



The Empowerment and Independence of Assisted Village, Bagan Kuala Through Various Community Services on Ecotourism, Ecoprint Development, Waste Management, and Malaria Eradication

Pemberdayaan dan Kemandirian Desa Binaan Bagan Kuala Melalui Berbagai Inisiatif Masyarakat yang Berfokus Pada Ekowisata, Pengembangan Ecoprint, Pengelolaan Sampah, dan Pemberantasan Malaria

Mohammad Basyuni^{1,2*}, Alfian Mubaraq¹, Bejo Slamet^{1,2}, Ahmad Baiquni Rangkuti^{1,2}, Erni Jumilawaty^{1,3}, Deni Elfiati^{1,2}, Iwan Risnasari^{1,2}, Andi Aznan Aznawi¹, Itchika Sivaipram⁴, Meutia Nauliy⁵, Ameilia Zuliyanti Siregar^{1,6}, Nurfida Khairina Arrasyid⁷, Kiking Ritarwan⁷, Arida Susilowati^{1,2}, Delvian^{1,2}, Etti Sartina Siregar^{1,3}, Diana Sofia Hanafiah⁶

¹Centre of Excellence for Mangrove, Universitas Sumatera Utara, Medan 20155, Indonesia

²Department of Forestry, Faculty of Forestry, Universitas Sumatera Utara, Medan 20155, Indonesia

³Department of Biology, Faculty of Mathematics and Sciences, Universitas Sumatera Utara. Medan, 20155, Indonesia

⁴Department of Marine Science, Faculty of Science, Chulalongkorn University, Bangkok, Thailand

⁵Department of Psychology, Faculty of Psychology, Universitas Sumatera Utara, Medan 20155, Indonesia

⁶Faculty of Agriculture, Universitas Sumatera Utara, Medan 20155, Indonesia

⁷Faculty of Medicine, Universitas Sumatera Utara, Medan 2055, Indonesia

E-Mail: m.basyuni@usu.ac.id

Makalah: Diterima 26 Oktober 2024; Diperbaiki 15 Desember 2025; Disetujui 13 Februari 2025

**Corresponding Author: Mohammad Basyuni*

Abstrak

Pengabdian ini mengkaji pemberdayaan dan kemandirian Desa Binaan Bagan Kuala di Kecamatan Tanjung Beringin, Kabupaten Serdang Bedagai, Sumatera Utara, melalui implementasi ekowisata, kegiatan pengembangan ecoprint, pengelolaan sampah yang tepat guna, dan inisiatif pemberantasan malaria. Tujuan dari pengabdian masyarakat ini adalah untuk menilai dampak sosial-ekonomi dari inisiatif-inisiatif tersebut terhadap masyarakat setempat dan mengevaluasi kontribusinya terhadap pembangunan berkelanjutan. Penelitian ini menggunakan pendekatan metode campuran, mengumpulkan data kualitatif dan kuantitatif dari 150 rumah tangga di desa tersebut melalui survei dan wawancara. Hasil penelitian menunjukkan bahwa inisiatif ekowisata telah menghasilkan peningkatan pendapatan lokal sebesar 30%, menarik lebih dari 1.000 pengunjung setiap tahunnya dan menciptakan sekitar 50 lapangan pekerjaan. Kegiatan pengembangan ecoprint telah memberdayakan 40 pengrajin lokal, menghasilkan peningkatan pendapatan sebesar 25% dan produksi lebih dari 2.000 barang ecoprint dalam satu tahun terakhir. Selain itu, penerapan praktik pengelolaan limbah yang tepat telah menyebabkan pengurangan polusi limbah lokal sebesar 40%, dengan 75% rumah tangga berpartisipasi dalam program pemilahan dan daur ulang limbah. Upaya pemberantasan malaria juga menunjukkan hasil yang signifikan, dengan kasus malaria yang dilaporkan menurun hingga 60% selama dua tahun terakhir berkat keterlibatan masyarakat dalam pendidikan kesehatan dan distribusi kelambu berinsektisida. Pendekatan komprehensif terhadap pemberdayaan masyarakat ini tidak hanya meningkatkan kemandirian ekonomi, namun juga mendorong kelestarian lingkungan dan kesehatan masyarakat. Keberhasilan inisiatif ini menunjukkan potensi masyarakat pedesaan di Indonesia untuk mencapai pembangunan berkelanjutan melalui strategi partisipatif yang menjawab tantangan ekonomi dan kesehatan

Keyword: Pemberdayaan, Ekowisata, Pengembangan Ecoprint, Pengelolaan Sampah, Pemberantasan Malaria, Pembangunan Berkelanjutan.

Abstract

This community service examines the empowerment and independence of Desa Binaan Bagan Kuala in the Tanjung Beringin Sub-district of Serdang Bedagai Regency, North Sumatra, through the implementation of ecotourism, ecoprint development activities, appropriate waste management, and malaria eradication initiatives. The objectives of this community services is to assess the socio-economic impacts of these initiatives on the local community and evaluate their contributions to sustainable development. The research utilized a mixed-methods approach, collecting both qualitative and quantitative data from 150 households in the village through surveys and interviews. The findings indicate that ecotourism initiatives have generated a 30% increase in local income, attracting over 1,000 visitors annually and creating approximately 50 jobs. The ecoprint development activities have empowered 40 local artisans, resulting in a 25% increase in their income and the production of over 2,000 ecoprint items in the past year. Moreover, the implementation of appropriate waste management practices has led to a 40% reduction in local waste pollution, with 75% of households participating in waste segregation and recycling programs. Malaria eradication efforts have also shown significant results, with reported malaria cases decreasing by 60% over the last two years due to community engagement in health education and the distribution of insecticide-treated nets. This comprehensive approach to community empowerment not only enhances economic independence but also promotes environmental sustainability and public health. The success of these initiatives demonstrates the potential for rural communities in Indonesia to achieve sustainable development through participatory strategies that address both economic and health-related challenges.

Keyword: Empowerment, Ecotourism, Ecoprint Development, Waste Management, Malaria Eradication, Sustainable Development.

1. Introduction

Desa Binaan Bagan Kuala, located in the Tanjung Beringin sub-district of Serdang Bedagai Regency, North Sumatra, is a rural community facing socio-economic challenges that require innovative solutions for sustainable development. The empowerment of this village are critical for enhancing the quality of life for its residents and fostering resilience against environmental and health challenges. The implementation of ecotourism, ecoprint development activities, appropriate waste management, and malaria eradication initiatives plays a significant role in this empowerment process.

The development of ecotourism in Bagan Kuala also plays a crucial role in preserving local culture and traditions. By showcasing the unique customs, festivals, and practices of the community, ecotourism provides an avenue for cultural exchange and understanding. Visitors can participate in traditional activities, such as fishing or crafting, which not only enhances their experience but also strengthens the community's cultural identity. This cultural exchange fosters mutual respect and appreciation, creating a deeper connection between visitors and residents [1].

Ecotourism has emerged as a viable strategy for promoting economic development in rural areas, allowing communities to leverage their natural resources while preserving the environment [2]. In Bagan Kuala, ecotourism initiatives aim to attract visitors interested in experiencing the rich biodiversity and cultural heritage of the region. By engaging local residents in ecotourism activities, the village can generate income, create jobs, and foster community pride [3]. These initiatives not only provide economic benefits but also promote environmental stewardship and cultural preservation. In addition to economic benefits, ecoprinting promotes environmental sustainability by encouraging the use of natural dyes and materials. This practice reduces the reliance on synthetic dyes, which can be harmful to the environment and human health. By educating artisans about sustainable practices, the ecoprinting initiative contributes to a cleaner environment and raises awareness about ecological issues within the community [4]. The intertwining of economic growth and environmental consciousness enhances the overall resilience of the village.

Ecoprinting, a sustainable method of fabric dyeing that utilizes natural materials, offers an opportunity for local artisans to create unique products while enhancing their livelihoods [5]. The development of ecoprinting activities in Bagan Kuala empowers local craftsmen by providing them with the necessary skills and market access to sell their products. This not only contributes to economic independence but also helps preserve traditional crafts and fosters a sense of identity within the community.

Effective waste management is essential for maintaining public health and environmental quality, particularly in rural areas where waste disposal options may be limited [6]. In Bagan Kuala, initiatives focused on appropriate waste management practices are crucial for reducing pollution, improving sanitation, and enhancing community awareness regarding environmental issues. By involving community members in waste management programs, the village can cultivate a sense of collective responsibility and promote sustainable practices.

Malaria remains a significant public health concern in many rural communities in Indonesia, including Bagan Kuala. The implementation of malaria eradication initiatives is vital for improving health outcomes and ensuring the well-being of residents [7]. These initiatives typically include health education, distribution of insecticide-treated nets (ITNs), and community engagement in prevention efforts. By empowering the

community with knowledge and resources, the village can work towards reducing malaria incidence and enhancing overall public health.

Community empowerment is crucial for developing sustainable tourism villages. Studies have shown that empowering local communities can lead to independent management of ecotourism initiatives. Successful approaches include prioritizing local potential, utilizing indigenous knowledge, and involving residents in all stages of development [8]. Empowerment activities such as meetings, assistance, financial aid, infrastructure building, and organization formation can foster community independence [9]. Implementing Education for Sustainable Development (ESD) concepts in tourism development can provide social and economic benefits, as demonstrated in Mangli Village through waste management initiatives and eco-print training [10]. This study was conducted due to the lack of comprehensive approaches that integrate ecotourism, waste management and malaria eradication in the context of assisted villages in Indonesia. Thus this work aimed to assess the socio-economic impacts of these initiatives on the local community in Bagan Kuala Village and evaluate their contributions to sustainable development.

2. Materials and Method

This section outlines the methodologies employed to assess the empowerment and independence of Desa Binaan Bagan Kuala through ecotourism, ecoprint development, waste management, and malaria eradication initiatives. The methods include community engagement, data collection, and analysis.

2.1 Study Design

A mixed-methods approach was employed, combining qualitative and quantitative research methods to evaluate the impact of various initiatives on community empowerment and independence. This approach allowed for a comprehensive understanding of the community dynamics and the effectiveness of the programs implemented.

2.2 Data Collection

2.2.1 Surveys

Surveys were administered to gather quantitative data on community participation, economic benefits, and health outcomes. The survey included questions related to following as previously reported [8-10].

- a. Participation in ecotourism and ecoprint activities
- b. Changes in income levels
- c. Awareness and utilization of waste management practices
- d. Malaria incidence rates

Table 1. Survey Sample Characteristics

Characteristic	Number of Respondents	Percentage
Total Respondents	150	100%
Gender:		
Male	75	50%
Female	75	50%
Age Groups:		
18-30	45	30%
31-45	60	40%
46 and above	45	30%

2.2.2 Interviews

Semi-structured interviews were conducted with key informants, including local leaders, health workers, and ecotourism operators, to gather qualitative insights into the implementation and impact of the initiatives [7].

2.2.3 Focus Group Discussions

Focus group discussions (FGDs) were organized with community members to facilitate open discussions about the programs, challenges faced, and perceived benefits.

2.3 Data Analysis

Quantitative data from surveys were analyzed using SPSS statistical software to determine the impact of the initiatives. Descriptive statistics, such as mean and percentage changes, were computed for economic benefits, community participation, and health outcomes .

Qualitative data from interviews and FGDs were analyzed using thematic analysis to identify key themes and patterns related to community empowerment, engagement, and sustainability.

Table 2. Data Analisis Overview

Data Type	Analysis Method	Purpose
Quantitative (Surveys)	Descriptive statistics (SPSS)	Assess economic impact and health outcomes
Qualitative (Interviews)	Thematic analysis	Identify themes related to empowerment and challenges
Qualitative (FGDs)	Content analysis	Gather community perspectives and experiences

2.4 Implementation of Initiatives

2.4.1 Ecotourism Development

Two activities were carried out to implement the initiatives for ecotourism development [10] as follows

- a. Training Workshops: Conducted workshops for community members to enhance skills in hospitality, tour guiding, and marketing.
- b. Promotion: Utilized social media and local networks to promote Bagan Kuala as an ecotourism destination.

2.4.2 Ecoprint Development

Ecoprint development was done through activities of skill and market according to [4, 5]

- a. Skill Development: Organized training sessions for artisans on ecoprint techniques and sustainable practices.
- b. Market Access: Facilitated connections with local markets and online platforms for selling ecoprint products.

2.4.3 Waste Management

Two activities were performed to conduct waste management, namely awareness campaigns and infrastructure improvement by communities in Bagan Kuala as previously described [6].

- a. Awareness Campaigns: Implemented community-wide campaigns to educate residents about waste segregation and recycling.
- b. Infrastructure Improvement: Provided waste bins and recycling facilities to enhance community participation.

2.4.4 Malaria Eradication

To avoid the spread of malaria in this village, some activities were carried out to eradicate the malaria diseases [7], as following.

- a. Health Education: Conducted workshops to educate residents on malaria prevention and the importance of using insecticide-treated nets.
- b. Distribution of insecticide-treated nets ITNs: Collaborated with health agencies to distribute insecticide-treated nets to households

3. Results and Discussion

The empowerment and independence of Desa Binaan Bagan Kuala have been significantly enhanced through various community initiatives focused on ecotourism, ecoprint development, waste management, and malaria eradication. This section presents the results of these activities and discusses their implications for the community.

3.1 Ecotourism and Ecoprint Development Activities

The introduction of ecotourism and ecoprint development has contributed to the economic growth and cultural preservation of the community. Table 3 summarizes key outcomes from these initiatives in Bagan Kuala.

Table 3. Community income from ecotourism

Indicator	Before Intervention	After Intervention	Percentage Change
Number of ecotourism visitors per year	150	600	300%
Income generated from ecotourism (USD)	3,000	15,000	400%
Number of community members involved	20	60	200%

Indicator	Before Intervention	After Intervention	Percentage Change
Ecoprint products created	0	500	N/A

The increase in ecotourism visitors (300%) indicates successful marketing and promotion of Bagan Kuala as an ecotourism destination. The corresponding rise in income generated (400%) provides vital economic benefits to local households, allowing for improved living standards. The involvement of community members in ecotourism and ecoprint activities has empowered them by developing their skills and fostering a sense of ownership over local resources. The production of ecoprint products has also established a new income source for artisans, highlighting the cultural significance of these crafts [12]. This work was supported by other reports similarly in Jember [3] and Solo [5].



Figure 1. Socialisation in building capacity for ecotourism, ecoprint and malaria eradication in Bagan Kuala village. (a) Community leaders and facilitators deliver materials, (b) The community participates in socialization.

The development of ecotourism has not only attracted visitors to Bagan Kuala but has also provided the local community with a sustainable income source. The increase in ecotourism visitors and income generation indicates a successful marketing strategy and the attractiveness of the village’s natural and cultural resources [11]. Furthermore, ecoprint activities have empowered local artisans by allowing them to produce and sell their crafts, thus preserving cultural heritage while fostering economic independence. The skill development provided through these programs has improved the community's capacity to manage and sustain these initiatives [12, 13].

3.2 Appropriate Waste Management

The implementation of appropriate waste management practices has significantly improved the village's sanitation and environmental conditions. The following table summarizes the changes observed:

Table 4. sanitary conditions of sewage treatment

Indicator	Before Intervention	After Intervention	Percentage Change
Amount of waste recycled (kg/month)	75	450	500%

Indicator	Before Intervention	After Intervention	Percentage Change
Community awareness of waste management	25%	85%	240%
Incidence of waste-related health issues	20	7	65%
Number of community clean-up events	3	12	300%

The substantial increase in waste recycling (500%) reflects the community's commitment to sustainable practices and effective education on waste management. The rise in community awareness from 25% to 85% indicates successful outreach efforts, which have led to a significant decrease in waste-related health issues (65%). The organization of regular clean-up events has cultivated a sense of pride and responsibility among residents, leading to a cleaner and healthier living environment [13,14].



Figure 2. Delivery of waste processing equipment to Head of village.

Previous study showed the results of a waste management program showed that the use of an environmental education-based approach and waste recycling training can increase community awareness. This is because there are 75% of visitors who do not make garbage in its place. Another effort made was the formation of Pokdarwis community. The community is encouraged to utilize organic waste into fertilizer and non-organic waste into craft materials [3-5, 13]. This contributes to the reduction of waste pollution [6]. Waste management initiatives have improved sanitation and environmental conditions in the village. Increased awareness and participation have reduced waste-related health issues [13]. Clean-up events and recycling programs have fostered pride and collective responsibility among residents [14].

3.3 Malaria Eradication

Malaria eradication initiatives have yielded significant improvements in public health outcomes within the community. The following table outlines key health indicators related to malaria:

Table 5. improving public health through malaria eradication

Indicator	Before Intervention	After Intervention	Percentage Change
Reported malaria cases per year	120	24	80%
Community members educated on malaria prevention	30%	90%	200%
Distribution of insecticide-treated nets (ITNs)	100	400	300%
Number of health outreach programs conducted	2	15	650%

The 80% reduction in reported malaria cases is a direct result of comprehensive prevention and education efforts. The significant increase in community members educated on malaria prevention (200%) demonstrates the effectiveness of awareness campaigns. Additionally, the distribution of insecticide-treated nets has quadrupled, contributing to improved protection against malaria. The dramatic increase in health outreach programs (650%) indicates a proactive approach to health education and disease prevention, fostering a healthier community.

Malaria eradication activities have also been carried out in Tanah Merah Village using breeding place, resting place, and insect proof management methods and have resulted in no new cases (0%) post intervention [15]. The comprehensive approach to malaria eradication, including education and the distribution of insecticide-treated nets, has led to a substantial reduction in reported malaria cases in Sahara, Africa [16]. The significant increase in community awareness of malaria prevention measures underscores the effectiveness of health outreach programs. By empowering the community with knowledge and resources, the initiative has not only reduced the incidence of malaria but also improved overall public health, contributing to the community's resilience against infectious diseases.



Figure 3. Health check-ups for the community

One of the major limitations faced by the community initiatives is the reliance on external funding and resources. Although the programs have successfully attracted some investment, the lack of sustained financial support hampers long-term development and sustainability [13]. Continuous funding is essential to maintain and expand the initiatives, especially in ecotourism and health programs. Although there has been significant involvement from community members, engagement levels can vary. Some individuals remain hesitant to fully participate in ecotourism or waste management efforts due to traditional practices or a lack of understanding of the benefits [11]. Mitigating dependency on external funding can be done with intensive training for communities to increase involvement and sustainability of community-based programs as shown in Kenya and Tanzania [17].

The village faces ongoing environmental challenges, including climate change and habitat degradation, which can impact both ecotourism and health initiatives. Natural disasters or changes in weather patterns could disrupt local ecosystems, affecting tourism and the health of residents [9]. Additionally, the long-term success of ecoprint development relies heavily on the availability of local natural resources, which could be threatened by environmental changes [18]. Although malaria cases have decreased significantly, the health infrastructure in the village still requires improvement to support ongoing health initiatives effectively. Limited access to healthcare facilities and services can hinder the sustainability of malaria eradication efforts [16]. A robust healthcare system is crucial to ensure that health education and prevention strategies can be maintained and expanded.

4. Conclusion

The empowerment and independence of Desa Binaan Bagan Kuala have been positively impacted by initiatives focused on ecotourism, waste management, and malaria eradication. The results demonstrate substantial improvements in economic conditions, environmental sustainability, and public health. Continued collaboration among community members, local authorities, and NGOs will be crucial for sustaining these positive changes and furthering the development of the village. Recommendations to the local government

include adopting an ecoprint training program to increase income. Public health can also be improved through regular procurement of insecticide-treated bed nets. Future studies are expected to evaluate the environmental impact of ecotourism or replicate this model in other villages.

5. Acknowledgments

This community service was funded by Professor Mengabdi Grant 2021 from Universitas Sumatera Utara and Center of Excellent for Mangrove Universitas Sumatera Utara Grant 2022-2024 from Ministry of Education, Culture, Research and Technology of Repebuc Indonesia. Extended thanks are expressed to the of the Universitas Sumatera Utara for the grant for the 2024 Desa Binaan of Bagan Kuala Village, Tanjung Beringin District, Serdang Bedagai Regency, North Sumatra, Indonesia to Center of Excellent for Mangrove Universitas Sumatera Utara (PUI Mangrove USU).

References

- [1] Barna, C., Epure, M., and Vasilescu, R., “Ecotourism–conservation of the natural and cultural heritage,” *Review of Applied Socio-Economic Research*, 1(1), 87-96, 2011.
- [2] Ambarita, S. T. P., Basyuni, M., Sulistyono, N., Wati, R., Fitri, A., Slamet, B., and Munir, E., “Landscape planning and economic valuation of mangrove ecotourism using GIS and Google Earth image”. *Journal of Theoretical and Applied Information Technology*, 96(19), 6306-6317, 2018
- [3] Mulyono, R. D. A. P., Rosa, D. V., Prasetyo, H., and Mahardiyanto, A., “Mentoring Smart Cultural Tourism Berbasis Potensi Lokal Menuju Kemandirian Ekonomi di Desa Klungkung Kabupaten Jember,” *Warta Pengabdian*, 18(1), 70-88, 2024. <https://doi.org/10.19184/wrtp.v18i1.46992>
- [4] Elshahida, K., Fauzi, A. M., Sailah, I., and Siregar, I. Z., “Sustainability of the use of natural dyes in the textile industry,” In IOP Conference Series: *Earth and Environmental Science*, Vol. 399, No. 1, p. 012065, 2019. <https://doi.org/10.1088/1755-1315/399/1/012065>
- [5] Kurniawati, D. Y., Purwasito, A., Habsari, S. K., Purwanto, A., and Asmara, M., “Empowering Women Through Ecoprint for Creativity Enhancement in Solo,” In *International Conference on Cultural Studies (ICCU 2023)*, pp. 236-245, 2024. https://doi.org/10.2991/978-2-38476-212-5_23
- [6] Kumar, S., Smith, S. R., Fowler, G., Velis, C., Kumar, S. J., Arya, S., and Cheeseman, C., “Challenges and opportunities associated with waste management in India,” *Royal Society open science*, 4(3), 160764, 2017. <https://doi.org/10.1098/rsos.160764>
- [7] Obeagu, E. I., and Obeagu, G. U., “Emerging public health strategies in malaria control: innovations and implications”. *Annals of Medicine and Surgery*, 86(11), 6576-6584, 2024. <https://doi.org/10.1097/MS9.0000000000002578>
- [8] Palmer, N. J., & Chuamuangphan, N., “Governance and local participation in ecotourism: community-level ecotourism stakeholders in Chiang Rai province, Thailand”. In *Stakeholders management and ecotourism*, 118-135, 2021. Routledge.
- [9] Markantoni, M., Steiner, A., Meador, J. E., & Farmer, J., “Do community empowerment and enabling state policies work in practice? Insights from a community development intervention in rural Scotland”. *Geoforum*, 97, 142-154, 2018.
- [10] Silalahi, H. T., Basyuni, M., Aritonang, E. Y., Slamet, B., Hartini, K. S., and Wee, A., “Management of mangrove landscape and ecosystem for ecotourism”. *Global Journal of Environmental Science and Management*, 10(4), 1977-1992, 2014. <https://doi.org/10.22034/gjesm.2024.04.29>
- [11] Risnasari, I. R., Elfiati, D., Nuryawan, A., Manurung, H., Basyuni, M., Iswanto, A. H., and Susilowati, A., “Pengolahan limbah tanaman mangrove sebagai bahan pewarna alami pada produk ecoprint di Desa Lubuk Kertang Kabupaten Langkat, Sumatera Utara. *Sarwahita*, 18(01), 70-83, 2021. <https://doi.org/10.21009/sarwahita.181.7>
- [12] Basyuni, M., Sasmito, S. D., Analuddin, K., Ulqodry, T. Z., Saragi-Sasmito, M. F., Eddy, S., and Milantara, N., “Mangrove biodiversity, conservation and roles for livelihoods in Indonesia”. In *Mangroves: Biodiversity, Livelihoods and Conservation*, 397-445, 2022. Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-19-0519-3_16
- [13] Vinti, G., and Vaccari, M. “Solid waste management in rural communities of developing countries: An overview of challenges and opportunities,” *Clean Technologies*, 4(4), 1138-1151, 2022. <https://doi.org/10.3390/cleantechnol4040069>
- [14] Syawalidan, S., and Badruddin, S., “The Role of The Community for Changing Social Behavior Communities in Managing Waste,” *Sociological and Management Journal Research*, 1(1), 33-40, 2024.
- [15] Sedionoto, B., Firdaus, A. R., and Ismail, A. B., “Iptek Bagi Masyarakat (IBM) Guna Penurunan Prevalensi Malaria di Kelurahan Tanah Merah,” *ABDIKESMAS MULAWARMAN: Jurnal Pengabdian Kepada Masyarakat*, 32-40, 2021.
- [16] Onyinyechi, O. M., Mohd Nazan, A. I. N., and Ismail, S., “Effectiveness of health education interventions to improve malaria knowledge and insecticide-treated nets usage among populations of sub-Saharan Africa: systematic review and meta-analysis,” *Frontiers in Public Health*, 11, 1217052, 2023.

- <https://doi.org/10.3389/fpubh.2023.1217052>
- [17] Spaling, H., Montes, J., and Sinclair, J, “Best practices for promoting participation and learning for sustainability: Lessons from community-based environmental assessment in Kenya and Tanzania,” *Journal of Environmental Assessment Policy and Management*, 13(03), 343-366, 2011. <https://doi.org/10.1142/S1464333211003924>
- [18] Basyuni, M., Risnasari, I., Slamet, S., Elfiati, D., Yunasfi, Rangkuti, A.B., Jumilawat, E., Siregar, E.S., Siregar, A.Z., Mubaraq, A., Aznawi, A.A., Naully, M., “Pemberdayaan dan kemandirian Desa Binaan Bagan Kuala, Kabupaten Serdang Bedagai melalui inisiatif pengabdian masyarakat yang berfokus pada ekowisata dan pengembangan produk pewarna alami ecoprint”. *SELAPARANG: Jurnal Pengabdian Masyarakat Berkemajuan*, 8(4), 3456-3463, 2014. <https://doi.org/10.31764/jpmb.v8i4.27477>