(2), 66-80. DOI: <https://doi.org/10.61194/jhlqr.v2i2.531>
- Babić, D., Babić, D., Fiolic, M., & Ferko, M. (2022). Road markings and signs in road safety. *Encyclopedia*, 2(4), 1738-1752. <https://doi.org/10.3390/encyclopedia2040119>
- Beall, J. M., et al. (2022). Community-based ecotourism and sustainable development in forest-dependent regions. *Sustainability*, 14(9), 5123. <https://doi.org/10.3390/su14095123>
- Booty, F. (2006). *Facilities management handbook*. Oxford: Routledge.
- Budowski, G. (1976). Tourism and environmental conservation: conflict, coexistence, or symbiosis?. *Environmental conservation*, 3(1), 27-31. doi:10.1017/S0376892900017707
- Buhler, W., Dittman, B., & Langley, R. L. (2025). Personal Protective Equipment. In *Farm Toxicology: A Primer for Rural Healthcare Practitioners* (pp. 23-50). Cham: Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-80441-0_4
- Castillo-Salazar, I. P., Sanagustín-Fons, V., & Pardo, I. L. (2025). Ecotourism as a catalyst for sustainable development: Conservation governance in mountain regions. *Societies*, 15(7), 196. <https://doi.org/10.3390/soc15070196>
- Chis, T. V., et al. (2025). Integrated noise management strategies in industrial environments: a framework for occupational safety, health, and productivity. *Sustainability*, 17(3), 1181. <https://doi.org/10.3390/su17031181>
- Cvetković, M., Brankov, J., Ćurčić, N., Pavlović, S., Dobričić, M., & Tretiakova, T. N. (2023). Protected natural areas and ecotourism—priority strategies for future development in selected serbian case studies. *Sustainability*, 15(21), 15621. <https://doi.org/10.3390/su152115621>
- Das, B. K. (2024). Beyond the 'protected Area' Paradigm in conservation: exploring India's Forest legislation as a new conservation model for developing countries. *Environmental Management*, 74(6), 1223-1238. <https://doi.org/10.1007/s00267-024-02056-3>
- DeFries, R., Hansen, A., Turner, B. L., Reid, R., & Liu, J. (2007). Land use change around protected areas: management to balance human needs and ecological function. *Ecological applications*, 17(4), 1031-1038. <https://doi.org/10.1890/05-1111>
- Dey, D., & Arunachalam, A. (2024). *Sustainable and Traditional Environmental Conservation in Asia*. Springer.
- Dwicahyo, I., Suhardjono, L. M. L., & Siswoyo, H. (2024). Water Allocation Model Due to Non-Technical (Economic, Social, and Environmental) Factors. *Journal of Hunan University Natural Sciences*, 51(6). <https://doi.org/10.55463/issn.1674-2974.51.6.3>

- Eze, K., Olusegunbiyi, S., Shorunke, M., & Michael, O. (2025). Sustainable soil-structure interaction for road infrastructure in flood-prone regions of Nigeria. *The Asian Review of Civil Engineering*, 14(1), 1-8. DOI: <https://doi.org/10.70112/tarce-2025.14.1.4254>
- Fandeli, C. (2002). *Perencanaan kepariwisataan alam*. Yogyakarta: Fakultas Kehutanan Universitas Gadjah Mada.
- Harbor, J. (1999). Engineering geomorphology at the cutting edge of land disturbance: erosion and sediment control on construction sites. *Geomorphology*, 31(1-4), 247-263. [https://doi.org/10.1016/S0169-555X\(99\)00107-5](https://doi.org/10.1016/S0169-555X(99)00107-5)
- Ibrahim, A. O. (2025). Assessing Saudi Arabia's Tourism Infrastructure and Facilities: Challenges and Opportunities for Sustainable Tourism Development. *BIMA Journal of Science and Technology GOMBE*, 9(1A), 195-211. DOI: <https://doi.org/10.64290/bima.v9i1A.899>
- ILO. (2022). *Occupational safety and health in the future of work*. Geneva: International Labour Organization.
- Jamal, T., Taillon, J., & Dredge, D. (2011). Sustainable tourism pedagogy and academic-community collaboration: A progressive service-learning approach. *Tourism and Hospitality Research*, 11(2), 133-147. <https://doi.org/10.1057/thr.2011.3>
- Jamil, A. H., Deli, M. M., Rauf, U. A. A., Jamilah, M., Sinniah, S., & Abdullah, S. I. N. W. (2024). Resilience and sustainability in tourism-forestry systems through risk management framework: review and concept. *Journal of Law and Sustainable Development*, 12(1). <https://doi.org/10.55908/sdgs.v12i1.1120>
- Knecht, H., Balanay, J. A. G., Langley, R., Tutor Marcom, R., & Richards, S. L. (2024). Retrospective risk assessment of injuries and fatalities in the forestry and logging workforce in the United States, 2003-2019. *Journal of agromedicine*, 29(3), 372-383. <https://doi.org/10.1080/1059924X.2024.2325708>
- Kiswanto, et al. (2025). Adaptive ecosystem restoration for strengthening ecotourism hotspots in protected forest landscapes. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1562, No. 1, p. 012022). DOI 10.1088/1755-1315/1562/1/012022
- Kolawole, A. S., & Iyiola, A. O. (2023). Environmental pollution: threats, impact on biodiversity, and protection strategies. In *Sustainable utilization and conservation of Africa's biological resources and environment* (pp. 377-409). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-19-6974-4_14
- Li, Y., & Liu, C. (2023). Risk assessment and hazard identification in outdoor tourism areas. *Safety Science*, 158, 105982. <https://doi.org/10.1016/j.ssci.2022.105982>
- Hariram, N. P., Mekha, K. B., Suganthan, V., & Sudhakar, K. (2023). Sustainalism: An integrated socio-economic-environmental model to address sustainable development and sustainability. *Sustainability*, 15(13), 10682. <https://doi.org/10.3390/su151310682>
- Mahadewi, N. M. E., Tantra, D. K., Surata, I. K., & Irwanti, N. K. D. (2025). The Role of Mountain Rural Destination Planning to Event Tourism: Tourism Planning and Ergonomic Approach. In *Handbook of Tourism and Hospitality Marketing in Indonesia* (pp. 101-122). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-96-2567-3_5
- Makanda, K., Nzama, S., & Kanyerere, T. (2022). Assessing the role of water resources protection practice for sustainable water resources management: A review. *Water*, 14(19), 3153. <https://doi.org/10.3390/w14193153>
- McClelland, L. F. (1998). *Building the national parks: Historic landscape design and construction*. London: JHU Press.
- McCray, L. E., Oye, K. A., & Petersen, A. C. (2010). Planned adaptation in risk regulation: An initial survey of US environmental, health, and safety regulation. *Technological Forecasting and Social Change*, 77(6), 951-959. <https://doi.org/10.1016/j.techfore.2009.12.001>

- Nugroho, A. W., et al. (2023). IDENTIFYING NEW TOURIST DESTINATIONS IN BALIKPAPAN'S PROTECTED FOREST: A SOLUTION TO PROLONGED SOCIAL CONFLICTS. *Bulletin of the Transilvania University of Brasov. Forestry, Wood Industry, Agricultural Food Engineering. Series II*, 16(2), 17-36. DOI: <https://doi.org/10.31926/but.fwiafe.2023.16.65.2.2>
- O'Brien, J. J. (1989). Concrete. In *Construction Inspection Handbook: Quality Assurance/Quality Control* (pp. 280-337). Boston, MA: Springer US.
- Parkash, S., & Kathait, A. (2014). A selected annotated bibliography and bibliography on landslides in India. *National Institute of Disaster Management, Ministry of Home Affairs, Govt. of India, New Delhi*, 172(9), 69-81.
- Pemerintah Kota Balikpapan. (2012). *Peraturan daerah Kota Balikpapan tentang rencana tata ruang wilayah (RTRW) Kota Balikpapan tahun 2012–2032*. Balikpapan: Pemerintah Kota Balikpapan.
- Pradipta, M. (2025). Tourist Safety Level in Cengklik Reservoir: Impact and Development Strategy to Increase Tourist Attraction. *Jurnal Kepariwisata: Destinasi, Hospitalitas dan Perjalanan*, 9(2), 161-175. DOI: <https://doi.org/10.34013/jk.v9i2.1918>
- Republik Indonesia. (1970). *Undang-Undang Nomor 1 Tahun 1970 tentang keselamatan kerja*. Lembaran Negara Republik Indonesia Tahun 1970 Nomor 1. Jakarta: Sekretariat Negara.
- Republik Indonesia. (1999). *Undang-Undang Nomor 41 Tahun 1999 tentang kehutanan*. Lembaran Negara Republik Indonesia Tahun 1999 Nomor 167. Jakarta: Sekretariat Negara.
- Republik Indonesia. (2009). *Undang-Undang Nomor 32 Tahun 2009 tentang perlindungan dan pengelolaan lingkungan hidup*. Lembaran Negara Republik Indonesia Tahun 2009 Nomor 140. Jakarta: Sekretariat Negara.
- Samino García, R. (2023). A service-learning program assessment: Strengths, weaknesses and impacts on students. *Intangible Capital*, 19(1), 4-24. DOI: 10.3926/ic.2093
- Shukla, S. K., & Kaul, S. (2024). Advanced Building Materials. In *Thermal Evaluation of Indoor mate and Energy Storage in Buildings* (pp. 1-36). CRC Press.
- Simpeh, F., & Amoah, C. (2023). Assessment of measures instituted to curb the spread of COVID-19 on construction site. *International Journal of Construction Management*, 23(3), 383-391. <https://doi.org/10.1080/15623599.2021.1874678>
- Sitairesmi, D. T., Nugroho, R. A., & Putri, D. L. (2023). Environmental damage and land use changes: forest protection strategy. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1183, No. 1, p. 012074). DOI 10.1088/1755-1315/1183/1/012074
- Sulistyo, T., & Abrar, A. (2017). Characterization of Thin Alluvial Bed Aquifers in Manggar River Balikpapan East Kalimantan Indonesia. *JTT (Jurnal Teknologi Terpadu)*, 5(1), 54-62. DOI: <https://doi.org/10.32487/jtt.v5i1.212>
- Tank, I., & Sharma, S. (2025). Pollution Prevention Strategies for Air and Water in Construction. In *Handbook of Construction Project Management* (pp. 1545-1570). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-96-7631-6_51
- Törner, M., & Pousette, A. (2009). Safety in construction—a comprehensive description of the characteristics of high safety standards in construction work, from the combined perspective of supervisors and experienced workers. *Journal of safety research*, 40(6), 399-409. <https://doi.org/10.1016/j.jsr.2009.09.005>
- Voskresenskaya, E., Vorona-Slivinskaya, L., & Panov, S. (2018). Legal regulation of environmental protection, management of natural resources, and environmental safety in construction sector. In *MATEC web of conferences* (Vol. 193, p. 02025). EDP Sciences. <https://doi.org/10.1051/matecconf/201819302025>
- World Health Organization. (2022). *Consolidated telemedicine implementation guide*. World Health Organization.