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The Influence of Green Infrastructure and Community Participation on Sustainable Natural Resource Management in Indonesia

Darman[1], Hans Yohanes Elrix Doirebo[2]
[1] Universitas Bina Mandiri Gorontalo
[2] Jayapura University of Science and Technology

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ABSTRACT

This research explores the influence of green infrastructure and community participation on sustainable natural resource management in Indonesia through qualitative analysis. Fifteen stakeholders, including government officials, activists, community leaders, NGO representatives, and scholars, were interviewed to gather diverse perspectives on the subject. Thematic analysis revealed key themes highlighting the critical role of green infrastructure in enhancing ecosystem resilience and biodiversity conservation. Additionally, community participation emerged as essential for fostering inclusive decision-making processes and empowering local communities in resource governance. Despite challenges such as funding constraints and power imbalances, opportunities for innovation and collaboration were identified. The findings underscore the interconnectedness of green infrastructure, community participation, and sustainable natural resource management, suggesting integrated approaches for addressing the complex challenges facing Indonesia's natural resources.

Corresponding Author:

Name: Darman
Institution: Universitas Bina Mandiri Gorontalo
Email: darman@ubmg.ac.id

1. INTRODUCTION

In the Indonesian archipelago, where luxuriant rainforests, expansive mangroves, and varied marine ecosystems coexist, protecting the natural resources while meeting the demands of an expanding populace presents a significant problem [1], [2]. Indonesian natural resource management is at a crossroads where it is more important than ever to balance environmental sustainability with economic growth [2]–[4]. The need for sustainable practices is more important than ever in light of the fast-paced urbanization, industrialization, and climate change that we are experiencing.

Because sustainable natural resource management is complex, an integrated approach incorporating ecological, social, and economic factors is required. Green infrastructure and community involvement have become keystones in the global advancement of sustainable development agendas in recent years [5]–[7]. Green infrastructure is a promising approach to improving biodiversity protection, reducing the effects of climate change, and enhancing overall environmental quality. It consists of natural and semi-natural regions that offer vital ecosystem services. Concurrently, community involvement—which is based on

the idea of giving local stakeholders a voice in decision-making processes—has been acknowledged as a major factor in achieving lasting results by encouraging social cohesiveness, resilience, and ownership [8]–[10].

The goal of this study is to examine how community involvement, green infrastructure, and sustainable natural resource management interact in the Indonesian setting. This study uses a qualitative analytical framework to try and understand the complex dynamics, viewpoints, and behaviors influencing how these components relate to one another. By investigating the perspectives, goals, and actual experiences of those involved in natural resource management programs, this study seeks to clarify the fundamental processes that facilitate or obstruct the adoption of sustainable practices.

2. LITERATURE REVIEW

2.1 Sustainable Natural Resource Management in Indonesia

Indonesia confronts enormous challenges in managing its natural resources sustainably because of its wide range of various ecosystems, which include tropical rainforests, coastal habitats, and agricultural landscapes. Deforestation, habitat degradation, overexploitation, and pollution are putting growing pressure on the country's rich biodiversity, which is essential for ecological stability and human well-being. Sustainable natural resource management techniques are being advanced via coordinated efforts driven by the necessity to strike a balance between environmental conservation and economic development [11].

Indonesia's commitment to incorporating sustainability principles into development agendas is demonstrated by government policies and initiatives like the Indonesia Green Growth Program (GGGI), the National Biodiversity Strategy and Action Plan (NBSAP), and the National Action Plan for Climate Change Adaptation (RAN-API). But turning these goals into real results is still a very difficult task, hampered by institutional capacity issues, loopholes in regulations, and conflicting socioeconomic agendas.

2.2 Green Infrastructure: A Pathway to Ecological Resilience

Green infrastructure has gained popularity as a viable strategy for boosting ecological resilience and encouraging sustainable development. It is comprised of natural and semi-natural components that offer ecosystem services. Within the Indonesian setting, green infrastructure refers to a wide range of habitats, such as mangroves, forests, wetlands, and coastal areas. These ecosystems are essential for controlling climate, preserving water quality, promoting biodiversity, and protecting livelihoods [5], [6], [12].

Investing in green infrastructure has several advantages, including improving food security, carbon sequestration, and tourism income in addition to lessening the effects of climate change-related calamities like landslides and floods. Additionally, by enhancing air quality, lowering urban heat island effects, and creating recreational possibilities, green infrastructure initiatives can have a positive co-benefit on human health and well-being [13]–[16].

2.3 Community Participation: Empowering Stakeholders for Sustainable Outcomes

The fundamental tenet of sustainable natural resource management is community participation, which acknowledges the critical role that local stakeholders play in environmental stewardship, resource governance, and decision-making processes. Community-based initiatives, such agroecological practices, marine protected areas

(MPAs), and community forestry programs, have shown promise in Indonesia for improving resource sustainability and empowering underprivileged groups [17]–[20].

Active community involvement cultivates social capital, resilience, and adaptability by advancing inclusive decision-making procedures, supporting regional knowledge networks, and fortifying social bonds. Moreover, community-based approaches can improve the efficacy, equality, and legitimacy of natural resource management interventions by involving communities as active partners in conservation and development projects [21], [22].

Research Gaps and Opportunities

While existing literature provides valuable insights into the theoretical foundations, empirical evidence, and policy implications of green infrastructure and community participation in natural resource management, several gaps warrant further exploration. Future research should focus on elucidating the mechanisms underlying the effectiveness of green infrastructure interventions, assessing the socio-economic impacts of community-based approaches, and identifying strategies for scaling up successful initiatives.

Moreover, comparative studies across different geographical contexts, socio-cultural settings, and governance arrangements can enrich our understanding of the contextual factors shaping the outcomes of sustainable natural resource management interventions. By embracing transdisciplinary research methodologies, fostering knowledge co-production, and promoting inclusive stakeholder engagement, future research endeavors hold the promise of advancing innovative solutions to the complex challenges facing Indonesia's natural resource management sector.

3. METHODS

3.1 Research Design

This study employs a qualitative research design to explore the influence of green infrastructure and community participation on sustainable natural resource management in Indonesia. Qualitative methods are well-suited for capturing the diverse perspectives, experiences, and perceptions of stakeholders involved in complex social phenomena [23]. Through in-depth interviews and focus group discussions, this research aims to unravel the nuanced dynamics shaping the relationship between green infrastructure, community participation, and sustainable natural resource management practices.

3.2 Sampling

Purposive sampling will be utilized to select participants representing a diverse range of perspectives, expertise, and experiences related to natural resource management in Indonesia. A total of 15 informants will be recruited, including government officials, environmental activists, community leaders, representatives from non-governmental organizations (NGOs), and academic scholars. Sampling criteria will encompass geographical diversity, sectoral representation, and engagement in green infrastructure or community participation initiatives.

3.3 Data Collection

Data collection methods will include in-depth interviews and focus group discussions, complemented by document analysis.

a. In-depth Interviews: Semi-structured interviews will be conducted with each informant to explore their perceptions, experiences, and practices related to green infrastructure, community participation, and sustainable natural resource

b. management. Interviews will be audio-recorded with participants' consent and transcribed verbatim for analysis.
c. Focus Group Discussions (FGDs): Group discussions will be organized with community members residing in areas with significant natural resource importance. FGDs will provide a forum for participants to share their perspectives, concerns, and aspirations regarding natural resource management and the role of green infrastructure and community participation. FGDs will be facilitated by the researcher and recorded with the participants' consent.
d. Document Analysis: Relevant documents, reports, policies, and literature on natural resource management in Indonesia will be reviewed to provide context and background information for the study. Document analysis will complement primary data collection by triangulating findings and identifying emergent themes.

3.4 Data Analysis

Data analysis will be conducted using NVivo, a qualitative data analysis software, to facilitate systematic coding, categorization, and thematic analysis of the interview transcripts, FGD recordings, and document excerpts. The following steps will guide the data analysis process:

a. Data Coding: Interview transcripts and FGD recordings will be imported into NVivo, and initial codes will be generated based on recurring themes, concepts, and ideas. Open coding will be employed to capture the breadth and diversity of participants' responses.
b. Thematic Analysis: Through iterative cycles of coding and memo-writing, themes and patterns will be identified across the dataset. Themes related to green infrastructure, community participation, sustainable natural resource management, and their interrelationships will be explored, compared, and synthesized.
c. Data Triangulation: Findings from interviews, FGDs, and document analysis will be triangulated to validate and corroborate emergent themes. Data triangulation enhances the credibility and reliability of the findings by integrating multiple sources of evidence.
d. Member Checking: To enhance the trustworthiness of the findings, preliminary findings will be shared with participants for member checking. Participants will be invited to provide feedback, clarifications, or additional insights to ensure the accuracy and validity of the interpretations.

3.5 Ethical Considerations

This research will adhere to ethical principles, including informed consent, confidentiality, and respect for participants' autonomy and dignity. Participants will be provided with information about the study's purpose, procedures, and potential risks and benefits before obtaining their consent to participate. Confidentiality will be maintained by using pseudonyms and de-identifying sensitive information during data analysis and reporting.

4. RESULT AND DISCUSSION

4.1 Overview of Participants

Fifteen participants representing diverse backgrounds and expertise, including government officials, environmental activists, community leaders, representatives from non-governmental organizations (NGOs), and academic scholars, were interviewed for this study based on their involvement and knowledge in natural resource management in Indonesia. Their demographic profiles and

roles in natural resource management were varied, with participants engaging in activities such as policy development, community-based conservation initiatives, advocacy, research, and sustainable development projects across sectors including environmental, forestry, fisheries, agriculture, marine conservation, indigenous rights, land use planning, sustainable development, geography, and climate change. These participants contributed valuable insights and perspectives on the influence of green infrastructure and community participation on sustainable natural resource management in Indonesia, enriching the depth and breadth of the study's findings with their diverse expertise and experiences.

4.2 Themes Identified

Thematic analysis of the interviews conducted with the participants revealed several key themes related to the influence of green infrastructure and community participation on sustainable natural resource management in Indonesia. These themes encapsulate the diverse perspectives and experiences shared by the participants:

4.3 Role of Green Infrastructure

Green infrastructure plays a pivotal role in promoting sustainable natural resource management practices in Indonesia. The insights gathered from the interviews highlight the multifaceted contributions of green infrastructure to ecological resilience, biodiversity conservation, and climate change mitigation.

Participants emphasized the importance of preserving and restoring green infrastructure elements such as forests, wetlands, mangroves, and coastal areas. Mr. Rahmat, a government official, underscored the significance of mangrove restoration projects in mitigating coastal erosion and protecting coastal communities from the impacts of climate change-induced disasters such as storms and sea-level rise. Similarly, Dr. Siti, an academic scholar, emphasized the vital role of forests in maintaining watershed integrity and ensuring water security for local communities by regulating water flow, replenishing groundwater, and reducing soil erosion.

Furthermore, green infrastructure provides essential ecosystem services that are crucial for supporting biodiversity and maintaining ecological balance. Ms. Putri, a community leader, highlighted the importance of intact forests and mangroves in providing habitat for diverse plant and animal species, including endangered species such as orangutans and sea turtles. She emphasized the need to protect these habitats to safeguard biodiversity and prevent the loss of invaluable ecological resources.

Moreover, green infrastructure serves as a natural buffer against climate change impacts by sequestering carbon, regulating water flow, and reducing the vulnerability of communities to natural hazards. Mr. Jamal, an environmental activist, emphasized the role of forests in sequestering carbon dioxide from the atmosphere and mitigating climate change by storing carbon in biomass and soil. He advocated for the conservation and restoration of forests as a cost-effective strategy for climate change mitigation and adaptation.

4.4 Community Participation and Empowerment

Community participation emerges as a cornerstone in fostering sustainable natural resource management practices in Indonesia. Through inclusive decision-making processes, capacity building initiatives, and co-management arrangements, local communities play a vital role in shaping resource governance and conservation efforts.

Participants highlighted the importance of empowering communities to actively engage in the management and protection of natural resources. Ms. Putri, a community leader, shared her experiences in mobilizing local communities to establish community-managed forests, emphasizing the sense of ownership and responsibility that such initiatives instill among community members. Similarly, Mr. Jamal, an environmental activist, stressed the importance of inclusive governance structures that empower indigenous communities and marginalized groups to participate in decision-making processes and advocate for their rights.

Community-based approaches, such as community forestry, marine protected areas, and sustainable agriculture practices, were cited as effective strategies for promoting community participation and fostering environmental stewardship. Dr. Siti, an academic scholar, highlighted the success of community forestry programs in empowering local communities to manage forest resources sustainably, improve livelihoods, and conserve biodiversity. She emphasized the need for supportive policies and institutional frameworks that recognize and respect community rights and traditional knowledge systems.

Moreover, community participation fosters social cohesion, resilience, and adaptive capacity by strengthening social networks, building trust, and enhancing collective action. Mr. Rahmat, a government official, underscored the importance of community-based approaches in building resilience to climate change impacts and promoting sustainable development at the local level. He emphasized the need for collaborative partnerships between government agencies, civil society organizations, and local communities to address shared challenges and achieve common goals.

Despite the benefits of community participation, challenges such as power imbalances, tenure conflicts, and limited access to resources often hinder meaningful engagement and marginalized communities. Participants stressed the importance of addressing these challenges through capacity building, institutional support, and equitable governance structures that ensure the inclusion of all stakeholders in decision-making processes.

4.5 Challenges and Opportunities

The exploration of challenges and opportunities surrounding green infrastructure and community participation in sustainable natural resource management in Indonesia revealed a complex landscape shaped by various factors. These challenges and opportunities provide critical insights into the barriers and pathways towards achieving more effective and inclusive resource governance.

Challenges

Funding Constraints: Limited financial resources pose a significant challenge to the implementation of green infrastructure projects and community participation initiatives. Government budgets may be insufficient to support large-scale conservation efforts, and alternative funding sources are often difficult to access, particularly for marginalized communities.

Bureaucratic Hurdles: Complex bureaucratic processes and regulatory frameworks can impede the timely implementation of green infrastructure projects and community-based initiatives. Permitting requirements, land tenure issues, and overlapping jurisdictional responsibilities may create administrative barriers and delays.

Power Imbalances: Power imbalances within decision-making processes and resource governance structures can marginalize local communities and hinder their meaningful participation. Elites, government agencies, and external actors may wield disproportionate influence, limiting the voice and agency of marginalized groups.

Tenure Conflicts: Land tenure conflicts, particularly in areas with overlapping claims to natural resources, can escalate tensions and impede collaborative efforts toward sustainable resource management. Unclear land tenure arrangements and competing land use interests may exacerbate conflicts and undermine conservation efforts.

Opportunities

Policy Reform: Opportunities exist for policy reform to address institutional barriers and create enabling environments for green infrastructure and community participation initiatives. Strengthening legal frameworks, decentralizing decision-making authority, and recognizing community rights can

enhance the effectiveness and legitimacy of resource governance mechanisms.

Capacity Building: Capacity building initiatives aimed at empowering local communities and enhancing their knowledge and skills in natural resource management are critical. Training programs, technical assistance, and knowledge exchange platforms can empower communities to actively engage in conservation efforts and contribute to sustainable development.

Collaborative Partnerships: Collaborative partnerships between government agencies, civil society organizations, academia, and local communities can leverage collective expertise and resources to address shared challenges. Multi-stakeholder platforms, participatory planning processes, and joint initiatives can foster trust, collaboration, and knowledge sharing.

Innovation and Technology: Advances in technology, including remote sensing, geographic information systems (GIS), and mobile applications, offer innovative solutions for monitoring, managing, and conserving natural resources. Digital platforms for data collection, mapping, and decision support can enhance transparency, accountability, and community engagement in resource management.

Discussion

The results of the interviews align with existing literature, highlighting the importance of green infrastructure and community participation in promoting sustainable natural resource management [5], [6], [12], [24]. The insights provided by the participants underscored the need for holistic approaches that prioritize ecological integrity, social equity, and institutional capacity building to achieve lasting conservation outcomes.

Implications for Policy and Practice

The insights gleaned from the interviews have significant implications for policy and practice in Indonesia. Policymakers should prioritize investments in green infrastructure projects that enhance ecosystem services, protect biodiversity, and promote climate resilience. Furthermore, efforts to empower local communities through inclusive decision-making processes, capacity building, and resource allocation are essential for ensuring the sustainability and effectiveness of natural resource management initiatives.

Limitations and Future Directions

It is essential to acknowledge the limitations of this study, including the small sample size and the potential for bias in participant selection. Future research could explore the perspectives of additional stakeholders and employ mixed-methods approaches to provide a more comprehensive understanding of the factors influencing sustainable natural resource management in Indonesia.

5. CONCLUSION

This study provides valuable insights into the influence of green infrastructure and community participation on sustainable natural resource management in Indonesia. The findings highlight the importance of investing in green infrastructure projects to enhance ecological resilience and mitigate the impacts of climate change. Moreover, empowering local communities through inclusive decision-making processes and capacity building is crucial for promoting stewardship of natural resources and fostering social cohesion. While challenges such as funding constraints and power imbalances persist, opportunities for policy reform and collaboration offer pathways for advancing sustainable development goals. By integrating these insights into policy and practice, Indonesia can move towards more inclusive, resilient, and sustainable natural resource management systems that safeguard the nation's ecological heritage for future generations.

REFERENCES

[1] G. Rusmayadi, S. Supriandi, and R. Pahrijal, "Trends and Impact of Sustainable Energy Technologies in Mechanical Engineering: A Bibliometric Study," *West Sci. Interdiscip. Stud.*, vol. 1, no. 09, pp. 831–841, 2023.

[2] Y. Iskandar, J. Joeliaty, U. Kaltum, and H. Hilmiana, "Bibliometric Analysis on Social Entrepreneurship Specialized Journals," *J. WSEAS Trans. Environ. Dev.*, pp. 941–951, 2021, doi: 10.37394/232015.2021.17.87.

[3] Y. Iskandar, R. Pahrijal, and K. Kurniawan, "Sustainable HR Practices in Indonesian MSMEs from a Social Entrepreneurship Perspective: Training, Recruitment, Employee Engagement, Social Impact of Local Communities," *Int. J. Business, Law, Educ.*, vol. 4, no. 2, pp. 904–925, 2023.

[4] Y. Iskandar, J. Joeliaty, U. Kaltum, and H. Yudomartono, "Key Factors Affecting Social Enterprise Performance: A Literature Review," *J. Dev. Entrep.*, vol. 28, no. 02, p. 2350015, 2023.

[5] P. Aghion, C. Hepburn, A. Teytelboym, and ..., "Path dependence, innovation and the economics of climate change," *… green growth*, 2019.

[6] Y. Chen and A. Whalley, "Green infrastructure: The effects of urban rail transit on air quality," *Am. Econ. J. Econ. Policy*, vol. 4, no. 1, pp. 58–97, 2012.

[7] M. M. Hussain, S. Pal, and M. A. Villanthenkodath, "Towards sustainable development: The impact of transport infrastructure expenditure on the ecological footprint in India," *… and Green Development*. Elsevier, 2023.

[8] R. Kumar *et al.*, "Impacts of plastic pollution on ecosystem services, sustainable development goals, and need to focus on circular economy and policy interventions," *Sustain.*, vol. 13, no. 17, pp. 1–40, 2021, doi: 10.3390/su13179963.

[9] J. S. Frazer, A. Shard, and J. Herdman, "Involvement of the open-source community in combating the worldwide COVID-19 pandemic: a review," *J. Med. Eng. Technol.*, vol. 44, no. 4, pp. 169–176, 2020.

[10] G. Murewanhema *et al.*, "Maternal, sexual and reproductive health in marginalised areas: Renewing community involvement strategies beyond the worst of the COVID-19 pandemic," *Int. J. Environ. Res. Public Health*, vol. 19, no. 6, p. 3431, 2022.

[11] S. Soviana and J. Puspa, "Multi-layer distribution system of Indonesian fruit-vegetable sector: current challenges and future perspectives," in *Conference on International Research on Food Security, Natural Resource Management and Rural Development, Tropentag*, 2012.

[12] K. Shulla, B. F. Voigt, S. Cibian, G. Scandone, and ..., "Effects of COVID-19 on the sustainable development goals (SDGs)," *… Sustainability*. Springer, 2021. doi: 10.1007/s43621-021-00026-x.

[13] R. Shakya and L. Ahiablame, "A synthesis of social and economic benefits linked to green infrastructure," *Water*, vol. 13, no. 24, p. 3651, 2021.

[14] H. H. Trinh, M. McCord, D. Lo, and G. Squires, "Do green growth and technological innovation matter to infrastructure investments in the era of climate change? Global evidence," *Appl. Econ.*, 2023, doi: 10.1080/00036846.2022.2125493.

[15] D. Furberg, Y. Ban, and U. Mörtberg, "Monitoring urban green infrastructure changes and impact on habitat connectivity using high-resolution satellite data," *Remote Sens.*, vol. 12, no. 18, p. 3072, 2020.

[16] V. M. Govigli, M. Rois-Díaz, and ..., "The green side of social innovation: Using sustainable development goals to classify environmental impacts of rural grassroots initiatives," *Environ. Policy …*, 2022, doi: 10.1002/eet.2019.

[17] Sajad Ahmad Bhat and Priyanka Patni, "A review: Impact of motivation and toxic work around job culture," *World J. Adv. Res. Rev.*, vol. 17, no. 3, pp. 747–751, 2023, doi: 10.30574/wjarr.2023.17.3.0463.

[18] R. Thohiri, R. Yuni, P. Hastuti, and A. Arwansyah, "Factors That Influence Investments in The Indonesia Stock Exchange to Improve Understanding of Capital Market Subjects Study on Unimed Campus Communities," in *The 3rd International Conference Community Research and Service Engagements, IC2RSE 2019, 4th December 2019, North Sumatra, Indonesia*, 2020.

[19] R. Kusumawardhani, I. S. Kurniawan, A. Maulida, and A. D. Cahya, "Pelatihan UKM rumahan industri pangan sebagai upaya meminimalkan kendala berwirausaha," *J. Pengabdi. Kpd. Masy. (Indonesian J. Community Engag.*, vol. 6, no. 1, pp. 23–28, 2020.

[20] C. A. Grace-McCaskey, L. D'Anna, K. S. Hagge, R. Etheridge, and R. L. Smith III, "Virtually Engineering Community Engagement: Training for Undergraduate Engineers During the COVID-19 Pandemic," *Hum. Organ.*, vol. 81, no. 3, pp. 217–228, 2022.

[21] A. Ardhiyansyah, Y. Iskandar, and W. O. Riniati, "Perilaku Pro-Lingkungan dan Motivasi Sosial dalam Mengurangi Penggunaan Plastik Sekali Pakai," *J. Multidisiplin West Sci.*, vol. 2, no. 07, pp. 580–586, 2023.

[22] Y. Iskandar, "Pengaruh Modal Sosial, Kapabilitas Financial, Orientasi Kewirausahaan terhadap Daya Saing Bisnis Berkelanjutan serta Implikasinya pada Kinerja UMKM Industri Kuliner di Kota Sukabumi," *Senmabis Semin. Nas. Manaj. dan Bisnis*, vol. 4789, pp. 2–19, 2022.

[23] J. W. Creswell, "Research Desain: Pendekatan Kualitatif, Kualitatif, Dan Mixed (Edisi Keti)." Yogyakarta, 2013.

[24] S. Sahnoune, N. Benhassine, F. Bourbia, and H. Hadbaoui, "Quantifying the effect of green-roof and urban green infrastructure ratio on urban heat island mitigation-semi-arid climate," *J. Fundam. Appl. Sci.*, vol. 13, no. 1, pp. 199–224, 2021.