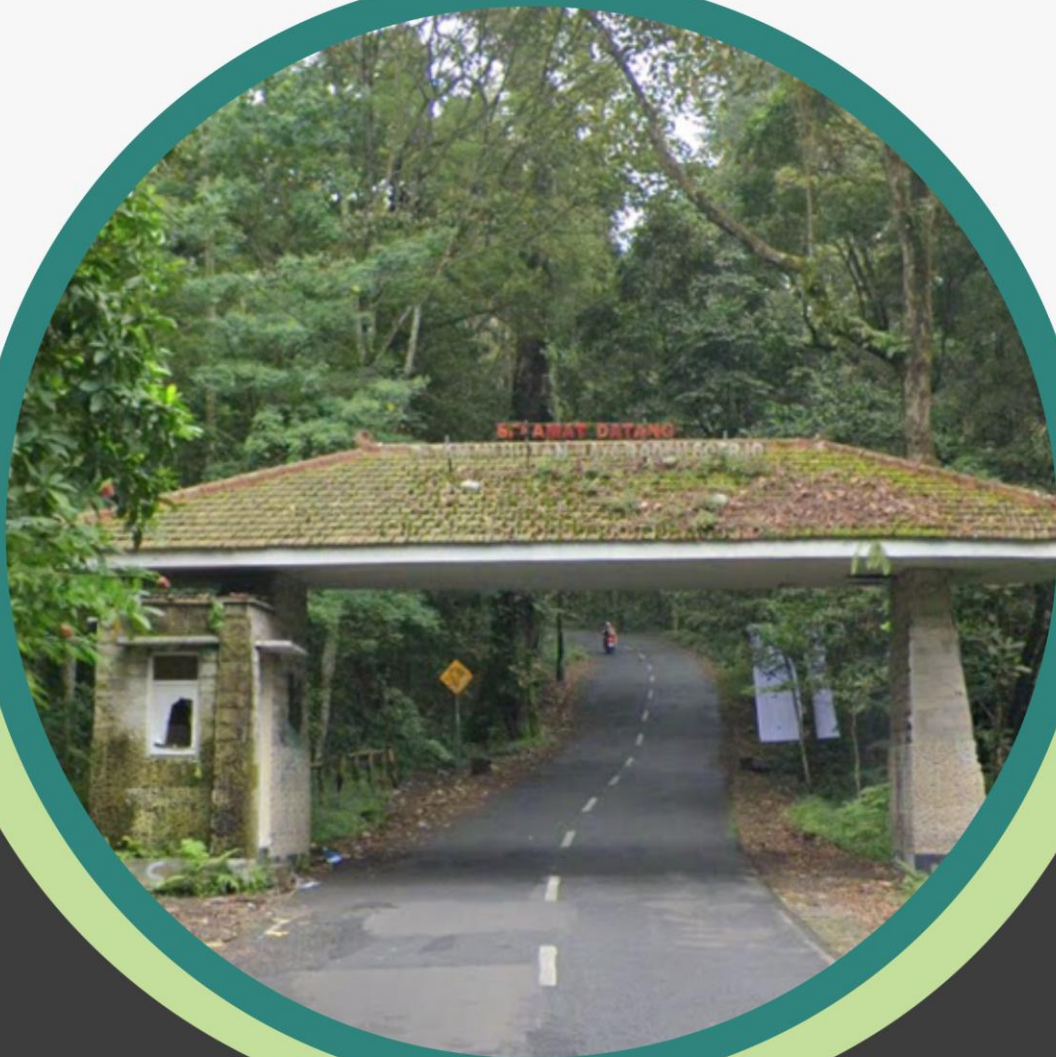


Abdul Hamid, et.al

POLICY TRANSFORMATION FOR TAHURA R. SOERJO CONSERVATION AWARENESS





Policy Transformation for Tahura R. Soerjo Conservation Awareness

Policy Transformation for Tahura R. Soerjo Conservation Awareness

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FOREWORD

Praise and gratitude be to Allah SWT for His blessings and guidance, which have enabled the completion and publication of this book entitled “Policy Transformation for Tahura R. Soerjo Conservation Awareness” . On behalf of Regional Research and Innovation Agency of East Java Province, Indonesia, I would like to express my highest appreciation to the author for producing such a comprehensive and relevant scientific work addressing critical issues in environmental conservation.

This book serves as a valuable contribution to supporting better, more sustainable, and community-based management of the Raden Soerjo Forest Park (Tahura R. Soerjo). Through a multidisciplinary approach and the use of modern analytical methods, the book offers fresh insights into the importance of policy transformation in responding to current challenges in the field.

Climate change, environmental degradation, and socio-economic pressures on conservation areas demand innovative and adaptive policy reforms. This book comes at an opportune time as a source of thought and action for policymakers, academics, environmental practitioners, and the general public in building collective awareness of the importance of preserving our natural heritage.

I hope that the findings presented in this book will not only serve as a source of academic reading but also inspire practical policy implementation, and become a reference for future research and community service programs.

On this occasion, I would also like to extend my sincere thanks to all parties who have supported the writing and publication of this book. May this work bring great benefits, both to the academic world and to sustainable development in the environmental sector.

Surabaya, 2025

Head of Regional Research and Innovation Agency of East Java Province





PREFACE

We express our deepest gratitude to Almighty God for His blessings and guidance, which have enabled us to complete this book entitled “Policy Transformation for Tahura R. Soerjo Conservation Awareness”. This book is intended as a contribution to the discourse on strengthening public awareness and policy development in the conservation of the Raden Soerjo Forest Park (Tahura R. Soerjo), one of East Java’s most important protected areas.

Tahura R. Soerjo holds not only high ecological value but also plays a crucial role in the social, cultural, and economic lives of surrounding communities. However, various challenges such as socio-economic pressures, land use conflicts, and institutional and regulatory gaps continue to hinder its effective management. Therefore, policy transformation is essential to address these dynamics and promote inclusive, participatory, and sustainable conservation governance.

This book provides an in-depth exploration of education and communication strategies, incentive-based conservation approaches, multi-stakeholder engagement, and collaborative governance models grounded in environmental ethics and the rights of local communities. Furthermore, it discusses the application of information technology, digital service innovation, policy analysis using Structural Equation Modeling (SEM), and offers recommendations for short-, medium-, and long-term policy actions that can be implemented by decision-makers.

We acknowledge that this work is far from perfect. Nevertheless, we hope that this publication will serve as a valuable reference for academics, practitioners, policymakers, and the general public in understanding the importance of policy transformation in enhancing conservation awareness and sustainability at Tahura R. Soerjo. Finally, we would like to thank all those who have supported the preparation of this book. Constructive criticism and suggestions are highly appreciated for future improvements.

Surabaya, 2025
Authors



EDITORS

It is my great privilege to serve as the editor of this book titled “Policy Transformation for Tahura R. Soerjo Conservation Awareness” . This work represents a collaborative effort between researchers, practitioners, and policy experts who are deeply committed to advancing sustainable conservation practices in one of East Java’s most important protected areas — Tahura R. Soerjo.

As editor, I have had the opportunity to guide the development of this publication, ensuring coherence in its structure, relevance in its content, and clarity in its message. Each chapter has been carefully reviewed and refined to meet academic standards while remaining accessible to a broader audience, including policymakers, environmental practitioners, and local communities.

This book not only provides a critical analysis of current conservation policies but also proposes innovative strategies for transforming governance, enhancing community participation, and integrating technology into forest park management. It is our hope that this publication will serve as a valuable reference and catalyst for meaningful dialogue and action in the field of environmental conservation.

I would like to express my sincere gratitude to the authors, reviewers, and supporting institutions for their dedication and contributions to this project. Their commitment to excellence and sustainability has made this publication possible.



Amodu, Salisu Ameh PhD is a distinguished scholar in African Philosophy, with a Ph.D. in African Philosophy from the University of Nigeria, Nsukka, and advanced degrees from Prince Abubakar Audu University and Kogi State University, Anyigba. His academic expertise spans African metaphysics, epistemology, ethics, humanism, gender studies, and peace and conflict resolution, reflecting his multidisciplinary approach to critical issues within African studies. Amodu, Salisu Ameh PhD is currently serving as a lecturer in the Department of Philosophy and is a member of the board at the Center for Diploma and Pre-degree Studies at Prince Abubakar Audu University. His dedication to education is further demonstrated through his leadership in initiatives such as the Educate 500 Students on Quality Research program, which underscores his commitment to advancing intellectual development among students. An accomplished author and editor, Amodu, Salisu Ameh PhD has made significant contributions to African philosophical scholarship. His publications include *Land in African Ontology* and *Rational Proof of the Existence of God in Igala Ontology*, as well as co-edited works on African philosophy, ethics, and sociocultural studies. His impactful research and writings have earned him numerous honors, including an Award of Excellence for his contributions to African studies. As an active member of several academic organizations, including the Association for the Promotion of African Studies (APAS) and the Association of Philosophy Professionals of Nigeria (APPON), Amodu, Salisu Ameh PhD also serves as an editorial board member and manuscript reviewer for leading journals. His influence extends beyond academia, contributing to contemporary discourse in philosophy and fostering deeper engagement with Africa's intellectual heritage. Through his scholarly work and commitment to community-focused initiatives, Amodu, Salisu Ameh PhD continues to promote African philosophical thought and inspire future generations.



Engr. Imran Arshad is a result-oriented, multi-disciplinary, and Gulf-experienced engineering professional with 14 years of professional experience in the field of agricultural engineering. He holds a Ph.D. in Irrigation and Drainage Engineering from Sindh Agriculture University, Pakistan, and has completed his M.E. in Irrigation and Hydraulics Engineering from Institute of Water Resources

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He has received numerous awards and recognition for his outstanding research and contributions to the field of agricultural engineering, including the Best Scientist Award, Excellence in Research Award, Best Researcher Award, Outstanding Researcher Award, and Best Ph.D. Scholar Award, among others. As a registered engineer from Pakistan Engineering Council (PEC), he is a permanent member of Pakistan Engineers Foundation (PEF), Pakistan Society of Horticultural Sciences (PSHS), and Institute for Engineering Research and Publication (IFERP). He is serving as an Associate Section Editor for Scientific Forefront Journal in Agricultural Research (SFJAR) and an editorial board member for European Journal of Agriculture and Food Sciences (EJFOOD). He is also a permanent member of the review committee for 5 various international journals.

Engr. Imran Arshad is a distinguished authority in the agricultural domain, boasting an impressive publication record of 58 scientific research papers in national and international peer-reviewed journals, as well as 18 technical articles. His expertise extends to reviewing 134 scientific research papers for various multidisciplinary national and international peer-reviewed journals, including Vigyan Varta, Journal of Experimental Agriculture International, International Journal of Applied Agricultural Sciences, and many others.

With a broad range of research interests in agriculture and water resources management, Engr. Imran Arshad has a special focus on Irrigation and Drainage, Agricultural Engineering, Agronomy, Agriculture Extension, Finite Element Modeling, and agricultural pest control in the Asian region. As the Editor of the Agricultural Sciences section, he provides a platform for researchers, scientists, and engineers to share their knowledge and expertise in the field of agricultural engineering. His goal is to promote sustainable agricultural practices and innovative solutions for agricultural development.



ACKNOWLEDGEMENTS

The completion of this book, titled “Policy Transformation for Tahura R. Soerjo Conservation Awareness”, would not have been possible without the support and contributions of many individuals and institutions. First and foremost, we would like to express our deepest gratitude to Almighty God for His blessings and guidance throughout the writing and research process.

We extend our sincere appreciation to the editor, and all contributing authors for their dedication, expertise, and valuable input in developing the content of this publication. Their professionalism and commitment have been instrumental in shaping this work into a comprehensive and meaningful resource on conservation policy transformation. Special thanks are also due to mentors, colleagues, and fellow researchers who provided constructive feedback, encouragement, and moral support during the preparation of this book. Finally, we would like to thank our families and loved ones for their patience, understanding, and continuous encouragement throughout the entire process of completing this publication.

Surabaya, 2025

The Author2



CONTRIBUTORS



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Ari Sasmoko Adi, is a professional in the field of Transportation Engineering and Highway. He holds the position of Junior Researcher and serves as a lecturer in the Faculty of Engineering, Civil Engineering Program, at the University of 17 August 1945 Samarinda. He completed his bachelor's degree in 2000, followed by a Master's degree in 2003, and obtained his Doctorate in 2017. Dr. Ari Sasmoko Adi is actively involved in research and development in the field of Transportation Engineering and Highway as part of his role as a Junior Researcher. As an academic, he is likely engaged in teaching activities, sharing his knowledge and experience with students in the Civil Engineering Program. Overall, his profile reflects a dedication to higher education, research, and a commitment to advancing knowledge in the field of Civil Engineering.



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ABBREVIATIONS

ACM	Adaptive Collaborative Management
AEC	ASEAN Economic Community
AGATA	Aksi Gerakan Anti Illegal Logging
AI	Artificial intelligence
APBD	Anggaran Pendapatan dan Belanja Daerah – Regional Revenue and Expenditure Budget
ARWFR	Andanan River Watershed Forest Reserve
ASEAN	Association of Southeast Asian Nations
BBNJ	Biodiversity Beyond National Jurisdiction
BELA	Basic Education Laws Amendment
BIG	Badan Informasi Geospasial - Geospatial Information Agency
BIM	Building Information Modeling
BPDAHL	Badan Pengelola Daerah Aliran Lahan - Watershed Management Agency
CBAM	Concerns-Based Adoption Model
CBD	Convention on Biological Diversity
CBET	Community-Based Ecotourism
CBFM	Community-Based Forest Management
CBNRM	Community-Based Natural Resource Management
CFS	Community Forestry Scheme
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CSR	Corporate Social Responsibility
DAK	Dana Alokasi Khusus – Special Allocation Fund
DBH	Dana Bagi Hasil – Revenue Sharing Fund
DOI	Digital Object Identifier
DPSIR	Driving Forces, Pressures, State, Impact, Response
DPSIR	Driving forces-Pressure-State-Impact-Response
ECOWAS	Economic Community of West African States
EFQM	European Foundation for Quality Management
EIPM	Evidence-Informed Policy Making
ESG	Environmental, Social, and Governance
EUPHA	European Public Health Association
FDI	Foreign direct investment

FGD	Focus Group Discussion
FLEGT	Forest Law Enforcement, Governance and Trade
FPIC	Free, Prior and Informed Consent
GBF	Global Biodiversity Framework
GCF	Green Climate Fund
GEF	Global Environment Facility
GIS	Geographic Information Systems
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HAM	Hak Asasi Manusia - Human Rights
HR	Human resource
HTI	Hutan Tanaman Industri - Industrial Plantation Forest
ICZM	Integrated Coastal Zone Management
InVEST	Integrated Valuation of Ecosystem Services and Trade-offs
IoT	Internet of Things
IoT	Internet of Things
IPCA	Indigenous Protected and Conserved Areas
IT	Information Technology
IUCN	International Union for Conservation of Nature
KKN	Kuliah Kerja Nyata - Community Service-Learning Program
KMPT	Kawasan Minat Penelitian Terpadu - Integrated Research Interest Area
KPA	Kawasan Pesisir dan Pulau-Pulau Kecil - Coastal and Small Islands Area
KSDAE	Konservasi Sumber Daya Alam dan Ekosistem
LCTL	Low-Carbon Transformational Leadership
LiDAR	Light Detection and Ranging
MENA	Middle East and North Africa
METT	Management Effectiveness Tracking Tool
MODIS	Moderate Resolution Imaging Spectroradiometer
MRV	Monitoring, reporting, and verification
MSF	Masyarakat Sadar Flora
MSME	Micro, small and medium enterprises
NbS	Nature-based Solutions
NDC	Nationally Determined Contribution
NodeXL	Network Overview, Discovery, and Exploration for Excel
NRE	New Renewable Energy
NTFP	Non-Timber Forest Products
OWA	Other Effective Area-Based Conservation Measures
PAD	Pendapatan Asli Daerah - Regional Original Revenue
PAME	Protected Area Management Effectiveness
PAR	Participatory Action Research
PES	Payment for Ecosystem Services

PHBM	Pengelolaan Hutan Bersama Masyarakat
PHPA	Pelestarian Hutan dan Perlindungan Lahan
PLN	Perusahaan Listrik Negara
PLS	Partial Least Squares
PLUS	Patch-Growing-Based Land Use Simulation
PP	Peraturan Pemerintah
PPP	Public-private partnership
QR Code	Quick Response Code
R&D	Research and development
RaTA	Rapid Land Tenure Assessment
REDD+	Reducing Emissions from Deforestation and Forest Degradation Plus
RIGHT	Rights-based Approach to Development
RKPD	Rencana Kerja Pemerintah Daerah – Regional Government Work Plan
RKW	Rencana Kerja Tahunan - Annual Work Plan
ROAM	Restoration Opportunities Assessment Methodology
RPJMD	Rencana Pembangunan Jangka Menengah Daerah – Medium-Term Regional Development Plan
RPK	Rencana Pengelolaan Kawasan
RSDI	Regional Sustainable Development Index
RTRW	Rencana Tata Ruang Wilayah – Spatial Planning of the Region
S1	Strata 1 / Sarjana - Bachelor's Degree
S2	Strata 2 / Magister - Master's Degree
SADC	Southern African Development Community
SD	Sekolah Dasar - Elementary School
SDG	Sustainable Development Goal
SECAS	Social-Ecological Complex Adaptive Systems
SEM	Structural Equation Modeling
SHARED	Sustainable, Holistic, Adaptive, Resilient, Equitable, and Diverse (model or framework)
SIMAKSI	Sistem Informasi Pengelolaan Kawasan Strategis - Strategic Area Management Information System
SMA	Sekolah Menengah Atas - Senior High School
SMP	Sekolah Menengah Pertama - Junior High School
SNA	Social Network Analysis
SOP	Standard Operating Procedure
SWOT	Strengths, Weaknesses, Opportunities, Threats
Tahura	Taman Hutan Raya
TFCA	Transfrontier Conservation Area
ToC	Theory of Change

TQM	Total Quality Management
UAE	United Arab Emirates
UAS	Unmanned Aircraft System
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Programme
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UPT	Unit Pelaksana Teknis - Technical Implementation Unit
UPTD	Unit Pelaksana Teknis Daerah
US	United States
USAID	United States Agency for International Development
UU	Undang-Undang - Law
VIIRS	Visible Infrared Imaging Radiometer Suite
VUCA	Volatility, Uncertainty, Complexity, Ambiguity
WaSSI	Water Supply Stress Index
WEF	Water-energy-food
WWF	World Wide Fund for Nature



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Chapter 1

INTRODUCTION

Abdul Hamid and Tri Weda Raharjo

Awareness of the importance of environmental conservation is increasingly a key focus on various global agendas, given the negative impacts of climate change, biodiversity loss, and overexploitation of natural resources. Policy innovation strategies play an important role in driving public awareness and participation. This approach involves a combination of technology, education, and cross-sector collaboration to create sustainable impact. The scientific literature shows that policies involving information technology, economic incentives, and community-based campaigns can significantly increase public awareness of conservation issues.

Technology integration and digitalization play a crucial role in strengthening conservation policies. The use of blockchain in water-intensive industries has been shown to increase the effectiveness of government interventions as well as supply chain awareness toward water conservation, according to (Leng & Hao, 2025). In addition, the use of digital twins in the management of water-energy-food resources shows great potential in increasing urban people's understanding of the relationship among these resources, as revealed (Shehadeh et al., 2025). Digitalization also contributes to the development of green cities by promoting environmentally friendly innovations and increasing public awareness of environmental issues (Li et al., 2024). In addition to technological approaches, citizenship-based educational and social strategies are also important in conservation endeavors. (Maheshwari et al., 2025) propose mandatory conservation training that adopts the principle of defending the country as a form of patriotic approach to create long-term awareness and involve various sectors in the protection of wildlife and its ecosystems.

Active community participation and increased local awareness are also key to the success of conservation programs. Studies in Ghana show that public awareness of the SDGs, especially SDG fourteen on marine conservation, is still low, so an inclusive and community-based

communication strategy is needed (Odoom et al., 2024). The management of conflict use and conservation in the UNESCO Geopark area is a good illustration of a community participatory approach through tourism-aware groups (Sulistyo et al., 2023). In agriculture, innovations such as precision agriculture and the use of sensors for water efficiency are becoming an integral part of sustainable conservation strategies. This approach not only increases productivity, but also maintains the sustainability of natural resources to support food security (Rastogi et al., 2024; Saad Sultan, 2021).

A. Education and Communication Strategy

Education and communication strategies play a crucial role in increasing public awareness of the importance of environmental conservation, especially in the midst of the increasingly urgent threat of ecosystem degradation. Based on more than ten recent international studies (2021–2025), a variety of innovative and contextual approaches have proven effective in educating the public and shaping pro-environmental behaviors. (Loury et al., 2021) show that in Cambodia, the combination of direct education, print media, and social media with an emphasis on local narratives can significantly expand the reach of water conservation messages as well as increase community engagement. A similar approach is also applied in the "One Health" strategy that integrates human, animal, and environmental health issues through digital media, although (Oliveira et al., 2025a) note the need for a more inclusive strategy to reach non-academic audiences.

In Europe, hands-on experience-based approaches in urban biodiversity education have proven effective, such as those carried out by Oliveira et al. (2025) in Portugal, where students are actively involved in biodiversity documentation and the results are published and exhibited to the public. (Lucrezi, 2022) added that understanding local perceptions is very important in designing targeted marine environmental communication strategies, especially for coastal users in Italy. Meanwhile, in Kenya, (Nzau et al., 2022) emphasized the importance of integrating formal, informal, and indigenous knowledge education in shaping positive attitudes toward conservation through participatory forest management.

In the context of higher education, the Project-Based Learning model has succeeded in integrating conservation values into the curriculum, as implemented (Oliveira et al., 2025b). In the tourism sector, (Pásková et al.,

2024) recommend the use of education and communication based on dynamic systems supported by information technology to reduce the impact of water pollution due to tourist activities. More broadly, the concept of cross-generational community planning based on disaster resilient conservation education is an important strategy in encouraging social participation, as identified (Wang & Tsai, 2022).

Cross-country and institutional collaboration is also an effective means of conservation education, as in the case of bilateral cooperation among Austria and Hungary to improve the resilience of native forests to climate change through scientific data-driven campaigns (Szamosvári et al., 2023). Lucrezi (2021) suggested that coastal recreation activities be used as an environmental education platform by conveying messages through visual narratives and inclusive communication strategies. Requena-Mullor et al. (2024) added that for environmental communication to be more socially relevant, an approach that involves non-academic actors and the delivery of messages that are easily understood by the general public is needed. Education and communication aim not only to disseminate information, but also to build emotional connections and collective responsibility toward environmental preservation with the ten processes visualized in figure 1.1.

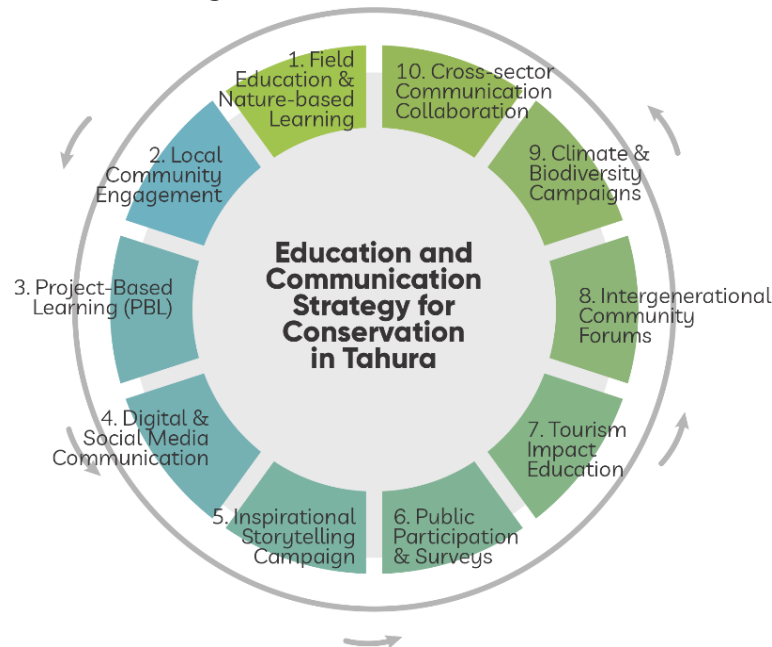


Figure 1.1. Education and Communication Strategy for Conservation in Tahura

Table 1.1. summarize education and communication strategies to increase conservation awareness that can be implemented in the Great Forest Park (Tahura).

Table 1.1. Education and communication strategy for Tahura

No	Strategy	Application Description in Tahura	Reference
1	Field Education and Educational Nature Tourism	Conduct educational tours, observation of flora-fauna and forest school programs.	Loury et al., 2021
2	Local Community Engagement and Indigenous Knowledge	Involve local residents in the role of guides, area guards, or local resource persons.	Nzau et al., 2022
3	Project-Based Learning (PBL)	Collaboration with schools and universities for the Tahura biodiversity documentation project.	Oliveira et al., 2025
4	Digital Communication and social media	Use Instagram, YouTube, or apps to deliver conservation information based on local narratives.	Requena-Mullor et al., 2024
5	Visual Campaigns and Inspirational Stories	Showcasing the stories of forest rangers, volunteers, or community leaders through educational exhibits and posters.	Loury et al., 2021
6	Participatory Surveys and Research	Involve visitors or communities in species monitoring and reporting on ecosystem conditions.	Lucrezi, 2022
7	Education on the Impact of Tourism	Socialization through infographics and open discussions about the impact of visitors on the ecosystem.	Pásová et al., 2023
8	Intergenerational and Climate Resilient Community Forum	Build cross-age learning spaces on conservation, disaster risk mitigation, and sustainability.	Wang & Tsai, 2022
9	Forest Climate Change Adaptation Education	Educational campaign based on data monitoring climate change and its effects on the Tahura ecosystem.	Szamosvári et al., 2023
10	Social Media Integration for Health-Environment Education	Cross-sector collaboration to expand the reach of ecosystem health-based conservation campaigns.	Requena-Mullor et al., 2024

Source: author search, 2025

To support the development of Tahura as an environmental education center based on conservation and community involvement, a well-planned education and communication strategy is needed that can be implemented technically. This strategy must be relevant to local characteristics,

incorporate participatory approaches and information technology, and be able to build awareness across generations. The following table presents the technical implementation steps of various strategies that can be implemented in Tahura based on global good practices.

Table 1.2. Education and Communication Strategy and Technical Implementation in Tahura

Strategy	Technical Implementation Steps in Tahura
Field Education and Educational Nature Tourism	- Create an interpretive trail with information boards.- Train local educational guides.- Organize a "Nature School" program for students and students.
Local Community Engagement	- Form a Tahura Care Community Group (KMPT).- Recruit residents as conservation guides or extension workers.- Involve traditional leaders to explain local wisdom on conservation.
Project-Based Learning (PBL)	- Collaborate with universities for KKN programs or biodiversity research.- Invite students to document flora and fauna and make reports or e-books.
Digital Communication and social media	- Create an official Instagram, YouTube, and TikTok Tahura account.- post-weekly educational content: "Species Facts", "Forest Ranger Stories", etc.- Develop QR codes at tourist sites that are linked to educational videos.
Inspirational Story Campaign	- Record and broadcast the inspiring stories of forest rangers and locals through local TV and social media.- Put up murals or infographics at the main post and entrance to Tahura.
Surveys and Public Participation	- Create a "Citizen Science" program where visitors can report species findings or habitat destruction through the app.- Provide feedback forms for visitors at conservation posts.
Education on the Impact of Tourism	- Put educational infographics in camping, tracking, and tourist post-areas.- Give an "ecotourism briefing" to groups of visitors before entering the forest.
Intergenerational Community Forum	- Hold a monthly "Citizens' Forum" on conservation and climate change issues.- Form cross-age classes, such as the Elderly and Children's Conservation Club.
Climate and Biodiversity Campaign	- Display daily temperature, humidity, and species data boards.- Publish monitoring research results through wall and web newsletters.
Collaboration Communication Among Sectors	- Collaborate with health, education, and tourism agencies to create integrated content (e.g. "Healthy with Forests").- Engage local influencers for public campaigns.

Each strategy in the table above is prepared to be immediately adopted by Tahura managers and their strategic partners (table 1.2.). This

approach emphasizes active community involvement, digital media integration, and local capacity building. This technical implementation also opens up space for collaboration among the government, academia, the private sector, and the community, so that Tahura can double function as a conservation area and a sustainable environmental education center.

To support effective community involvement and education in Tahura, a Standard Operating Procedure (SOP) for Community Involvement and Education was prepared with the aim of ensuring active, structured, and sustainable involvement of the community in conservation activities and ensuring the integration among field activities and environmental conservation values. This SOP includes several main components, namely stakeholder identification through mapping of surrounding community groups such as customary villages, youth, females, and schools; determining the role of the community as local guides, education facilitators, forest supervisors, or research volunteers; as well as recruitment and training standards that consider age, residence, and willingness to engage. In addition, the activity protocol includes a list of participatory activities such as open classes, tree planting, and animal monitoring, with written guidelines to ensure consistent implementation. Ethics and permits are important principles in the Free, Prior and Informed Consent cooperation process, while coordination is carried out through synergy among Tahura management institutions and community representatives in each stage of planning. Each activity must also be fully documented and evaluated through an integrated information system.

In line with the SOPs, the Monitoring and Evaluation Guide (Monev) for the Impact of Education and Community Engagement Programs is designed to assess the effectiveness of the program in increasing awareness, engagement, and change in community behavior toward conservation. The Monev process consists of five stages: planning, implementation, analysis, reporting, and feedback and revision. At the planning stage, success indicators such as the number of participants, increased knowledge, and real community action are determined, and initial data (baseline) is compiled to be a reference. The implementation of Monev is carried out through direct observation, surveys, interviews, and pre- and post-education questionnaires. The results were then analyzed using simple qualitative and quantitative approaches such as scoring and graphs to compare developments over time. Monev results reports are

made periodically (monthly/quarterly) with easy-to-understand data visualizations. The findings are then used to provide feedback to the community and stakeholders and become the basis for program revisions or adjustments if necessary. With these two concepts—the SOP for Community Involvement and Education and the Monitoring and Evaluation Guidelines—it is hoped that Tahura managers and implementing partners will have comprehensive and practical operational documents to carry out education and community involvement programs in a systematic, transparent, and sustainable manner.

B. Strengthening Multi-Party Collaboration

Strengthening multi-stakeholder collaboration is a crucial strategy in environmental conservation, especially in the context of socio-ecological complexity and resource limitations. Based on ten indexed international publications from 2020 onwards, a collaborative approach involving various factors such as governments, local communities, NGOs, academics, and the private sector has been proven to strengthen the effectiveness and legitimacy of conservation programs. An effective collaboration model requires recognition of the equality of actors as well as adaptive social learning approaches, as shown by Hovardas (2021) in the context of collaborative natural resource management (Hovardas, 2021). In marine conservation in Europe, the MarCons network of scientists emphasizes the importance of cross-country and sectoral cooperation to close the gap among science and public policy (Katsanevakis et al., 2020). Similar is also emphasized in the management of Australian islands which requires a collaborative platform across jurisdictions and stakeholders (Kark et al., 2022).

In area-based conservation practices, collaborative communication among actors is often hampered by tensions of meaning and importance. Rice (2022) developed a framework for managing these "dialectical tensions" in African coastal conservation programs (Rice, 2022). In Germany, urban conservation programs involving vulnerable communities prove that the success of collaboration depends on the flexibility of approaches and strengthening local capacity (Kowarik et al., 2025). Collaboration has also been proven to strengthen the preservation of historic buildings in Europe through the integration of digital data and joint decision-making among technocrats, communities, and regional managers

(Resta et al., 2024). Meanwhile, in the context of sustainable fisheries in eastern Indonesia, cross-sectoral collaboration, including international partners and local governments, is seen as essential in addressing marine resource governance challenges (Kobayashi, 2023). A collaborative approach in the field of conservation not only drives efficiency, but also enhances the social legitimacy, environmental justice, and long-term sustainability of the conservation policies or programs implemented.

In strengthening multi-stakeholder collaboration for environmental conservation, there are some challenges and obstacles that often hinder the effectiveness and sustainability of these initiatives. One of the main challenges is power and access inequality (power asymmetry), where dominant actors such as governments or international donors often ignore the voices of local communities or indigenous communities, thus hindering inclusive and equitable social learning in the management of conservation areas (Hovardas, 2021). In addition, differences in goals and values among actors are also significant obstacles; for illustration, the conflict among ecological conservation interests and local economic needs create dialectical tensions that require a collaborative communication approach that is sensitive to differences in motivation and meaning (Rice, 2022).

The lack of coordination mechanisms and a shared platform further complicates the situation, as the absence of a permanent forum or structure that facilitates the exchange of information and experiences among sectors causes the synchronization of programs to be ineffective, as found in island conservation projects in Australia that failed without a strong cross-jurisdictional coordination system (Kark et al., 2022). On the other hand, the low capacity of local communities—both in access to information, technical skills, and legitimacy—creates inequalities in participation in the decision-making process, especially in collaborative projects such as fisheries management in Maluku (Kobayashi, 2023).

Policy fragmentation and institutional interests are also an important issue, where many conservation policies run sectorally without integration among institutions such as the environment, fisheries, tourism, and forestry, thus triggering overlapping authority and lack of synergy (Katsanevakis et al., 2020). Communication barriers and language differences, both literally and figuratively—such as communication styles or technical terms—also affect understanding and common vision in multinational or cross-community collaborations (Rice, 2022). Finally, the reliance on short-term

funding from specific donors or projects makes it difficult for many collaborative initiatives to sustain after the funding period ends, especially when local institutional capacity is not strong enough to run activities independently (Kowarik et al., 2025).

To ensure the success of conservation and sustainable management in the Great Forest Park (Tahura), a collaborative approach is needed that involves various stakeholders in a structured manner. The implementation of multi-stakeholder collaboration in Tahura must be tailored to the local context, taking into account social values, institutional capacity, and fair participation mechanisms. The following table presents the forms of technical implementation of multi-stakeholder collaboration that can be applied in Tahura based on practices and recommendations from the international literature (table 1.3).

Table 1.3. Implementation of Multi-Stakeholder Collaboration in Tahura Management

Collaboration Aspects	Implementation Steps in Tahura	Reference
Coordination Structure	- Form a <i>Tahura Collaboration Forum</i> (managers, communities, NGOs, academics, private sector).- Establish a structure and regular meetings.	Kark et al., 2022
Setting Goals and Zones	- Cross-stakeholder deliberations to agree on priority zones and targets for education, tourism, and restoration programs.	Hovardas, 2021
Integrated Collaborative Program	- Implement programs such as <i>Forest School</i> , <i>Participatory Ecotourism</i> , and <i>Species Monitoring</i> with residents and partners.	Kowarik et al., 2025
Communication and Resolution Mechanisms	- Hold a <i>Quarterly Tahura Forum</i> for coordination and discuss conflicts.- Implement protocols of collaboration and participation ethics.	Rice, 2022
Joint Monitoring and Evaluation	- Involve all parties in annual evaluations and measurement of conservation indicators.- Publish results through local and digital media.	Katsanevakis et al., 2020
Local Capacity Support	- Hold technical training for residents and partners related to conservation, facilitation, and ecotourism.- Help access to basic conservation information and equipment.	Kobayashi, 2023

Source: researcher search, 2025

The success of collaboration at Tahura is highly dependent on participatory institutional design, open communication among actors, and the sustainability of the program through joint evaluation. By emulating

successful practices at the global level and adapting them to local conditions, Tahura can become a model of collaborative conservation that is inclusive and has a real impact.

The Tahura Collaboration Forum serves as a strategic forum that brings together various stakeholders to unite visions and actions in effective and inclusive conservation management. Based on international practices and local needs, the forum has some key priorities, namely the preparation of a Joint Action Plan that includes educational programs, habitat restoration, and management of nature tourism in the short to medium term; coordination among actors as a permanent communication space to harmonize cross-sectoral activities such as related agencies, NGOs, local communities, academics, and tourism actors; and resolution of conservation conflicts through participatory dialogue to resolve issues of governance, territorial boundaries, or community access. In addition, strengthening local capacity is a priority by identifying the need for training, facility support, and facilitation for community groups or conservation volunteers. The forum is also tasked with monitoring activities and ensuring accountability for program implementation in a transparent manner to the public.

To maintain the effectiveness and sustainability of collaboration, evaluations must be conducted regularly and participatorily. The practical steps of evaluation at Tahura commence with the determine joint indicators by the forum, such as the number of active partners, the level of community participation, and the number of collaborative programs that have been implemented. Furthermore, surveys and field observations were conducted through interviews or simple questionnaires to program participants—such as residents, guides, and students—as well as collective visits to the activity sites. Evaluations are carried out on a quarterly or semi-monthly basis, where forums gather to discuss achievements, challenges, and adjust strategies if needed. The results of the evaluation are then visualized in the form of infographics or information boards on Tahura posts and social media so that they are easily accessible to the public. Finally, two-way feedback is given the widest possible opportunity for all parties, including local communities, so that evaluation is not only top-down but truly participatory.

As an operational reference, some concrete indicators that can be used to measure the success of the collaboration include: the number of

joint conservation activities per month, the number of local residents who have been trained and participated, an increase in the frequency of educational visits or biodiversity monitoring activities, and the level of satisfaction of collaborative partners with the performance of the forum. Thus, the Tahura Collaboration Forum can continue to develop into a responsive, transparent, and sustainable mechanism in supporting environmental conservation.

To ensure the effectiveness and sustainability of conservation collaboration in Tahura, evaluations must be carried out in a structured manner based on clear, measurable, and trackable indicators on a regular basis. Good evaluation indicators include both quantitative and qualitative aspects, such as the number of active partners in the forum, the level of attendance at regular meetings, and the number of collaborative activities—such as education, research, or restoration—carried out per month. In addition, community empowerment is also an important parameter, for illustration through the percentage of local residents involved as guides, facilitators, or conservation volunteers. The quality of communication among actors can be measured through annual surveys to determine the level of satisfaction of partners with transparency and decision-making processes. The sustainability of the program is marked by the existence of activities that continue to run without dependence on external funds. On the environmental side, the decrease in destructive activities such as encroachment or forest burning, as well as an increase in the area of the restored area, are indicators of the direct impact of these collaborative endeavors.

Community capacity building is the main foundation for the success of this collaboration. Practical steps that can be taken include conservation technical training such as species identification, ecosystem monitoring, early fire extinguishing, and habitat restoration techniques. Communication and education training is also no less important, including fostering residents to become ecotourism guides, nature school facilitators, or local conservation storytellers. Access to information and the provide equipment such as guidebooks, educational videos, GPS, and biodiversity documentation tools will strengthen the community's participatory capacity. In addition, strengthening local institutions such as the establishment and empowerment of the Tahura Care Community Group (KMPT) can increase community coordination and ownership of

conservation programs. Real project-based mentoring, where residents are directly involved in research and restoration activities with academics and NGOs, is an effective way to build capacity gradually and contextually.

Conflicts among stakeholders are a natural dynamic in the collaboration process. To overcome this, mitigation measures need to be carried out systematically and transparently. Identifying the root cause through open dialogue and stakeholder mapping helps to understand the conflict more deeply. Facilitation of dialogue by neutral parties such as academics or independent mediators is essential to create a safe and equal space for discussion. Pre-agreed rules of collaboration forums—such as participation protocols and cooperation ethics—can be used as guidelines in mediation. The outcome of mediation should be well documented and followed by a concrete action plan that clearly divides responsibilities among all parties. A win-win solution approach that accommodates ecological values as well as local economic needs, such as the division of management zones or the compromise area model, is a strategic solution in maintaining harmony among parties. Evaluation of collaboration based on real indicators, comprehensive community capacity building, and participatory and fair conflict resolution, will be the key to the success of the Tahura Collaboration Forum in realizing inclusive, effective, and sustainable conservation management.

Measuring the success of conflict resolution in collaborative forums such as Tahura is not enough to simply observe the loss of tension, but also involves assessing the quality of the mediation process, the implementation of agreements, and the satisfaction and sustainability of long-term outcomes. Based on the practice of conflict evaluation in the context of conservation (as conveyed by Rice, 2022), success indicators can be grouped into five main aspects: process, outcomes, implementation, stakeholder satisfaction, and sustainability. An inclusive process is characterized by the presence of all parties in the mediation meeting and the participation of neutral facilitators that are mutually agreed. The outcome of mediation can be judged from the existence of a written Contract or action document that is solutive and accepted by all parties. Implementation is important to ensure that concrete actions are taken post-Contract, such as the sharing of access to resources or changes to the zoning system. Stakeholder satisfaction can be measured through surveys or discussions that show that the majority of participants feel heard and

treated fairly. On the other hand, sustainability is manifested in the form of non-recurrence of conflicts in the 6–12-month period as well as forums that remain active to communication and coordination.

To apply these measurements practically in the field, several methods can be used. First, an anonymous partner satisfaction questionnaire can be shared with all parties after the mediation session to get impartial input on their perception of the process and outcomes. Second, structured meeting records help track the number of issues that have been successfully resolved and the follow-up that has been implemented. Third, field observations were conducted to identify whether conflicting behaviors—such as unlawful access, encroachment, or boycotts—had decreased post-release. Fourth, in-depth interviews by independent facilitators with key stakeholders provide a richer understanding of the barriers and perceptions of the success of resolutions. Fifth, periodic reporting such as quarterly reports from the forum can record the progress of conflict resolution and implementation in a transparent manner.

For illustration, the success of conflict resolution can be seen when the boundary conflict of the conservation zone is successfully resolved by an Contract among the residents and the officers to install boundary signs together. In the case of local tour guide disputes, the facilitation of the establishment of an official association that regulates the sharing of schedules is tangible evidence of a sustainable solution. Likewise, when the tension among conservation and tourism activities is overcome through a visitor quota system and educational programs that maintain ecological and economic balance. Thus, a holistic and participatory evaluation approach will strengthen the capacity of the Tahura Collaboration Forum in resolving conflicts effectively and sustainably.

Conflict management in community-based conservation collaboration, such as in Tahura, requires systematic and participatory evaluation. The best survey method for conflict evaluation is a combinatorial approach—combining quantitative and qualitative surveys—that can capture the dynamics of perception, satisfaction, and legitimacy of the resolution process. (Allen & Ross, 2024) demonstrated the success of a participatory approach based on community workshops and independent research in resolving conservation conflicts in Fraser Island, Australia. Meanwhile, (Ruano-Chamorro et al., 2022) developed a framework for evaluating procedural justice in conservation, with indicators

such as process transparency, access to decision-making, and equitable conflict facilitation. To ensure citizen participation in evaluations, various studies emphasize the importance of using local media and inclusive formats. For illustration, an interactive serious game in watershed management in Colombia to help citizens understand conflicts and their role in collective planning (Gonzalez et al., 2024). In addition, (Hausner et al., 2021) found that providing informal evaluation spaces through village discussions and citizen involvement in conservation planning strengthens the social legitimacy of national conservation policies in Norway. Preventive measures to prevent future conflicts include: establishing a permanent communication structure, developing a collaborative code of conduct, and strengthening the capacity of community facilitators. (Maldonado Ibarra et al., 2022) emphasized that low citizen understanding of conservation goals can create latent conflicts, which can be prevented by increasing transparency and community-based education. In the context of tourism on Dachen Island, emphasized the importance of identifying the interests of actors from the beginning and providing a sustainable compromise mechanism (Ali & Li, 2024). Long-term evaluations such as those conducted in Scotland show that initial success in conflict mediation can collapse if it is not supported by local leaders, liaison structures among actors, and equitable participation (Cox et al., 2020). The best survey method for evaluating conflict is a combination of quantitative and qualitative instruments developed in a participatory manner. Citizen participation in the evaluation will only be effective if the media, language, and facilitation are adapted to the local context. To prevent conflicts from re-emerging, the Tahura forum needs to have a fixed communication mechanism, strengthen the capacity of community facilitators, and carry out evaluations based on social justice indicators.

Participatory evaluation is an important approach in community-based conservation management because it places communities as active subjects, rather than passive objects. More than ten international scientific publications from 2020 onwards have shown that the success of long-term conservation programs is largely determined by community involvement in assessing, reflecting, and refining policies and programs. Ruano-Chamorro et al. (2021) offer a framework of procedural justice in conservation that emphasizes three main pillars of participatory evaluation: meaningful engagement, process transparency, and

recognition of socio-cultural diversity. Gonzalez et al. (2024) developed a serious game-based approach to watershed management in Colombia to encourage citizens to understand the policy structure and communicate their priorities collectively. Evaluations are carried out by integrating narrative data, interactive decisions, and direct feedback among actors. Similar methods can also be applied in Tahura through conflict mapping and collaborative simulation. (Gao et al., 2025) through a systematic review highlighted the weak involvement of stakeholders in the evaluation stage and suggested the integration of landscape approaches and participatory visual scenarios to bridge conflicts of interest in nature solutions-based conservation projects.

(Peterson St-Laurent et al., 2020) offer an analytic-deliberative framework for natural resource evaluation that combines quantitative analysis with deliberative discussion, allowing communities to deliver assessments that are experience-based, rather than just numbers. This approach has proven effective in assessing the effectiveness of collaborative management in forest and coastal areas. Cox et al. (2020) in a long-term study in Scotland used qualitative and quantitative indicators to assess the sustainability of adaptive co-management in wildlife conservation conflict areas. Evaluations were conducted through serial interviews, perception surveys, and analysis of the sustainability of the actors' networks. Similarly, (Siangulube et al., 2023) show how multi-stakeholder forums in Zambia use participatory evaluation tools to detect participation inequities and encourage gradual improvement of landscape governance structures.

Furthermore, (Smyth et al., 2021) describe how participatory assessment in water research networks in Latin America advises local adaptation through actor mapping, community discussions, and reflective surveys across social and cultural locations. In addition, in the context of the implementation of conservation based on cultural and ecological values, Maldonado Ibarra et al. (2022) found that participatory evaluation methods based on in-depth interviews and social observation can uncover hidden conflicts that are not visible in formal surveys. Hausner et al. (2021) show that community involvement in conservation evaluation through informal forums, customary meetings, and collective reflection can increase local support for conservation in the mountainous regions of Norway. Participatory evaluation methods in conservation have evolved

significantly and are globally recognized as a key approach to ensuring social and ecological sustainability. With the support of more than ten international scientific publications, this approach emphasizes equal dialogue, flexibility of tools, and social validation of program outcomes. At Tahura, this method can be the main foundation for measuring impact and improving conservation collaborative practices in a sustainable manner.

C. Incentive Approach to Conservation

The incentive approach in conservation has become an effective strategy globally to increase community participation in the conservation of protected areas, including community-based ones such as Tahura. More than ten international studies highlight that incentives—both financial and non-financial—can strengthen citizens' commitment to conservation and minimize land use conflicts. One form of incentive that is widely applied is the payment of environmental services (PES). A study by Nunez Godoy et al. (2022) in Argentina showed that the effectiveness of PES is highly dependent on the understanding of landowners and the suitability of compensation values to local needs. A similar thing was also found by Kim et al. (2023) in the context of wetland areas in Korea, which emphasized the need for PES Contract standards that are structured based on two-way preferences: giver and legatee.

Incentives can also be in the form of strengthening community-based ecotourism. Aseres & Sira (2020) prove that most visitors to Bale National Park, Ethiopia, are willing to pay conservation fees to support the sustainability of the area, which can also be diverted as income from local communities. Meanwhile, (Vijulie et al., 2024) exemplify that natural grasslands in Romania are successfully preserved through integration with nature-based tourism that provides economic benefits for villagers. In addition, an environmentally friendly livelihood-based incentive approach was also developed. (He & Jiao, 2023) propose a "conservation-compatible livelihoods" model that integrates conservation management with local economic activities such as organic farming or traditional handicrafts, so that there is a symbiosis among ecological sustainability and social well-being. In India, (Mariyam et al., 2021) found that landowners around national parks are willing to switch to animal-friendly land use if the incentives are relevant, simple, and short-term. For the context of Tahura, an incentive approach can be applied through conservation subsidies for

farmers around the forest. Profit sharing scheme from entrance tickets or nature tourism services. Training and support for ecotourism and agroecological agriculture businesses. In the context of education and youth, (Rana et al., 2024) emphasize the importance of incentives based on local agroecotourism and culinary training that involve the younger generation as future conservation agents. This is in line with the multi-scale approach as studied by Smyth et al. (2021), that social and institutional incentives strengthen integration among conservation and natural resource management in different regions.

Designing conservation incentives in areas such as Tahura faces some structural and social challenges. One of the main challenges is inequality in access and allocation of benefits among local actors, which often leads to distribution inequities and diminishes the legitimacy of incentive schemes. (Coolsaet et al., 2020) show that in various global contexts, conservation incentives often fail if they do not pay attention to the access rights of indigenous peoples or vulnerable groups to resources. (Saengavut & Somswasdi, 2022) also emphasized that people's preferences for the form and duration of incentives vary widely, so uniform designs are at risk of being ineffective. In addition, the complexity of the incentive system also creates institutional challenges. (Khuu et al., 2021) showed that weak inter-agency coordination in Con Dao National Park, Vietnam, led to program overlap and decreased efficiency of conservation incentives. Another problem is the value of incentives that are often not equal to the cost of land opportunities or community labor, as criticized (Tafoya et al., 2020) in the context of ecotourism and PES in Costa Rica.

To measure the effectiveness of ecotourism incentives, the evaluation needs to be carried out multidimensionally, involving ecological, social, and economic indicators. For illustration, Arias-Arévalo et al. (2025) developed an evaluation framework based on three values: instrumental (economic), relational (social bonds), and intrinsic (concern for nature), which have been shown to reinforce each other when evaluated participatively in Colombia. Quantitative evaluation can also be carried out through the analysis of land cover change, citizen participation rates, and local economic acceptance, as applied in the Theory of Change-based PES evaluation model (Cerveira et al., 2024). Another important question is whether financial and non-financial incentives can be integrated. The answer: yes. Some studies even suggest that the integration of the two improves conservation

sustainability. (Arias-Arévalo et al., 2025) state that citizens often remain conservationists even without pay, because their intrinsic value and social connection with nature are stronger than financial incentives. This approach is also supported (He & Jiao, 2023), who developed the concept of conservation-compatible livelihoods, which are livelihoods that are designed in harmony with local ecological and cultural values. Practically, the integration of incentives in Tahura can be in the form of: (1) payment or profit sharing from tourism; (2) social recognition such as local awards; (3) access to training and markets for environmentally friendly products; and (4) participation in governance as a form of non-material incentive.

The integration of incentives in field conservation practices has been shown to strengthen collaboration among area managers, local communities, and tourists. A successful integrative illustration is the scheme of sharing the proceeds of ecotourism with the communities around the protected area. As Guerrero-Moreno & Oliveira-Junior (2024) shows, many community-based ecotourism initiatives (CBETs) in the tropics combine financial incentives (from tickets and tour services) with non-financial incentives such as training, social recognition, and participation in local governance. This approach is also found in Katon-Karagay National Park in Kazakhstan, where the management of tourist visits based on conservation zones is complemented by social incentives in the form of ecotourism service business opportunities provided only to villagers around the park. Integration is also carried out through a small business-based environmental compensation mechanism. In some national parks in China, local tourism actors are provided with training for the development of eco-friendly cultural products and services, as a form of non-financial incentive that strengthens the economic and ecological sustainability of communities around the region (Wan et al., 2025). Meanwhile, (Guo et al., 2023) stated that forms of incentives that prioritize citizens' autonomy in determining conservation based economic activities are more acceptable than direct cash help.

To measure the effectiveness of ecotourism incentives, the most relevant metrics are a combination of ecological, social, and economic indicators. Ecologically, effectiveness can be measured through reduced pressure on the area, increased vegetation cover, or protection of key species. Socially, the metrics used include community participation in ecotourism programs, satisfaction of local actors, perception of benefits,

and sustainability of community relations with park managers (Guerrero-Moreno & Oliveira-Junior, 2024). From the economic side, the indicators that are often used are increasing household income from ecotourism, diversifying livelihoods, and distributing profits fairly (Tafoya et al., 2020). (Aktymbayeva et al., 2023) also emphasized the importance of calculating tourism carrying capacity as a spatial metric that determines the extent to which an area can receive visits without damaging its ecological function. In a large bibliometric study, (Das et al., 2025) showed that cross-sectoral indicators—such as the linkage of ecotourism to the SDGs, tourism carbon emissions, and local institutional capacity—are starting to be widely used as more metrics in assessing the success of incentivized ecotourism programs.

To create a sustainable ecotourism-based conservation system in Tahura, incentives do not always have to be in the form of financial support. Various international studies confirm that non-financial incentives such as social recognition, training, or access to decision-making also have a significant impact on encouraging community engagement. In addition, local communities have a strategic role in evaluating the impact of ecotourism on social and environmental welfare. Non-financial incentives, the role of communities in evaluations, as well as methods for measuring community satisfaction are visualized in figure 11.2.

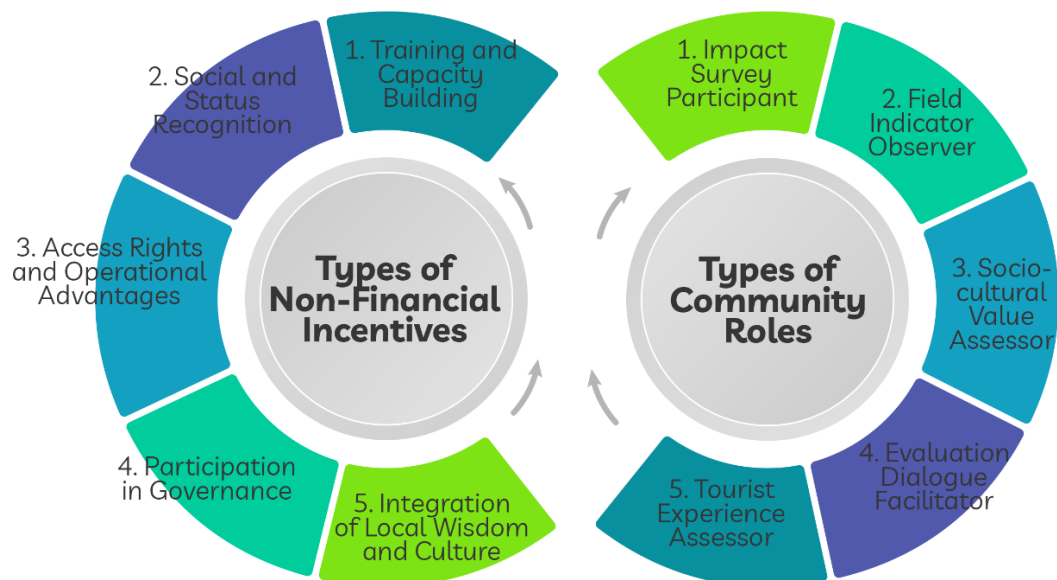


Figure 11.2. Types of Non-Financial Incentives and Types of Community Roles

Table 1.4. describes non-financial incentives, the role of the community in evaluation, as well as methods to measure community satisfaction and is related to the Type of Community Role in Tahura which explains the form of involvement in evaluation. Non-financial incentives such as training, social recognition, and access to decision-making can increase citizens' sense of ownership of conservation ecotourism. The community also has an important role to play in assessing the impact and determining indicators of program success, especially if the evaluation method is adapted to the local culture. Citizen satisfaction measurement is not only carried out through quantitative surveys, but also through qualitative approaches such as discussions and social mapping. This integrated approach allows Tahura management to align conservation goals with community expectations in a fair and sustainable manner.

Community participation in Tahura can be manifested in tangible forms that not only increase conservation effectiveness, but also strengthen the social and economic involvement of local communities. One of the main forms of participation is the active involvement of communities in planning and decision-making related to zoning, ecotourism regulations, and conservation policies through annual deliberative or consultative forums—an approach that has been successfully implemented in protected forest areas in China (Wan et al., 2025). In addition, the community can participate in ecotourism management and environmental education by becoming tour guides, homestay managers, local culinary presenters, and facilitators of the "nature school" program. This practice has shown success in Kazakhstan and Colombia, where citizen involvement in the tourism sector increases a sense of ownership as well as local income (Aktymbayeva et al., 2023; Guerrero-Moreno & Oliveira-Junior, 2024). Another form of participation that is no less important is contribution to conservation monitoring and evaluation. With the right training, communities can be engaged in monitoring biodiversity, habitat conditions, or the impact of tourism activities using simple methods or participatory digital applications—as has been implemented in community forest monitoring systems in Latin America and Southeast Asia (Cerveira et al., 2024). On the economic side, strengthening environmentally friendly local products such as handicrafts, traditional foods, or tourism services promoted as part of Tahura's identity can provide added value for the community while supporting regional branding. This model has been

successfully applied in the agroecological regions of Eastern Europe (Das et al., 2025).

Table 1.4. Non-Financial Incentives, Community Evaluation, and Satisfaction Measurement in Conservation Ecotourism

Types of Non-Financial Incentives	Practical Illustrations	Reference
Training and Capacity Building	Ecotourism training for village youth and residents as local guides	Guerrero-Moreno & Oliveira-Junior, 2024
	Training in eco-friendly tourism products and local conservation knowledge	Smyth et al., 2021
Social Recognition and Status	Granting of a certificate or title of "conservation volunteer" from the area manager	Guo et al., 2023
	Invitation as a resource person or facilitator of ecotourism training	Cerveira et al., 2024
Access Rights and Operational Advantages	Priority as a local tour operator (guide, transportation, service provider)	Arias-Arévalo et al., 2025
	Community-exclusive access to specific zones in tourist areas	Aktymbayeva et al., 2023
Participation in Governance	Citizen involvement in the preparation of conservation zoning and tourism plans	Wan et al., 2025
	Voting rights in area management forums or conservation working groups	Wan et al., 2025
Integration of Local and Cultural Wisdom	Transfer of traditional knowledge into ecotourism interpretation programs	Wan et al., 2025
	Support for branding local products as part of the area's conservation identity	Das et al., 2025
Impact Survey Participants	Fill out surveys related to the social, economic, and ecological impact of ecotourism on daily life	Guo et al., 2023
Field Indicator Observer	Monitor local indicators such as the presence of animals, tourist waste, or visitor volume	Das et al., 2025
Socio-Cultural Value Assessor	Convey important local values (such as a sense of security, community, and social comfort) in the form of local indicators	Arias-Arévalo et al., 2025
Evaluation Dialogue Facilitator	Be part of a community team that facilitates public discussion and decision-making based on evaluation results	Smyth et al., 2021
Traveler Experience Assessor	- Provide an assessment of tourist behavior and its impact from the perspective of the host community	Guerrero-Moreno, 2024

Not to forget, the social and cultural role of indigenous leaders or elders in conservation education is an important means to integrate traditional knowledge with modern science. They can be resource persons in trainings, conservation festivals, or more meaningful educational programs locally, such as cultural value-based conservation models in China and Latin America (Wan et al., 2025). Overall, the active participation of the community in planning, ecotourism, environmental monitoring, creative economy development, and strengthening cultural identity is a strong foundation for inclusive, sustainable, and community-based management of Tahura.

Community participation in Tahura, although it is the key to the success of conservation management, cannot be separated from various structural and social challenges that can reduce its effectiveness. One of the main barriers is inequality of access and representation, where participation is often dominated by certain groups such as village leaders or active tourism actors, while females, youth, or indigenous groups tend to be marginalized—a dynamic that also occurs in many community-based protected areas globally (Guo et al., 2023). In addition, the low technical capacity and organization of citizens causes participation to be only symbolic without substantial contribution, especially if the community does not understand the concepts of conservation, biodiversity monitoring techniques, or ecotourism management (Smyth et al., 2021). Without adequate training and capacity building, community involvement is difficult to develop into meaningful participation.

Another challenge is the lack of real and sustainable incentives for communities to be actively engaged. As noted by Cerveira et al. (2024), community involvement will be stronger if it is accompanied by concrete benefits, both in the form of direct economy and social recognition of their role in environmental conservation. The lack of a two-way feedback mechanism is also an important issue, as participation is often one-way, with the community only as a recipient of information or an implementer of activities with no space to provide input or evaluate results (Wan et al., 2025). Unclear roles and authority in the decision-making process further complicates the situation, so participation risks becoming a mere administrative formality with no real impact (Wang & Xie, 2025). On the other hand, the tension among conservation values and the needs of the local economy is also a significant hindrance. Communities often view

conservation as a restriction on access to resources that have been their livelihood, such as the prohibition of forest encroachment or infrastructure development (Aktymbayeva et al., 2023). Therefore, a more inclusive, socially just, and capacity building approach is needed so that community participation in Tahura can be truly meaningful, sustainable, and support the goal of environmental conservation holistically.

The integration of economic value with conservation in Tahura is a strategic approach that not only strengthens environmental conservation endeavors, but also improves the welfare of the surrounding community. By making conservation a source of economic benefits, the community has a real incentive to participate in the protection of the area. One of the main strategies is the development of community-based ecotourism, where residents become the main actors in the provide guide services, homestays, local culinary, and handicraft sales. As Guerrero-Moreno & Oliveira-Junior (2024) demonstrate, the active participation of communities in the ecotourism chain creates a direct link among ecological success and economic well-being. In Kazakhstan, the exclusivity model is implemented by granting tourism management rights only to local residents, thus reinforcing a sense of ownership and responsibility for the region (Aktymbayeva et al., 2023).

In addition, the development of productive businesses that are in line with conservation principles such as agroecology, sustainable fisheries, and the use of non-timber forest products (NTFPs) are also important means of integrating the economy and conservation. This approach is referred to by He & Jiao (2023) as conservation-compatible livelihoods, which are lifestyles that not only support the community's economy, but also reduce pressure on protected ecosystems. Strengthening the local economy through institutional incentive schemes—such as the distribution of confession proceeds to the community, conservation scholarships for farmers' children, or marketing local products labeled "Tahura conservation products"—can also increase the relevance of conservation in people's daily lives. Furthermore, Arias-Arévalo et al. (2025) emphasize that in addition to market value, recognition of relational economic value—the meaningful relationship among humans and nature—is essential in building sustainable community engagement. With a combination of strengthening community ecotourism, developing environmentally friendly businesses, and inclusive incentive mechanisms, the integration of

economic and conservation values in Tahura can create synergy among ecological sustainability and social welfare in the long-term.

Studies have shown that the success of community-based ecotourism (CBET) in various countries not only has a positive impact on environmental conservation, but is also able to improve the socio-economic well-being of local communities. One illustration is the CBET program at Bhitarkanika Wildlife Sanctuary, India, which has succeeded in strengthening citizens' participation in mangrove conservation through their role as tour guides, boat managers, and environmental educators, while increasing community income (Patita Paban Mohanty et al., 2024). In the Aksu-Zhabagly Nature Reserve, Kazakhstan, the integration among biodiversity and local culture in village ecotourism was successfully implemented with the support of a SWOT analysis for institutional strengthening and active participation of the community in tourism management and education (Akbar et al., 2022).

Another prominent illustration is the Gornje Podunavlje Reserve in Serbia, where the participation of local communities and educators in nature education pathways helps to reduce pressure on ecosystems while increasing visitor awareness of the importance of conservation (Stojanović et al., 2021). Meanwhile, in Katun Karagay National Park, Kazakhstan, granting villagers exclusive rights to manage tourism services contributes to reducing encroachment activities and strengthening local social and economic relations (Aktymbayeva et al., 2023). In the context of agrarian reform, COPA Protected Areas in South Africa shows how community management models create a system of conservation governance based on justice and legal ownership by local communities (Mthimkhulu & Nel, 2024).

Other international experiences include national park management in China adapting global practices to build inclusive and social incentive-based national systems (Kong et al., 2025). In Indonesia itself, Kalibiru Village is a successful illustration of the transformation of production forests into community-managed forest-based tourist destinations with real economic benefits (Wiyono et al., 2020), while Bukit Tigapuluh National Park displays the active role of indigenous peoples in conservation, visitor education, and protection of endangered animals (Musadad et al., 2022). From these various cases, it can be concluded that the success of community ecotourism depends on the active involvement of the community in the entire process—from planning, operational, to

evaluation—as well as the recognition of local management rights and cultural values. These findings provide a solid basis for the development of a similar model in Tahura, with an adaptive, inclusive approach that focuses on the unique potential of local communities.

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THEORETICAL FRAMEWORK ON CONSERVATION AND POLICY TRANSFORMATION

Andjar Prasetyo and Abdul Hamid

A. Concepts and Principles of Conservation Theory

Conservation theory is a conceptual framework that helps to understand, explain, or predict the interactions among humans and the environment and biodiversity. This theory includes a set of basic principles used to identify patterns, dynamics, and cause-and-effect relationships in nature conservation endeavors. For illustration, the theory of human behavior change is often used in conservation research to influence the actions of individuals or groups to achieve positive environmental and social outcomes. (Eyster et al., 2025) show that this theory-based approach can improve the effectiveness of conservation programs by integrating an understanding of people's motivations, values, and social norms. Conservation theory evolved in response to global threats to biodiversity, such as deforestation, climate change, and overexploitation of natural resources. In this context, approaches such as "theories of change" are important because they provide guidance for designing conservation strategies that are appropriate to the socio-economic and political conditions of a region. (Buelow et al., 2022) highlight that these theories help identify concrete steps that can be taken to address conservation challenges holistically. This approach also allows for the development of adaptive and sustainable solutions, given the complexity of environmental issues that often involve multiple stakeholders.

Key concepts in conservation theory include principles such as sustainability, community participation, and supporting conditions such as policies and regulations. Sustainability emphasizes the need to maintain a balance among human needs and the capacity of ecosystems to recover. Community participation refers to the active involvement of local communities in conservation decision-making, which often increases the success of programs. Supporting conditions such as government policies

and legal regulations play an important role in creating an environment that supports conservation practices. Buelow et al. (2023) show that these concepts are applied in specific approaches such as coastal wetland conservation, where collaboration among governments, scientists, and local communities is key to success. Conservation theory is based on the assumption that human actions can be directed to protect biodiversity through policy change, education, and moral awareness. This assumption reflects the belief that humans have the ability to change their behavior for the good of the environment. (Coghlan & Cardilini, 2024) emphasize that morality-based approaches, such as the cultivation of environmental ethical values, can motivate individuals and groups to behave more environmentally friendly. However, these assumptions also face challenges, such as cultural resistance or a lack of understanding of the urgency of environmental issues.

Models in conservation theory often use flowcharts or logical frameworks to explain the cause-and-effect relationship among conservation actions and ecological outcomes. One illustration is the "generic theory of change" model proposed by USAID for managing community-based businesses. This model shows how certain inputs, such as training and funding, can generate outputs such as community capacity building and positive impacts on biodiversity (Boshoven et al., 2022).

Many conservation programs around the world face sustainability challenges due to the lack of active participation of local communities as well as the lack of economic incentives that can motivate them to engage in environmental conservation. Without the support of the communities living around conservation areas, conservation endeavors often fail or do not last long. To address this problem, an alternative approach is needed that integrates conservation goals with local economic development. This article offers a solution in the form of a community-based business model designed using the Theory of Change (ToC) framework, which aims to link local economic activities with long-term conservation outcomes. The main approach used in this article is the ToC, which is a logical framework that helps map out how an intervention—in this case community-based business—can produce positive changes in the level of biodiversity conservation (Schneider, 2023). The goal of this model is to create a generic guide that can be applied in a variety of geographical and sociocultural contexts. With the ToC, program planners can design a more systematic

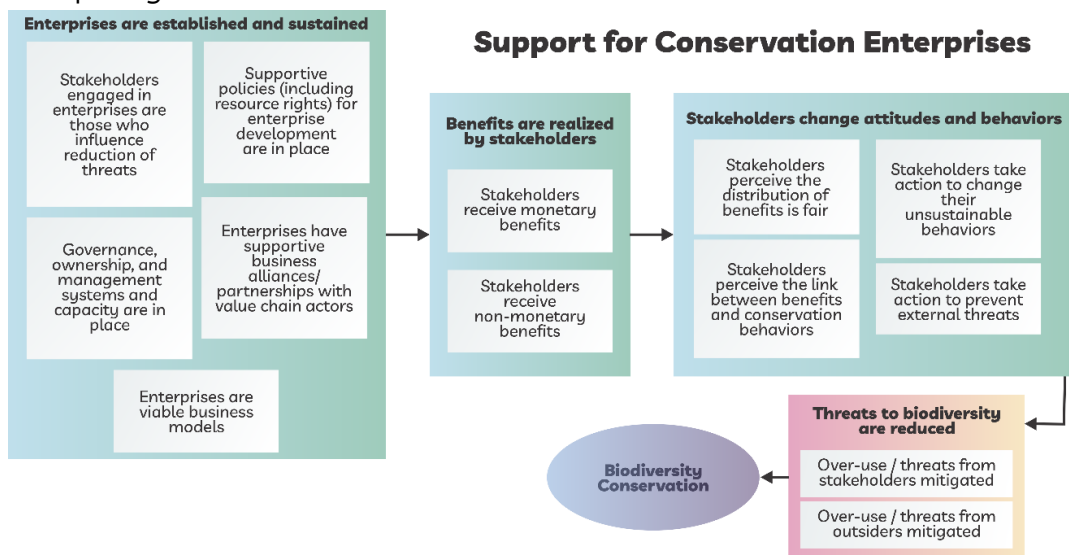
strategy, so that each step taken has a clear cause-and-effect relationship toward achieving conservation impacts.

A community-based business model for conservation consists of several important components: inputs, outputs, outcomes, and impacts. Inputs include resources such as training, capital, technology, and market access provided to communities to start environmentally friendly businesses, such as ecotourism or the production of non-timber forest products. Output is in the form of goods or services produced from the business, which is also a tool to manage natural resources in a sustainable manner. Outcomes involve improvements in ecosystem management, reduced threats to species and habitats, and strengthening community capacity. In the terminate, the impact to be achieved is the long-term preservation of biodiversity as well as the improvement of the economic and social welfare of local communities. This model has been implemented in various locations, including forest-based conservation programs in Africa and Asia. Illustrations include sustainable timber harvesting projects, ecotourism development, and the production and marketing of natural products such as honey, essential oils, and traditional medicines. In each case, the local community was provided with business management training, conservation techniques, and access to market networks. This approach not only increases people's income, but also changes their behavior patterns toward the environment, so that they become the main actors in conservation endeavors.

The implementation of this community-based business model has shown significant results in supporting conservation. One of the main outcomes is reduced pressure on natural resources, as communities shift to more sustainable economic activities. In addition, the existence of direct economic benefits provides a strong incentive for people to protect their environment. The active involvement of communities in the management of natural resources also increases the sense of ownership and responsibility for conservation areas. This model has several advantages, one of which is its ability to provide direct economic incentives to local communities, which is an important motivation in protecting the environment. In addition, the flexibility of the model allows for its application in different types of businesses and local contexts. However, this model also has limitations. For illustration, it requires a considerable initial investment in the form of training, infrastructure development, and

community capacity building. In addition, the success of the model relies heavily on the sustainability of the market for the products or services produced by the community.

This model is particularly relevant in today's global context, where the need for conservation is increasingly urgent, but often competes with the economic demands of local communities. By integrating economic and sustainability principles, the community-based business model shows that conservation is not only the responsibility of governments or environmental organizations, but can also be part of a community's economic development strategy. This opens up space for collaboration among the private sector, NGOs, and the government in creating inclusive and effective conservation solutions. The importance of a participatory approach in biodiversity conservation, with a focus on the economic empowerment of local communities through community-based businesses. Using the ToC framework, this model provides systematic guidance for designing conservation programs that are not only environmentally sustainable, but also provide tangible benefits to society. This is an illustration of the integration among economics and ecology, which shows that nature conservation can go hand in hand with improving the quality of human life.



Source: Judy Boshoven, Megan Hill, Ashleigh Baker, 2021, modify by Andjar, 2025

Figure 2.1. Support for Conservation Enterprises

Figure 2.1. helps practitioners design, monitor, and evaluate conservation programs systematically. The main goal of conservation theory is to maintain the balance of ecosystems and ensure the sustainability of life for future generations. Its relevance is seen in its application to the conservation of rare species, such as orchids, which require a specific approach due to their dependence on soil mycorrhiza. (Phillips et al., 2020) show that a deep understanding of the biological needs of these species allows for the development of more effective conservation strategies. Conservation theory is also relevant in the context of climate change, where an adaptive approach is needed to deal with environmental uncertainty.

The advantage of conservation theory lies in its ability to provide a structured practical guide for decision-making. Theoretical models help identify concrete steps that can be taken to achieve conservation goals. However, the main limitation of this theory is that there is often a gap among theory and practice. Phillips et al. (2020) highlight that while conservation theory provides a robust framework, its implementation is often hampered by factors such as lack of resources, community resistance, or lack of coordination among stakeholders. This shows the need for a more adaptive and inclusive approach. Conservation theory is applied in a variety of contexts, from community-based business programs to international initiatives to protect biodiversity. For illustration, Boshoven et al. (2021) show how the generic ToC model is used to support community-based business management aimed at protecting local ecosystems. At the national level, this theory is also applied in conservation policies that focus on habitat restoration or natural resource management. This application demonstrates the flexibility of conservation theory in addressing various environmental challenges. Conservation theory often complements other theories, such as theories of human behavior and ecology, to understand the complex dynamics among society and the environment. Eyster et al. (2025) show that the integration of conservation theory with human behavior theory can help identify factors that influence individual decisions regarding the environment. In addition, the relationship with ecological theory allows for a more in-depth analysis of the interactions among species and ecosystems. This interdisciplinary collaboration is essential for developing holistic and sustainable conservation solutions.

Conservation theory is a conceptual framework that provides a foundation for understanding, explaining, and designing effective strategies in endeavors to conserve biodiversity and manage ecosystems in a sustainable manner. By combining scientific, social, and political principles, the theory aims not only to maintain the balance of nature but also to create adaptive solutions to complex environmental challenges. The practical application of conservation theory has grown rapidly in a variety of contexts, from the protection of endangered species to the holistic management of ecosystems. At the local level, this theory assists communities and stakeholders in designing conservation programs that are responsive to ecological and social needs. On a global scale, conservation theory is the foundation for international treaties such as the Convention on Climate Change (UNFCCC) and the International Convention on Biological Diversity (CBD), which aim to protect biodiversity around the world. In a more specific context, conservation theory has been used to address threats to habitats, such as deforestation, pollution, and climate change. For illustration, a community-based approach has proven its effectiveness in engaging local communities as key actors in the conservation of natural resources. In addition, modern technologies such as satellite monitoring and genetic data analysis also support the implementation of conservation theory by improving the accuracy of population surveys and ecosystem mapping. The application of conservation theory also involves cross-disciplinary collaboration among scientists, environmental activists, governments, and the private sector. This ensures that the designed solution does not only focus on biological or ecological aspects, but also considers social, economic, and cultural factors. Thus, conservation theory not only aims to conserve biodiversity, but also improve the ecology-based decision-making process to be more inclusive, equitable, and sustainable. Through this practical application, conservation theory continues to adapt to increasingly complex environmental dynamics. From the protection of endemic species to the restoration of damaged ecosystems, this theory serves as an important guide for experts, policymakers, and society in creating a more sustainable future. With a focus on sustainability, community participation, and innovation, conservation theory continues to play a key role as a major milestone in global endeavors to maintain harmony among humans and nature (table 2.1.).

Table 2.1. Practical Apply Conservation Theory

No.	Research Title	Practical Application	Key Results
1	Use of theories of human action in recent conservation research	Apply human behavior theory to direct social and environmental action toward conservation.	This approach increases community engagement and prioritizes evidence-based action.
2	Enabling conservation theories of change	Development of a theory of change-based model to involve the community in coastal wetland conservation.	This model allows the implementation of conservation according to local and socio-economic needs.
3	Orchid conservation: From theory to practice	Conservation of orchid species through specific approaches such as mycorrhizal for reproductive success.	This conservation increases the success of the translocation of orchids in their natural habitat.
4	Conservation enterprises: Community-led businesses that contribute to conservation outcomes	Development of community-based businesses such as ecotourism to support conservation endeavors.	Providing economic benefits to the community while protecting the local ecosystem.
5	The use and abuse of moral theories in conservation debate about killing animals	Ethical discussions related to conservation policies that consider the protection of species from human threats.	Provide policy guidance that is fairer and based on moral values.
6	A guide to using species trait data in conservation	Use of species trait data to support risk evaluation, conservation planning, and action priorities.	Improve accuracy in the selection of priority species and efficiency of conservation measures.
7	Stable isotope approaches and opportunities for improving plant conservation	The use of stable isotopes to understand the ecophysiological response of plants to environmental changes.	Provides long-term insights to protect crops from climate change.
8	An interdisciplinary course on evolution and sustainability	Evolution-based education to raise awareness of conservation and sustainability.	Increasing public acceptance of the theory of evolution and its relevance to conservation.
9	The use and abuse of moral theories in conservation debate about killing animals	A moral approach in conservation policy to protect biodiversity from exploitation.	Provide an ethical foundation for more humane conservation-based policies.
10	On the Conservation Properties in Multiple Scale Coupling and Simulation for Darcy Flow	Conservation-based simulations to understand flow dynamics in complex ecosystems such as wetlands.	Produce more accurate models of water flow to support ecosystem restoration.

Source: author search, 2025

Conservation theory has demonstrated its relevance through a wide range of practical applications that integrate multidimensional approaches to achieving environmental sustainability and social well-being. One illustration is the use of human behavior theory, which helps change people's actions to be more concerned about the environment through a deep understanding of social motivations and norms. On the other hand, the theories of change model have been successfully applied in coastal wetland conservation by involving local communities, ensuring that the strategies designed are not only ecologically effective but also socially relevant. Species-specific approaches, such as those in orchid conservation, highlight the importance of paying attention to complex ecological interactions, including the use of species trait data to improve conservation efficiency based on specific risks and objectives. Stable isotope technology also makes a significant contribution by supporting an understanding of the response of plants to environmental stresses, which is the cornerstone of long-term protection policies. In addition, the community-based approach shows how an eco-friendly business model not only protects the ecosystem but also provides economic benefits to local communities, creating synergies among conservation and development. Meanwhile, evolution-based interdisciplinary education has succeeded in raising public awareness of the importance of conservation, while expanding the apply this theory in daily life. Ethics also play a central role in conservation policy, where a moral approach helps to create fairer and more sustainable policies, especially when it comes to the management of vulnerable species. Ecosystem simulation technology also provides deep insights into complex ecosystem dynamics, enabling more effective and adaptive management of natural resources. These applications prove the flexibility and effectiveness of conservation theory in responding to the increasingly complex environmental and social challenges of the modern era.

In the 1980s, there was a realization that traditional conservation approaches that tend to be exclusive and ignore the role of local communities often fail in the long run. In response, a more inclusive community-based approach began to be developed. Organizations such as the World Wildlife Fund (WWF) and the IUCN conducted research that showed that the active involvement of local communities is a key factor in conservation success. This approach emphasizes the importance of participation and direct benefits to communities as motivation to preserve

the surrounding environment. In the 2000s, the community-based business approach matured with the birth of programs such as Community-Based Natural Resource Management (CBNRM), especially in African countries. This program has proven that when communities are given the right and capacity to manage natural resources, they can create good solutions for both conservation and economic well-being. In Namibia, for illustration, CBNRM has been successful in reducing human-animal conflict and increasing community income through natural tourism managed by local communities. Entering the 2010s, the concept of conservation enterprises was increasingly widely applied globally. This term refers to economic endeavors designed to provide economic benefits to communities while supporting the preservation of biodiversity. Countries in Southeast Asia, Latin America, and Africa are beginning to integrate this model in their conservation policies. With this approach, economic activities such as organic farming, ecotourism, and the production of natural products become a means to build a harmonious relationship among humans and nature.

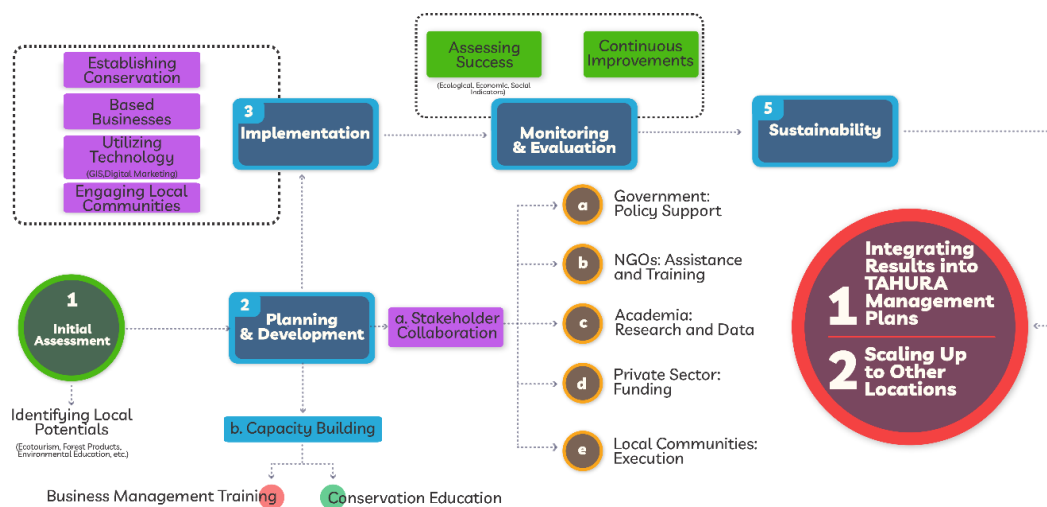
In Indonesia, the community-based business model is very relevant to be implemented in the Taman Hutan Raya (Tahura) area. The strategy includes strengthening the capacity of local communities through ecotourism management training, forest honey production, or natural ingredient-based crafts. In addition, diversification of conservation businesses is carried out such as sustainable management of medicinal plants and legal wood products. The use of technology such as geographic information systems (GIS) is used for ecosystem monitoring and digital marketing to promote conservation products. Regulations are also made to ensure equitable distribution of profits and support community-based forest management. Some Tahura in Indonesia have started to implement the concept of community-based business. For illustration, Tahura Sultan Thaha Syaifuddin in Jambi has integrated the use of medicinal plants by local communities as a conservation effort as well as economic improvement. At Tahura Ir. H. Djuanda in Bandung, community-based ecotourism has been successfully implemented, where the community is involved in the management of tourism facilities and environmental education. Land and animal conservation endeavors are also carried out through the restoration of critical lands with the participation of local communities using endemic species in the area.

The process of implementing the community-based business model (figure 2) at Tahura generally takes place in three main stages. The initial stage (1–2 years) involves initial situation assessment, community training, and basic infrastructure development. In the development stage (3–5 years), the conservation business begins to be run, accompanied by capacity building and regular monitoring. After five years or so, the model enters the sustainability stage, where the main focus is monitoring, evaluating results, and potential replication to other sites that have similar conditions. The successful implementation of community-based business models requires the involvement of various parties. The government plays a role in providing supporting policies, such as fiscal incentives and regulations that support community-based forest management. NGOs are present as partners in providing training and technical help to local communities. Academics contribute scientific data and technological innovations to support conservation monitoring and evaluation. The private sector participates in helping to market conservation products and provides initial investment. Most importantly, local communities are the main actors in the entire process, from planning to implementation and management of conservation endeavors.

Community-based business models provide significant ecological benefits in supporting biodiversity conservation. One of the positive impacts is the reduced pressure on forest ecosystems, as communities shift from destructive activities such as unlawful logging to sustainable ventures such as ecotourism or the management of non-timber forest products (Boshoven et al., 2021). In addition, this approach also triggers ecosystem regeneration, one of which is through reforestation programs on critical lands. With the active participation of the community, environmental restoration endeavors become more effective and sustainable.

From an economic perspective, this model provides an alternative source of income for local communities through various sustainable conservation endeavors. Illustrations include ecotourism, forest honey production, and environmentally friendly management of forest products. The income generated not only improves people's living standards, but can also be realized to support conservation operations. In Indonesia, a real illustration can be seen in Tahura Ir. H. Djuanda, where ecotourism has become an important source of income that supports the sustainability of the region. In addition to ecological and economic benefits, the model also

brings important social benefits to local communities. Direct involvement in conservation endeavors increases public awareness of the importance of environmental conservation. This creates a sense of ownership and responsibility for the surrounding natural resources. In addition, with community-based resource management practices, conflicts among humans and wildlife can be significantly reduced, as communities have common solutions to maintain ecosystem balance.



Source: Author Analysis, 2025

Figure 2.2. Tahura Conservation Concept based on Support for Conservation Enterprises

One of the main challenges in the implementation of this model is the limited capacity of local communities in technical and managerial aspects. To overcome this, it is necessary to conduct intensive training that includes conservation business management skills, financial management, marketing, and sustainable conservation techniques. For illustration, ecotourism training programs involving the communities around Tahura can improve their ability to provide professional and environmentally friendly tourism services. Community-based business models are prone to global market fluctuations, so it is important to diversify products and develop local markets as a backup. For illustration, in addition to selling legal wood products or forest honey to the international market, the community can also market them to domestic markets, such as organic

stores, hotels, or environmental education centers. This strategy helps reduce the risk if a decline in demand from abroad.

The implementation of this model requires considerable initial investment, especially for infrastructure, training, and promotion. One effective solution is to seek funding support from Corporate Social Responsibility (CSR) of private companies or international institutions such as the Global Environment Facility (GEF). Grants from these institutions can be used for the construction of ecotourism facilities, community training, and the provide environmentally friendly production tools. Out of sync policies are often an obstacle to community-based conservation management. Therefore, it is important to align national regulations with local needs, so that the distribution of the benefits of conservation products can run fairly. Revisions or drafting of new policies that support forest management by local communities will greatly help the smooth implementation of this model.

B. Public Policy Transformation Theory

Public policy transformation refers to profound and systemic changes in the direction, content, or process of policymaking due to external and internal pressures (Brummer & Ueno, 2024). One important approach in this area is the Punctuated Equilibrium Theory, which states that policies are generally stagnant but can change dramatically when there is a major crisis or significant disruption. This approach helps explain the dynamics of policy change that are not always linear and are often triggered by political momentum or extraordinary events. The theory of public policy transformation developed in response to the question of why seemingly stable policies can suddenly change radically. Global developments such as the COVID-19 pandemic, climate change, and rapid digitalization have strengthened the relevance of this theory (Brummer & Ueno, 2024). For illustration, in Japan, the global health crisis is accelerating digital transformation in government, demonstrating how external pressure can be a catalyst for policy reforms that were previously difficult to materialize.

Some of the core concepts in public policy transformation theory include: disruption, which is an event or condition that triggers major changes; Policy windows, which are moments where political, social, and technical situations come together to create opportunities for policy

innovation; and transformative literacy, which is the ability of bureaucratic actors to understand the complexity of systemic change and encourage its implementation (Jacob et al., 2021). These three concepts interact with each other in explaining the dynamics of policy transformation. The basic assumption of this theory is that public policy tends to be stable due to the existence of established institutional structures and interests. However, significant changes will only occur if there is a major crisis or strong pressure from the external environment (Brummer, 2024). In addition, bureaucratic and institutional actors have an active capacity to respond and even guide the transformation process, so that they are not just victims of environmental change.

Within the framework of its analysis, several models are used to understand public policy transformation. One of them is the Three-dimensional Analysis Framework which includes three dimensions: policy topics, policy instruments, and stakeholders (Yang et al., 2025). Another model is Technological Frames Theory, which helps explain how the interpretation of technology by policymakers can influence policy values and the orientation of digital transformation (Gualdi & Idemitsu, 2021).

The main goal of public policy transformation theory is to explain the mechanisms and conditions that allow radical and systemic policy change (Li et al., 2025). In an era marked by rapid change, such as the development of AI, sustainability issues, and social transformation, this theory is particularly relevant for understanding how local and national governments adapt. For illustration, the use of AI in policy decision-making in China demonstrates the practical application of this theory in the context of modern governance. One of the advantages of public policy transformation theory is its ability to explain major changes that cannot be explained by traditional incremental approaches. In addition, this theory combines political, technological, and institutional analysis in one holistic framework (Silander et al., 2024).

However, the weakness is the lack of attention to small or gradual change, as well as the challenges in the consistency of transformational policy implementation at the local level that often face resistance or resource constraints. This theory has been applied in a wide range of policy studies and practices, including the analysis of digital transformation in the public sector (Brummer & Ueno, 2024), the evaluation of sustainability policies and green innovation in companies (Sun et al., 2025), as well as the

study of gender in higher education reform in Scandinavia (Silander, 2024). The apply this theory helps policymakers and researchers understand the patterns, barriers, and opportunities in driving systemic change. Public policy transformation does not stand alone, but is often associated with other theories such as the Punctuated Equilibrium Theory, which is an important foundation in understanding the dynamics of policy change (Brummer, 2024). In addition, it is also closely related to Public Value Theory, which emphasizes the creation of public value in the process of transformation (Gualdi, 2021). In the context of technological innovation and sustainability, this theory is also related to affordance theory, which explains the potential of technology in opening up new spaces for collective action and progressive policies (Sun et al., 2025).

To understand the apply the theory of public policy transformation in the field of conservation, we need to look at how policies that were originally conventional can undergo fundamental changes through crisis pressures, technological innovations, or shifts in social values. Table 2.2. presents some practical illustrations of the apply the theory of public policy transformation in the context of environmental and natural resource conservation.

The transformation of public policy in the context of resource and environmental conservation shows a pattern of profound and systemic change, triggered by crises, technological developments, and institutional readiness. In China, the construction sector is undergoing transformation through digitalization with the adoption of technologies such as BIM and prefabrication as part of resource conservation endeavors, which can be analyzed through a three-dimensional framework—policy issues, instruments, and actors (Yang, 2025). A similar change occurred in Germany, where environmental bureaucracy strengthened transformative literacy, i.e. the ability of apparatus to understand and encourage sustainability policies from within the organization (Jacob, 2021). At the business level, Chinese companies are also beginning to make green innovation part of their corporate strategy, supported by public policies that encourage the reinterpretation of technology and information for conservation purposes (Sun, 2024). Local governments in China are also beginning to leverage AI in policy decision-making processes that focus on resource efficiency and conservation values, suggesting that

transformation is not only technological but also institutional and participatory (Li, 2023).

Table 2.2. Practical Transformation of Public Policy in Conservation

No	Practical Context	Policy Transformation	Mechanism of Change
1	Conservation in the construction industry (China)	Transition of AEC policy from conventional to digital construction & eco-friendly (Building Information Modeling (BIM), prefabrication)	Digital technology, government policy drive
2	Environmental administration in Germany	Internal transformation of the bureaucracy to support the sustainability transition	Sustainability education, transformational literacy
3	Green innovation by corporations (China)	Digital transformation policies encourage green innovation by the private sector	Affordance theory & <i>green policy</i> approach
4	Local government in China	The use of AI for conservation-based policy innovation and resource efficiency at the local level	AI, collaboration, and public policy innovation
5	Mountain of Dolomites, Italia	Changing the vision of mountain conservation and management through a political-ecological approach	Governance conflicts and climate change pressures
6	Global ocean governance	Emphasis on social justice aspects in marine conservation policies through the principle of <i>ocean equity</i>	International advocacy & policy redesign
7	Ecosystems at global risk	Technology integration and community participation in ecosystem preservation	Adaptive management, education, and economic incentives
8	Blue economy in Africa	Integrating climate change into a marine economy strategy based on conservation and climate resilience	Phased development of policy frameworks
9	Global geopolitical governance	Governance transformation toward multilateral cooperation to mitigate conflicts and environmental crises	Geopolitical crisis, cooperative approach

Source: author search, 2025

More studies show that the transformation of conservation policy is also occurring in broader contexts, including conflicts of value and interest. In the Dolomites, Italy, for illustration, the conservation narrative shifted from mere preservation to an arena of vision battles among development and sustainability (Zinzani, 2023). In the global ocean scope, the concept of ocean equity emerged as a new approach that emphasizes social justice in

the management of maritime resources, responding to historical injustices and ensuring inclusivity (Bennett et al., 2025). Ecosystem preservation as a whole is increasingly dependent on synergies among technologies such as remote sensing, community capacity, and policy incentives to create adaptive management systems that are resilient to climate change (Khattra et al., 2024). In Africa, policies in the blue economy sector demonstrate the importance of integrating climate change issues into maritime economic planning to create a more inclusive and responsive conservation framework (Karani et al., 2023). At the international level, global challenges such as the climate crisis and geopolitical conflicts are driving a transformation in world governance toward a more cooperative and sustainable paradigm (Scheffran, 2023). These studies show that the transformation of public policy in conservation is not a linear or predictable process. It involves the complex interaction among crises as triggers, technology as enablers, and institutions as agents of change. Theoretical approaches such as Punctuated Equilibrium Theory, affordance theory, and transformational literacy concepts provide relevant analytical frameworks to understand these dynamics, both at the local and global levels.

C. Socio-Ecological and Community-Based Conservation Approaches

The socio-ecological approach is an analytical framework that views humans and the environment as interrelated systems, in which the interaction among social and ecological aspects is studied holistically to understand the dynamics of natural resource management. This approach emphasizes the importance of the mutual relationship among communities and the surrounding ecosystems in designing sustainable environmental management strategies. CBNRM is a natural resource management approach that empowers local communities to be actively involved in decision-making, management, and use of natural resources in their regions. CBNRM aims to maintain the sustainability of natural resources while improving the social and economic welfare of the community through strengthening the right to governance, participation, and the use of local knowledge. The combination of the two concepts results in an environmental management strategy that focuses not only on ecosystem conservation, but also on community empowerment, recognition of traditional rights, integration of local knowledge with

modern science, and the creation of inclusive and participatory resource management mechanisms. This approach aims to achieve a balance among the ecological needs and socio-economic needs of the community in the long-term.

The CBNRM approach emerged in response to the failure a centralistic and top-down approach to natural resource management. Conservation policies have often been set without the active participation of local communities, ignoring traditional knowledge, indigenous peoples' management rights, and social dynamics at the local level. As a result, it not only causes resistance from the community but also accelerates environmental degradation (Valdez, 2022). It is in this context that the CBNRM approach began to be developed as a more inclusive and participatory strategy. This approach is based on the assumption that local communities have the capacity to manage natural resources sustainably if given adequate authority, access, and support. In addition, this approach also emphasizes the importance of integrating local knowledge with modern science in designing effective and sustainable resource management strategies.

Studies on Community Forest Management in Peru show that giving rights and responsibilities to local communities in managing forests can be an innovative solution to support sustainable forest conservation (Calero Valdez, 2022). Similar things were also found in the study ecotourism and co-management, which discussed how ecotourism and co-management can strengthen socio-ecological resilience in local food systems through community participation and environmental education (da Silva et al., 2025). In the marine sector, the Holomua Marine Initiative provides a concrete illustration of how community-formulated sociocultural principles and indicators can be used to integrate marine conservation with the participation of local communities in Hawai'i (Tait et al., 2024). Other studies such as Tourism and Conservation in Namibia have also shown that tourism opportunities can have a positive impact on forest and wildlife conservation within the framework of the CBNRM, particularly in the Zambezi region (Meyer et al., 2021).

However, the implementation of CBNRM does not always go smoothly. The Challenges in Pastoral Rangelands research identifies various challenges in the implementation of CBNRM in pastoral grassland areas, particularly about socio-ecological factors and political dynamics in

Kenya, Ethiopia, and Tunisia (Robinson et al., 2021). In the context of policy, the study *Ecological Politics in Alas Purwo* evaluates the role of policymakers in integrating local wisdom with conservation in Alas Purwo National Park, East Java (Setiawan et al., 2021). Several other studies offer technical and economic perspectives on the apply CBNRM. *Economic Benefits from Coral Reefs* uses network theory to analyze the economic benefits derived from coral reefs in multi-purpose conservation areas in the Southern Caribbean (Cavada-Blanco et al., 2021).

The socio-ecological and community-based conservation approach (CBNRM) is based on more key concepts that are the foundation for participatory, inclusive, and sustainable natural resource management. These concepts include co-management, ecosystem-based adaptation, and the use of traditional ecological knowledge. These three concepts are interrelated and are important elements in building social-ecological resilience while maintaining environmental sustainability and the welfare of local communities. Shared governance is a core principle in CBNRM that places the community as a partner in the decision-making process and implementation of natural resource management. By providing space for active community participation, this approach not only increases management effectiveness but also strengthens aspects of environmental justice. An illustration of the apply this concept can be seen in a protected area in Paraguay, where co-management policies have succeeded in increasing community participation in regional management by emphasizing the principles of equitable distribution of benefits and representation in decision-making (Bonatti et al., 2023).

In addition, ecosystem-based adaptation is becoming increasingly relevant in the face of climate change. This approach uses ecosystem functions to help communities deal with the impacts of climate change in a more resilient and sustainable way. Research by (Lavorel et al., 2020) shows that ecosystem services can be co-produced by communities and nature to support social adaptation through a cross-regional approach. This concept is also reinforced by studies that emphasize the importance of integration among community-based adaptation strategies and the use of traditional ecological knowledge to build the resilience of socio-ecological systems (Hosen et al., 2020). Traditional knowledge is one of the important pillars in CBNRM because it provides a local framework that is appropriate to the local cultural and environmental conditions. The results of the study

show that traditional ecological knowledge has great potential to be integrated into modern resource adaptation and management strategies (Hosen et al., 2020).

As an operational model, a framework was developed that emphasizes the importance of active community involvement, cultural values, and adaptive mechanisms in building socio-ecological resilience (Shemshad et al., 2025). This framework is particularly relevant in the context of complex and dynamic resource management, where flexibility and responsiveness are key to successful management. In practice, these concepts are often realized through real sector activities such as ecotourism, traditional fisheries, and the revitalization of traditional landscapes. For illustration, ecotourism can be an instrument to support the sustainability of natural resources through joint management and the use of local knowledge (da Silva et al., 2025).

The basic assume the CBNRM approach is that the active participation of local communities in natural resource management can improve ecological outcomes while strengthening social well-being. By giving people, the authority, access, and capacity to manage their own environment, it is hoped that a more responsive, fair, and sustainable management system will be created. This assumption is supported by studies in Namibia that show that community-based conservation successfully promotes ecosystem sustainability through co-management and local adaptation (Meyer et al., 2021). One of the most well-established illustrations of this assumption is the implementation of CBNRM in the Zambezi region of Namibia, where the co-management of natural resources has brought significant improvements to wildlife populations (Meyer et al., 2021). Although the economic impact varies, ecological outcomes show that community participation in decision-making and resource use has a significant contribution to biodiversity conservation. This is also supported by the research of (Gargallo & Kalvelage, 2021), which shows how community-based trophy hunting in Namibia becomes part of a socio-ecological system connected to global production networks.

However, for such participation to be effective, supportive institutional arrangements are needed. Studies on institutional arrangements emphasize the importance of national legal and policy frameworks in creating spaces for community-based conservation (Mbidzo et al., 2021). Without strong institutional support, community participation

is often limited to a symbolic level with no real influence in decision-making processes. A collaborative governance approach is also an important element in ensuring inclusive and productive participation. (Ullah & Kim, 2020) explore how collaborative governance in community-based trophy hunting programs can not only support conservation, but also provide direct economic benefits to local communities. Active participation in the management process is key in bridging the ecological goals and economic aspirations of the community.

On the other hand, governance challenges remain the main issue in the implementation of CBNRM. The (Kansky, 2022) study also highlights challenges in community-based conservation governance, including human–wildlife conflicts and the need for participatory dialogue mechanisms to build trust and contract among parties. To address these challenges, several initiatives are beginning to integrate participatory learning approaches. The Participatory Co-learning for Human–Wildlife Coexistence program (Kansky et al., 2024) shows how collaborative learning among communities, conservation practitioners, and academics can increase local capacity to manage human–wildlife interactions more effectively and harmoniously. In addition, research by (Meyer et al., 2021) shows that collective action in CBNRM has a direct impact on the level of community dependence on environmental resources. By increasing access to and control over resources, communities become more self-reliant and able to reduce the pressure of exploitation on the environment. This is in line with (Mbidzo et al., 2021) analysis of the role of communities in forest management and wildlife conservation in Namibia, which shows that despite many successes, there are still major challenges related to power imbalances and benefit distribution.

The socio-ecological and community-based conservation approach (CBNRM) is often represented as an adaptive framework that connects ecosystems with human social systems through participatory natural resource management strategies. This model emphasizes the importance of flexibility, collective learning, and collaboration in designing management systems that are responsive to changing environments and social dynamics. One illustration of implementation is the integration of ecotourism and co-management in supporting local food sustainability in Brazil, which has succeeded in increasing community resilience through environmental education and active community participation (da Silva et

al., 2025). As a theoretical model, this approach is often developed within the framework of Social-Ecological Complex Adaptive Systems (SECAS), which views conservation systems as dynamic, interrelated, and adaptable entities (Morse, 2023). SECAS provides a conceptual foundation for understanding how interactions among humans and the environment can be managed more effectively through a non-linear and inclusive approach. In the context of ecotourism, this framework helps explain how tourism opportunities can be mapped and utilized sustainably using complex adaptive systems approaches (Sahahiri et al., 2023). One of the main pillars of this theoretical structure is Adaptive Co-Management (ACM), which is a joint management process that involves various stakeholders in the continuous learning and adjustment cycle. A similar thing was also found in the study of ecotourism in marine protected areas, where the ACM model was used to evaluate the success of initiatives involving communities as key partners (Morse, 2023).

However, the implementation of this model has not always been seamless. For illustration, in the context of ecotourism management in human-elephant conflict areas, Therefore, the management model must be designed in such a way that it can absorb input from the community while maintaining the sustainability of the ecosystem. Community participation is also an important element in the management of marine protected areas. (Jiang et al., 2023) highlights how participatory planning and oversight can be a strong foundation for sustainable management of marine resources. In Bali, the Tri Hita Karana philosophy is also applied as a holistic framework to integrate cultural and spiritual values in the management of maritime ecotourism, demonstrating the relevance of this model in a tradition-rich local context (Wiwin, 2021). In addition, community-based ecotourism has been shown to contribute to the recovery of certain ecosystems, such as coral reefs. Research (Cahayani & Suryawan, 2024) emphasizes how conservation programs involving local communities can restore coral reef conditions while improving the economies of coastal communities.

The CBNRM approach has the main goal of supporting environmental sustainability while improving the socio-economic well-being of local communities. By placing communities as core actors in natural resource management, this approach aims to create a system that

is more inclusive, participatory, and responsive to ecological changes and social dynamics at the local level.

In the context of social forestry, a study on land suitability in Pesawaran Regency shows how community-based forest management can be an effective instrument to improve the welfare of communities around the forest (Koeswara et al., 2024). In addition, research (Murniati & Minarningsih, 2022) proves that agroforestry involving local communities in Tahura Wan Abdul Rachman is not only able to restore damaged forest functions, but also provide direct economic benefits to the community. This reinforces the argument that integration among environmental conservation and local economic development can be achieved through participatory management models. The relevance of this approach is also very strong in endeavors to mitigate climate change, especially through the management of mangrove ecosystems. Studies in Rembang show that active community participation in mangrove management is very effective in maintaining coastal resilience while reducing carbon emissions (Rahmat et al., 2022).

On the other hand, the challenge of deforestation and forest degradation is one of the critical issues that requires community-based solutions. (Dharmawan et al., 2023) research uses the DPSIR framework to identify the causes of deforestation in Aceh and suggests a social forestry approach as a more sustainable solution. The study by (Voigt et al., 2021) also highlights the threat of deforestation in the Wallacea region, as well as the importance of community involvement in protecting the unique biodiversity that exists in the region. The CBNRM approach has also been shown to contribute to soil and water conservation. Research by (Dharmawan et al., 2024) shows that these conservation practices are very beneficial in the management of sustainable ecological landscapes, including in the context of managing production and protected forest areas. Furthermore, Voigt et al. (2021) also emphasized the importance of collaborative management in protecting biodiversity while improving local economic well-being in conservation areas. This shows that the CBNRM approach is not only relevant in the context of the environment, but also in equitable sustainable human development.

CBNRM approaches have great potential in bridging the ecological and socio-economic needs of local communities. However, like other participatory approaches, it also faces more structural and operational

challenges. Table 2.2. is a description of the advantages and disadvantages of this approach.

Table 2.3. Advantages and Disadvantages of Socio-Ecological and Community-Based Conservation Approach (CBNRM)

Aspects	Excess	Debilitation
Resource Management Efficiency	This approach allows for more efficient use of natural resources because it involves communities that have in-depth local knowledge of the local ecosystem. This is supported by studies on protected forest management and Tahura which show that community-based strategies can increase ecosystem productivity while maintaining their sustainability.	Although ecologically efficient, it often takes a long time to build capacity and trust among parties, which can hinder rapid implementation. In addition, disparities in access and control over resources lead to inequality of benefits at the local level.
Local Engagement and Empowerment	The active participation of the community in the management process increases the sense of ownership and responsibility for the environment. Studies on the rehabilitation of Javanese langurs and peat restoration in Tahura Orang Kayo Hitam show that the involvement of local communities is crucial for the success of species and habitat conservation programs.	Conflicts of interest often arise among communities, local governments, and other stakeholders. The analysis of stakeholder mapping shows the need for a strong mediation mechanism so that all voices can be heard and there is no domination of certain groups.
Adaptability and Collaboration	The CBNRM framework is flexible and adaptive, making it suitable for application in a variety of geographical and cultural contexts. A study on collaboration in the management of Tahura Wan Abdul Rahman and the development of mangrove ecotourism proves that integration among ecological, social, and economic aspects can create holistic solutions for environmental conservation.	Limited technical and financial capacity is a major challenge. Many communities require intensive training and institutional support to be able to take an active role in resource management. Without such support, the risk of implementation failure is high.
Climate Change Mitigation and	Community-based management has been shown to be effective in climate change mitigation, such as in post-fire management of peatlands and	Political and regulatory factors are often an obstacle. For illustration, the lack of harmonization

Ecosystem Rehabilitation	restoration of degraded lands through integrated approaches. In addition, the conservation of rare species such as Javan langurs has also been successfully carried out through community participation	among national policies and local practices and weak coordination among agencies make it difficult for program implementation to develop optimally
Economic Improvement and Sustainable Tourism Development	This approach opens up economic opportunities for the community through the development of ecotourism, such as halal ecotourism, mangrove tourism, and urban geotourism. Thus, CBNRM not only protects the environment but also provides direct economic added value to the community.	There is a risk of excessive commercialization, where ecotourism can actually put pressure on the ecosystem if not managed properly. In addition, the distribution of economic benefits is often uneven, leading to inequities at the local level

Source: author search, 2025

This approach shows efficiency in the use of resources because it involves communities that have in-depth local knowledge of the local ecosystem, as seen in the study of protected forest management and Tahura (Sulistiowati et al., 2021). However, in implementation, this approach takes a long time to build capacity and trust among parties, so the process tends to be slow, especially if there is an inequality of access and control over resources (Tagliari et al., 2021). Active community participation is one of the main values of CBNRM because it increases a sense of ownership and responsibility for the environment. This is evident from the rehabilitation endeavors of the Javan langur (Ananda et al., 2022) and peat restoration in the Orang Kayo Hitam Tahura (Wulandari et al., 2021). However, conflicts of interest often arise among the community and local governments or other stakeholders, so a strong mediation mechanism is needed so that all voices can be heard and there is no domination of certain groups.

Another advantage of CBNRM is its high flexibility and adaptability, making it suitable for a wide range of geographical and cultural contexts. The integration of ecological, social, and economic aspects has been successfully implemented in the management of Tahura Wan Abdul Rahman (Sulistiowati et al., 2021). However, many communities still face

limited technical and financial capacity, requiring institutional support and intensive training to be able to take on the role to the fullest (Tagliari et al., 2021). In the context of climate change mitigation and ecosystem rehabilitation, community-based approaches have shown positive results, such as in post-peat fire management (Wulandari et al., 2025) and endangered species rehabilitation programs (Ananda et al., 2022). Unfortunately, political and regulatory factors are often obstacles due to the lack of synchronization among national policies and practices on the ground and weak coordination among agencies (Wulandari et al., 2021).

The socio-ecological and CBNRM approach is closely related to the theory of common-pool resource governance developed by Elinor Ostrom. Within Ostrom's framework, successful management of natural resources does not necessarily depend on state intervention or privatization, but can be achieved through collective management mechanisms designed in a participatory manner by local communities. Basic principles such as territorial demarcation, contextually appropriate use rules, participatory monitoring systems, and conflict resolution mechanisms are at the heart of successful common resource management, which is also the foundation of the CBNRM approach. In the Indonesian context, a study on forest governance in North Sumatra shows that the implementation of Law Number 23 of 2014 concerning Regional Government opens up space for strengthening the role of local actors in forest management. However, the results of (Ginting et al., 2023) research show that without synergy among actors and adequate access for communities, the principle of shared resource management is difficult to realize. The study confirms that while regulation provides opportunities, management success is highly dependent on the ability of local communities to build strong participatory institutions.

In addition, the book ACM approach have proven that participatory models such as CBNRM can strengthen local governance while increasing global engagement in environmental issues. ACM emphasizes the importance of collective learning, adaptation to changing ecological and social conditions, and collaboration across decision-making levels. This is in line with the Ostrom principle that places flexibility and adaptive capacity as essential elements in the sustainability of resource management. The CBNRM approach can be seen as an empirical apply Ostrom's theory of shared resource governance, which is enriched with the dimensions of

adaptivity and active participation of the community. The integration of these principles is not only relevant in the context of forest management, but also in the management of other natural resources such as the sea, peatlands, and conservation areas. Even so, implementation in the field still requires strong institutional support, regulatory compliance, and strengthening local capacity so that the goals of joint management can be achieved effectively and fairly.

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LEGAL AND INSTITUTIONAL FRAMEWORK OF CONSERVATION AREAS IN INDONESIA

Tri Weda Raharjo and Endriana Wahyu Alita

A. Species Conservation: Rare to Common

The management of conservation areas in Indonesia is in an increasingly complex condition due to increasing environmental pressures, climate change, and the need to maintain the sustainability of natural resources. In this context, legal and institutional frameworks play a crucial role as a foundation for endeavors to conserve biodiversity, both terrestrial and marine. However, based on the results of recent research, there are still many structural and normative challenges that hinder the effectiveness of the national conservation system. One of the main issues is the overlap and ambiguity of institutional mandates. (Nugraha et al., 2024) found that in cetacean management, for illustration, coordination among agencies is very weak, causing inefficiencies in policy implementation. A similar thing was also found (Sahri et al., 2020), who identified regulatory gaps and duplication of functions among agencies related to the protection of marine mammals. This situation reflects the need for a reformulation of an institutional framework that is more integrated and has a clear collaborative mechanism.

In addition, the role of local governments in the management of environmental strategic areas such as Essential Ecosystem Areas (KEE) is also an important focus. (Mohamad Nasir, 2024) emphasized the importance of integrating KEE into regional spatial plans to provide ecosystem protection more effectively. Without synergy among the central and local governments, the implementation of conservation policies will continue to face significant obstacles, especially in budget allocation, supervision, and local community participation.

In international law, Indonesia has played an active role in some multilateral agreements, such as UNCLOS and the BBNJ Treaty, which aim to protect the biodiversity of the high seas. (Wati, 2025) assesses that

Indonesia's involvement in this international regime opens up opportunities to increase national capacity in marine management. However, the challenge is to ensure the consistent implementation of these international principles within the national legal framework. In the field of environmental law, (Soraya et al., 2025) propose an innovative approach by giving legal standing to natural elements, such as trees or rivers. This concept, which is starting to be implemented in some countries, could be an alternative solution to strengthen environmental protection from a legal aspect, especially when human rights are not strong enough to guarantee the sustainability of ecosystems.

The comparative approach also provides important insights. (Dockendorff et al., 2022) show that although Indonesia and Brazil have ambitious forest restoration targets, policy challenges remain, especially in balancing economic growth with environmental conservation. Meanwhile, (Jundiani et al., 2024) compared green space management and water conservation among Indonesia and Australia, highlighting low public participation and cross-sector coordination in Indonesia as the main obstacles. As an alternative to a more inclusive management model, Reny (Tiarantika et al., 2024) evaluated community-based ecotourism in East Java as an illustration of participatory conservation. This model not only supports nature conservation, but also provides direct economic benefits to the communities around the region. This approach shows great potential for wider development, in line with the principles of environmental justice and local empowerment. The legal and institutional system of conservation areas in Indonesia still needs comprehensive reform. Harmonization of regulations, strengthening coordination among institutions, integration of regional authorities, and the implementation of more progressive environmental law concepts are crucial steps that must be taken. In addition, community participation and the use of international and comparative approaches can be the main drivers of the transformation of conservation policies in Indonesia toward a more sustainable direction and responsive to current global environmental threats.

The global environmental crisis that has increasingly echoed in the last decade has placed the issue of conservation at the top of the sustainable development agenda. Many countries are beginning to design a more comprehensive legal framework to protect biodiversity, water resources, and the critical ecosystems that sustain life. However, major

challenges remain in the implementation of these regulations, especially related to legal inconsistencies, weak enforcement, and lack of multi-stakeholder participation in the conservation management process.

1. **Species and Wildlife Conservation: Legal Inconsistencies and Weak Enforcement.** One of the crucial aspects of conservation law is the protection of endangered species and wildlife. (Romero-Vidal et al., 2022) explored the unlawful trade in parrots in the Neotropic region and found that despite the availability of international treaties such as CITES, their implementation at the national level is often ineffective due to inconsistencies among domestic law and international standards. This leads to loopholes in law enforcement that are exploited by unlawful trafficking networks. (Rayhan et al., 2021) also highlight similar challenges in Bangladesh, especially in the implementation of the Fish Act 1950 in Lake Kaptai. Although the law has a good goal of maintaining the sustainability of aquatic biodiversity, its effectiveness is limited by low public awareness, lack of capacity of law enforcement officials, and lack of coordination among agencies. This study provides an overview that good conservation regulation must be supported by a strong and participatory enforcement system.
2. **Multi-Actor Legal Approaches and Conservation Agreements.** In the context of modern governance, conservation is no longer just the responsibility of the government. (Boonrueang & Reid, 2021) compared conservation legal systems in Australia, Scotland, and the United States and found a shift toward a multi-actor approach. In all three countries, non-governmental actors such as NGOs, local communities, and the private sector are beginning to be involved in the drafting and implementation of conservation agreements. This model is considered more inclusive and effective because it can accommodate the interests of various stakeholders and increase accountability in natural resource management. This participatory approach shows that conservation law reform is not enough just on rulemaking, but must also create space for cross-sector collaboration and broad public participation.
3. **Marine Conservation Law and Marine Governance.** The ocean is one of the most vulnerable but vital ecosystems in supporting human life. (Shih et al., 2023) evaluated the development of marine law in Taiwan after the enactment of the Ocean Basic Act, including the draft Marine Conservation Act. The study shows Taiwan's endeavors to build a more

holistic legal framework to regulate marine use activities and protect maritime biodiversity. However, challenges remain in harmonization of regulations among sectors and implementation in the field. These findings are relevant for Indonesia, which has a very large marine area and a complex maritime ecosystem. Strengthening maritime law must be accompanied by effective coordination mechanisms among relevant ministries and agencies, as well as the participation of fishermen and coastal communities.

4. Conservation Policy and Law in the United States: Protection of Agricultural Lands. In the United States, (Olexa & Brock, 2022) developed specific legal guidelines on farmland conservation in Florida, aimed at maintaining land productivity while protecting the environment. This guide discusses the rights and obligations of farmers in following state conservation regulations, including incentive programs for environmentally friendly farming practices. This study provides an illustration that conservation can be designed within a policy framework that not only protects the environment, but also supports the community's economy. This model can be an inspiration for developing countries, including Indonesia, in designing regulations that balance environmental conservation and economic sustainability in the agriculture and plantation sectors.
5. Protection of Common Species: A New Approach. (Amos, 2024) criticizes traditional approaches in conservation law that tend to focus on rare or endangered species. He proposed that international conservation law should also pay attention to common species, which are still in large numbers, but are experiencing a slow decline in population. Without early protection, these species could be placed on the critical list in a short period. This proposal is important because the majority of current regulations will only react when a species is already in critical condition. With a proactive approach to common species, it is hoped that it can prevent mass extinction and maintain the stability of the ecosystem as a whole.
6. Phosphorus and Environmental Governance in Europe. (Garske et al., 2020) assessed EU regulations related to phosphorus management, which is a key element in agriculture but also a major cause of water pollution if not managed properly. The study found inequities in the integration of agricultural laws and environmental conservation,

leading to inefficiencies in phosphorus management. This research shows that conservation is not only related to the protection of flora-fauna, but also involves the management of nutrients and chemicals that have an impact on ecosystems. Therefore, the conservation legal framework needs to accommodate transversal environmental aspects, such as pollution, fertilizer use, and climate change.

Global environmental crises such as unlawful wildlife trade, deforestation, and degradation of marine ecosystems have prompted countries to develop stricter conservation legal frameworks. Although the approach to regulation and its implementation varies among countries, the key issues remain the same: how effectively conservation laws are enforced, the extent to which enforcement is carried out consistently, and what impact it has on biodiversity. The following is a comprehensive analysis based on international publications in 2020–2025.

1. A Comparison of Global Conservation Legal Frameworks. (Mogomotsi et al., 2021) assessed a similar situation in the member countries of the Southern African Development Community (SADC). Although the majority have ratified international treaties such as CITES and Convention on Biological Diversity (CBD), domestic implementation is still weak due to a lack of institutional capacity and intersectoral coordination. In South Asia, (Nower suvra & Ontar, 2024) compared Bangladesh's and India's legal responses to the unlawful wildlife trade. They noted that India has managed to improve the effectiveness of regulations through harmonization with CITES, while Bangladesh still faces major challenges in law enforcement despite having a fairly complete legal framework. (Turchyn, 2024) reviews Ukraine's endeavors to comply with the European Union's Forest Law Enforcement, Governance and Trade (FLEGT) as a measure to prevent unlawful logging. He suggested institutional modernization and monitoring systems as an important prerequisite to make this regulation effective.
2. The Impact of Conservation Policies on Biodiversity. Conservation policies must not only exist in the form of rules, but must also have a real impact on biodiversity protection. (Mascarello et al., 2021) found that anti-unlawful logging policies in Africa could be more effective if supported by accurate timber species identification technology.

Without the support of science and technology, law enforcement against unlawful logging perpetrators remains weak. (Mingfei et al., 2024) evaluated the marine environmental policy in Pakistan and suggested synchronization with Sustainable Development Goal (SDG) number 14 for the protection of marine habitats. The study shows that the success of maritime conservation depends on integration among national laws, global targets, and the participation of local fishers.

3. Conservation Law Enforcement Challenges. Law enforcement is one of the biggest challenges in conservation. (Faroque & South, 2022) identified that in Bangladesh, although there is already a legal framework for conservation, its implementation is hampered by limited institutional capacity and inter-agency coordination. This leads to low effectiveness of enforcement against environmental violators. (Nower suvra & Ontar, 2024) also highlight the weak law enforcement mechanisms in Bangladesh despite the availability of conservation regulations. Without increasing the capacity of the apparatus and a good information system, the law remains a document without repressive power. (Turchyn, 2024) adds that in Ukraine, institutional modernization and monitoring systems are key to preventing unlawful logging in the context of FLEGT. Without it, regulation will only become a formality with no real effect on the ground.

Conservation legal frameworks in different countries show significant variations in structure, implementation capacity, and integration with international agreements. However, the main challenges faced globally remain the same. First, harmonization of national law with international standards, including in ratification and implementation. Second, strengthening law enforcement through institutional capacity building, monitoring systems, and cross-sectoral coordination. Third, the integration of technology and science in the process of enforcement and evaluation of conservation policies. Fourth, increasing community participation and multi-actors so that policies are not only top-down but also inclusive and sustainable. Going forward, conservation law reform must be holistic, not only regulating what is and is not allowed, but also creating mechanisms that support sustainability and ecological justice. Indonesia and other developing countries can learn from these international experiences to strengthen their conservation legal and institutional frameworks.

Harmonization of conservation law is an important process in bridging differences among global, regional, and local legal frameworks to synergize in protecting the environment. In Southeast Asia, a region rich in biodiversity but vulnerable to environmental degradation, this harmonization is becoming increasingly urgent to ensure the sustainability of ecosystems and natural resources.

1. The main factor in the success of conservation law harmonization. One of the main keys to the success of harmonization is the existence of multilevel integration in environmental governance. (de Oliveira et al., 2024) show that effective coastal area management depends on synergy among land tenure rights, equitable power sharing, and coordination among stakeholders from the local to national levels. Without this synchronization, regulations often cannot be applied consistently or even create conflicts among parties. (Kim et al., 2020) emphasized the importance of constitutional and institutional support in ensuring the implementation of environmental laws. Their studies in Independent Commonwealth countries show that although many have international law commitments, the lack of a strong constitutional foundation and implementing institutions hinders the effectiveness of harmonization. These findings are relevant for Southeast Asian countries in designing more inclusive and sustainable legal reforms.
2. Community Participation in Conservation in Southeast Asia. Community participation is an inseparable element in the success of conservation law harmonization. (Sundram, 2025) explained that ASEAN has used a network governance approach to strengthen cross-sector collaboration and civil society participation. With this mechanism, local communities are not only the object of policy, but also active subjects in the decision-making process and implementation of environmental programs. In Vietnam, (Cong et al., 2020) examined the implementation of Integrated Coastal Zone Management (ICZM), which successfully involves communities in coastal resource management. While there are still challenges in coordination among levels of government and program sustainability, this study shows that active community participation increases the acceptability and effectiveness of conservation policies.



Figure 3.1. Illustration of ICZM

(Safitri, 2021) provides empirical evidence from Indonesia, where community participation and local leadership are very important in the implementation of peatland fire prevention policies. The program is carried out to fulfill the commitments of the ASEAN Haze Treaty, and its success depends heavily on the awareness and active role of local communities in changing traditional farm-burn farming patterns.

3. A Comparative Study of Environmental Regulation in Southeast Asia. (Lestari et al., 2024) compared environmental law frameworks in Indonesia, Malaysia, and Thailand, and concluded that policy success is strongly influenced by the country's ability to integrate national law with ASEAN regional initiatives. Countries that are able to align domestic regulations with ASEAN standards such as the ASEAN Contract on Transboundary Haze Pollution tend to have better

performance in environmental management. (Sinaga et al., 2025) added a business perspective in the harmonization of conservation laws. Their study of three major manufacturing companies in Southeast Asia shows that effective environmental policy communication—both internal and external—affects the alignment of companies' practices with ASEAN conservation guidelines. This opens up new opportunities to engage the private sector as a strategic partner in conservation endeavors.

The success of conservation law harmonization in Southeast Asia depends not only on normative synchronization among the global, regional, and local levels, but also on the existence of strong institutions, constitutional support, and active participation of communities. Some of the key factors influencing this success are multilevel integration in environmental management, which ensures coordination among agencies and levels of government; national legal reform that is in line with the principles of international environmental law; strengthening the capacity of implementing agencies, including law enforcement systems and monitoring mechanisms; inclusive community participation, both in the planning, implementation, and evaluation of conservation policies; and the involvement of the private sector and non-governmental organizations as strategic partners in the implementation of regional and global conservation standards. For Indonesia and other ASEAN countries, the lessons learned from these studies are important in developing a legal harmonization strategy that is not only formalistic, but also substantive and sustainable. With a more participatory and data-driven approach, Southeast Asia can become a regional model that successfully aligns development goals with environmental protection holistically.

Harmonization of conservation law is not only about the synchronization of norms among levels of regulation—global, regional, and national—but also relies heavily on the active role of local institutions and adaptive and responsive institutional frameworks. Local institutions have direct proximity to the community and the reality on the ground, so they are the spearhead of environmental policy implementation. Based on some international publications (2020–2025), here is a comprehensive analysis of the important roles of local institutions and institutional factors that support or hinder the harmonization of conservation law.

1. The Role of Local Institutions in the Harmonization Process. Local institutions are key actors in ensuring that the principles of conservation law can be effectively realized at the practice level. demonstrate the importance of coordination among local agencies in the management of the Lubombo Transfrontier Conservation Area (TFCA), which includes the regions of Mozambique, Eswatini, and South Africa. They found that the ecological mosaic approach—which involves the participation of local structures such as village councils and indigenous groups—was highly effective in bridging legal differences among countries.

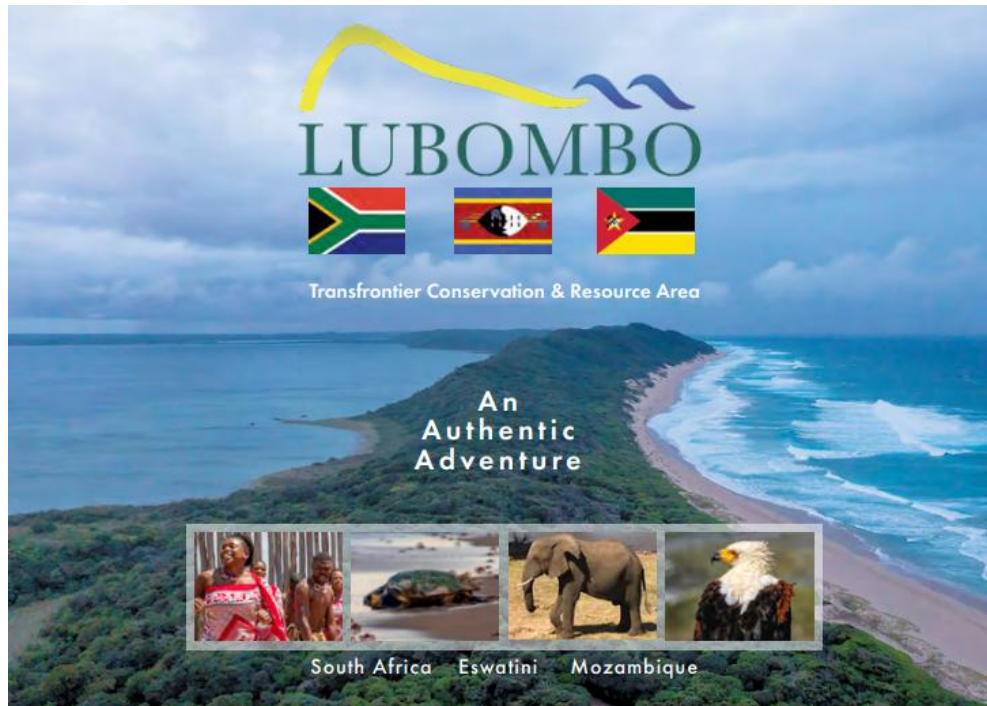


Figure 3.2. Lubombo TFCA

The Lubombo TFCA is a transboundary conservation area that covers the regions of South Africa, Eswatini, and Mozambique. The region consists of four main sections: Lubombo Conservancy-Goba TFCA, Ponta does Ouro-Kosi Bay TFCA, Nsubane-Pongola TFCA, and Usuthu-Tembe-Futi TFCA. In 2004, the Songimvelo-Malolotja TFCA and the Usuthu-Tembe-Futi TFCA expansion officially merged. In 2014, the Lubombo Conservancy-Goba TFCA merged with Usuthu-Tembe-Futi TFCA to connect the Lubombo Mountain ecosystem with the coastal plains. The region covers more than 10,000 km² and aims to promote sustainable development through holistic management of natural

resources. Lubombo TFCA has a very high biodiversity, ranging from warm coastal plains to mountains, forests, grasslands, and savannas. This area is a leading ecological tourism destination due to the combination of flora, fauna, and local culture. It contains important habitats such as national parks, nature reserves, and marine protected areas. The region not only protects wildlife, but also preserves the cultural heritage of indigenous peoples in all three countries. The Songimvelo-Malolotja TFCA is located on the border of South Africa and Eswatini, encompassing the Makhonjwa mountain area which is rich in geological value. The Barberton Makhonjwa geotrail was developed to preserve an old geological heritage estimated to be 3.2–3.6 billion years old. The area has been a UNESCO World Heritage site since 2018 and is known as the "Genesis of Life" because of the oldest fossils of life on earth. Malolotja Nature Reserve offers activities such as hiking, birdwatching, and canopy tours that combine adventure and nature conservation. The 49,000-hectare Songimvelo Game Reserve is one of South Africa's largest provincial reserves. With a varied landscape, ranging from savanna plains to high mountains, the region is home to four of the five Big Five species and 73 other mammal species. The reservation is also a breeding center for white rhinos and is equipped with accommodation facilities from basic to luxury class. Its existence supports endeavors to protect ancient geology and the art of rock painting in the world.

The Lubombo Mountains stretch for 800 km through three countries, with an altitude of among 400–800 meters. The highest mountain is Mount Mananga (776 meters above sea level). These mountains were formed by volcanic lava of the Jura era and are important geological formations. Many rivers such as the Mkuze, Olifants, and Usutu flow through its slopes, forming spectacular canyons. The vegetation is dominated by tropical forests and savannas, becoming a habitat for various rare flora and fauna. TFCA's 650 km² Jozini Dam is centered on the Jozini Dam (Pongolapoort Dam), the largest curved dam in the region. The lake is home to a variety of land and aquatic animals, including tigerfish which is very popular with anglers. The area includes the Pongola Nature Reserve (South Africa) and the Nsubane Conservation Area (Eswatini), as well as several

resorts and camping sites. The main activities include safaris, fishing, and exploring the surrounding natural beauty.

Lubombo and Goba Conservancies cover an area of 60,000 hectares in Eswatini and Mozambique. The area includes Hlane Royal National Park, Shewula Nature Reserve, Mbuluzi Game Reserve, and Mlawula Nature Reserve. The ecosystem is diverse, ranging from riparian forests to dry savannas. Visitors can enjoy safaris, hiking, or stay at participatory-managed community campsites. The main focus is the involvement of local communities in conservation and the development of an environment-based economy. Hlane Royal National Park is a vast area of thornveld savanna and rich in large animals such as elephants, lions, rhinos, giraffes, and hippos. The park is home to more than 250 species of rare birds and reptiles. Visitors can go on day or night safaris, trekking, or cycling on nature trails. Mlawula Nature Reserve provides a network of hiking trails that offer spectacular views and the opportunity to see wildlife up close. The Lubombo area is rich in local cultural traditions, especially in the Marula and Reed Dance festivals. The Marula festival is celebrated in Kwazulu-Natal and Eswatini, while Reed Dance is Eswatini's national event involving tens of thousands of young girls. Local culture is also displayed through cultural villages, dance performances, and traditional culinary. Marula, a typical fruit of this region, has many benefits, including in cosmetics and traditional medicines.

Maputo National Park was formed on December 7, 2021 by merging the Maputo Special Reserve and the Ponta do Ouro Partial Marine Reserve. It covers an area of 1,700 km² and is home to a variety of animals, including elephants, that can move freely through the Futi Corridor to the Tembe Elephant Park in South Africa. The rewilding process has succeeded in reintroducing 5,000 animals, making this area a successful illustration of ecosystem restoration in cross-border areas. Ponta do Ouro and Kosi Bay are popular coastal tourist destinations in Lubombo TFCA. Both offer beautiful beaches, diving, snorkeling, and turtle spawning. Kosi Bay is known for its traditional fish traps, while Ponta do Ouro is the starting point for exploring Mozambique's coastal region. The elephant migration route through the Futi Corridor is also a focus of international conservation to maintain the connectivity of wildlife habitats across countries.

Maritime activities such as fishing and diving are in high demand in the Lubombo area. The coral reef of Sodwana Bay is one of the best diving spots in the world, with more than 1,200 species of fish and 100 types of corals. The beaches of this area are also an important place for leatherback and loggerhead turtles to lay their eggs. Conservation endeavors through marine protected areas (M.PA.) maintain the sustainability of marine ecosystems and endangered species such as coelacanths. iSimangaliso Wetland Park is the first UNESCO World Heritage Site in South Africa. The region includes coastal ecosystems, lakes, swamps, and sand forests that are home to more than 500 species of birds and land animals. Major spots include False Bay, Lake St Lucia, Maphelane, and Sodwana Bay. I Simangaliso offers a unique experience combining a land safari and the beauty of the tropical sea. Sodwana Bay is known as one of the best diving destinations in the world, with coral reefs rich in biodiversity. The area is also a place for whale migration and breeding grounds for marlin and giant trevails. Birdwatching and nature photography are favorite activities in this coastal area.

Tembe Elephant Park and Ndumo Game Reserve are on the border of Mozambique and South Africa. Tembe is managed by the Tembe tribe and is famous for its population of "tusker" elephants with large tusks. Ndumo is rich in waterfowl and is a Ramsar site. Both regions offer safari, birdwatching, and cultural visitor experiences, as well as being an important part of the wildlife migration corridor. Lubombo is rich in biodiversity, especially birds. More than 500 species of birds are recorded in the area, including rare species such as the blue swallow and Southern Bald Ibis. Various national parks and reserves provide great opportunities for birdwatching and scientific research. Practical information on how to get to Lubombo, weather, currency, and travel requirements is included to make it easier for tourists to visit.

(Nguyen et al., 2020) compiled similar findings in the Mekong Delta, Vietnam, where the successful implementation of national conservation policies is strongly influenced by the capacity of local institutions to respond to socio-economic dynamics and land use. They highlight that despite good National Rules, without support from local institutions and an understanding of the local context, policies remain difficult to implement. (Romano et al., 2020) assessed the Spanish-

Portuguese cross-border biosphere area as a successful illustration of local community empowerment in conservation governance. The active participation of the community in landscape management is the foundation for the sustainability of the conservation network. This study proves that local institutions are not only policy implementers, but also initiators of community-based ideas and solutions. (Alpiani, 2025) review the challenges in the governance of the global seaweed industry and suggest the need for alignment among national policies and local community practices. In this context, local institutions must be mediators among international standards and local conditions, so that there is no conflict of interest or a decrease in community involvement.

2. Institutional factors that support harmonization. The success of the harmonization of conservation law is greatly influenced by the nature and structure of existing institutions. (Ślosarski & Juchniewicz, 2024) identified institutional flexibility and cross-actor learning as crucial factors in the harmonization of biodiversity data in the European Union. The capacity of institutions to adapt to new information and cooperate with various stakeholders is a key indicator of the success of legal harmonization. A common theme emerged in the study of Romano et al. (2020), which stated that collective learning and cooperation among local institutions are very important in overcoming regulatory differences in border areas. This shows that flexible and inclusive institutions are better able to adapt to complex political, economic, and environmental dynamics.
3. Institutional Factors That Hinder Harmonization. On the other hand, some publications also identify institutional factors that are obstacles to the harmonization of conservation law. Alpiani et al. (2025) cite overlapping regulations, conflicts among stakeholders, and unequal access to technology as the main obstacles in marine conservation governance. In many developing countries, inconsistencies among institutions have led to ineffective implementation of policies. Nguyen et al. (2020) added that weak capacity for implementing conservation laws at the provincial level is often due to conflicts of interest and non-uniform interpretations of national policies. Without a strong monitoring and evaluation mechanism, the result can be policy fragmentation and inequality in environmental protection among

regions. Romano et al. (2020) also mentioned that one of the major obstacles in cross-border conservation is the mismatch among the division of administrative territories and ecological reality. Rigid political boundaries often hinder ecosystem-oriented conservation endeavors.

The process of harmonization of conservation law requires the central role of local institutions and the support of a flexible and collaborative institutional system. Local institutions serve not only as policy implementers, but also as bridges among national-international legal norms and unique local realities. Some of the institutional factors that support harmonization are: Coordination across levels of government, including among central and regional institutions; flexibility and adaptation of policies to social and environmental changes; strengthening the capacity of local institutions in human, technological, and financial resources; and active participation of the community and multi-actors in the decision-making and implementation process.

On the contrary, the main obstacles include regulatory overlap and inter-institutional conflicts; implementation capacity gaps among regions; administrative structures that are incompatible with natural ecosystems. For Indonesia and other ASEAN countries, the lessons learned from these studies are very relevant in the formulation of conservation policies that are not only normative, but also substantive and sustainable. More inclusive and participatory institutional reform is an important step in realizing effective harmonization of conservation law.

Local institutions have an increasingly significant role in influencing national policies, especially in the context of environmental governance and conservation. As actors at the grassroots level, local institutions—be they civil society organizations, indigenous groups, local communities, or local government agencies—often serve as a link among the realities on the ground and policy formulation at the central level. International publications (2020–2025) show that although structural challenges such as elite dominance or limited capacity remain, local institutions continue to make an important contribution in shaping national policy direction through political pressure, institutional learning, and participation in natural resource governance reforms.

1. Local Institutions Influence National Policies. One of the main ways local institutions influence national policy is through collective pressure

on policymakers. (Gustafsson et al., 2020) found that in Peru, civil society organizations and local institutions have successfully pushed for land use reform by mobilizing support from national and international actors. While these endeavors are not entirely free from elite intervention, the study suggests that pressure from below can create momentum for more inclusive and sustainable policy change.

(Wong Villanueva et al., 2022) provide another illustration in the context of Amazonia, where cross-border initiatives among Peru, Brazil, and Bolivia create a bottom-up model of collaborative governance. Local institutions in the region are not only policy implementers, but also determinants of the common agenda that are then adopted by the national government. This approach is effective because it is based on real needs on the ground and not just on the top-down plan of the central government.

In the Indonesian context, (Diprose et al., 2022) found that local actors have the ability to change global supply chain regulatory practices, particularly in the tin mining industry. The study shows that although national regulation is often driven by international standards, the involvement of local actors can strengthen transparency and accountability in the extractive sector. This proves that local institutions can be a bridge among global principles and relevant local implementation.

Local institutions have great potential to influence national policy through: advocacy and political pressure, either directly against governments or through partnerships with international actors; a bottom-up approach in natural resource governance, which is based on local needs and realities; integration of informal and formal institutions, so that national policies are more inclusive and relevant; Contribution to the formation of norms and standards, including in the issue of supply chains and energy transition.

2. Effective Strategies to Increase the Capacity and Capabilities of Local Institutions

To ensure that local institutions can play their role optimally, a holistic and sustainable capacity building strategy is needed. (Sharma, 2023) suggested the need to strengthen organizational structures, human resources, and coordination among actors as a foundation for increasing the capacity of local institutions, especially in facing the

threat of climate change. Without strong internal capacity, local institutions will struggle to build credibility and advocate for the interests of their communities to the central government. International cooperation organizations such as the (OECD, 2021) emphasize that an inclusive approach, local ownership, and access to climate finance are key to strengthening the resilience of local institutions. By providing space for the community to lead the policy planning and implementation process, local institutions are not only policy executors, but also owners of development outcomes. In addition, targeted climate finance can increase the technical and operational capacity of local institutions in designing adaptation and mitigation programs that are appropriate to the local context.

Alpiani et al. (2025) highlight the importance of alignment among national policies and local community practices to strengthen the competitiveness and sustainability of natural resource-based industries. They suggested that the government should not only focus on legal harmonization, but also on improving access to information and technology for local institutions. Without it, national regulations tend to be not aligned with real needs on the ground, thus reducing their effectiveness. Some strategies that have proven effective in increasing the capacity of local institutions include: strengthening institutional structures, including management systems, decision-making mechanisms, and administrative capacity; increasing the capacity of human resources, through training, education, and technical knowledge transfer; strengthening networks and coordination, both among local institutions and with national and international institutions; empowerment through funding and access to technology, including support from donors, local governments, or the private sector; Increase community participation in the policy process, so that local institutions are not only implementers, but also facilitators of public participation. These steps should be carried out gradually and sustainably, with a focus on strengthening the internal capacity of local institutions and creating synergies with external actors. Without a comprehensive strengthening strategy, local institutions will continue to face obstacles in influencing national policies and carrying out effective climate conservation and adaptation functions.

B. Conservation Area Governance Structure

Conservation of protected areas in the era of global environmental crises require a more holistic approach, not only based on technical regulations but also based on ethical values, active community participation, and adaptive institutional structures. Two major publications—Akamani (2020) and Cano Cardona et al. (2022)—present important perspectives on how the principles of deep ecology, adaptive governance, indigenous rights recognition, and collaborative governance models can be a strong foundation for creating effective, inclusive, and sustainable conservation systems.

1. Philosophical and Ethical Basis in Conservation: Apply Deep Ecology Principles

(Akamani, 2020) underlines the need for a philosophical basis in the management of conservation areas through the apply deep ecology principles. In contrast with the anthropocentric paradigm that sees nature as a mere economic resource, deep ecology puts nature in a moral position equal to humans. According to this principle, ecosystems have intrinsic value and the right to exist without relying on their benefits to humans. Within this framework, conservation is not just an effort to safeguard resources for the future of humanity, but a collective responsibility to maintain the integrity of the entire ecological system. The deep ecology approach provides normative and moral legitimacy to environmental governance. It helps build a collective awareness that conservation is a universal responsibility, not just a technical or administrative policy. In addition, this approach is relevant to many local and traditional values that indigenous peoples embrace, such as respect for nature and living as a whole. Therefore, deep ecology is a strong foundation for creating social legitimacy behind conservation regulations. However, the apply the principle of deep ecology is not enough only in the philosophical realm. It must be accompanied by a responsive and participatory institutional structure so that it can be realized in field practice. Without integration with real governance, these ethical principles will be difficult to apply in everyday policies.

2. Tiered Institutional Structure and Adaptive Governance

Akamani (2020) also emphasizes the importance of multi-layered institutional structures and adaptive governance approaches in responding to complex ecological and social dynamics. Adaptive governance is an

institutional model that emphasizes the ability of institutions to learn, adapt, and work together across levels—from local communities to global networks. One of the key principles in adaptive governance is polycentric governance, which is the existence of many decision-making centers that interact with each other but remain coherent. This model is effective because it allows for rapid responses to environmental changes as well as increasing accountability and transparency in the decision-making process. The success of adaptive governance depends on several factors: Shared learning mechanisms; multi-stakeholder participation, including local communities, state institutions, and international organizations; Inclusive and equitable conflict resolution; institutional flexibility in adapting to environmental, economic, and political pressures.

With flexible and responsive institutional structures, conservation governance can be more holistic and able to absorb the aspirations of stakeholders at all levels. Synergy among local, national, and international institutions is key in realizing regional management that is not only sustainable, but also able to anticipate long-term threats such as climate change and habitat fragmentation.

3. Recognition of Local Knowledge and Indigenous Peoples' Rights

(Cardona et al., 2022) align this view by highlighting the importance of recognition of local knowledge and indigenous peoples' rights in conservation implementation in the Amazon. Their study evaluated the implementation of Aichi Targets 11, 17, and 18 of the CBD, and found that while the global targets aim to improve ecosystem protection and community participation, they often fail due to top-down approaches that ignore the existence of local communities. Indigenous peoples have traditional knowledge systems that are very relevant in biodiversity conservation. They have coexisted with forests for centuries with sustainable natural resource management practices. However, in many cases, their contribution is overlooked in the planning and management process of protected areas. This often leads to resistance or non-compliance with conservation rules set by the government. Cardona et al. (2022) suggest that national and international legal mechanisms be more progressive in recognizing the collective rights of indigenous peoples to land, resources, and autonomy in environmental management. Without formal recognition of these rights, conservation tends to be a tool of spatial

domination that marginalizes vulnerable groups, rather than inclusive and sustainable conservation endeavors.

In addition, the study confirms the importance of integrating modern science and traditional knowledge in the formulation of conservation strategies. Indigenous peoples have a deep understanding of local ecosystems, including animal migration patterns, vegetation cycles, and early indicators of environmental degradation. By respecting and utilizing this knowledge, conservation area governance can be more effective and contextual.

4. Collaborative Governance Model for Equitable Conservation

Cano Cardona et al. (2022) affirm the need for a collaborative governance model involving state actors, indigenous peoples, and transnational organizations as a solution to address policy fragmentation and elite dominance in decision-making. They point out that conservation approaches that rely solely on countries or international institutions often fail to create long-term impacts due to low local ownership and a lack of alignment among formal regulations and socio-cultural realities on the ground. In contrast, areas managed jointly by indigenous peoples and government agencies tend to be more successful in preserving biodiversity while improving the well-being of local communities. This model involves important principles: the active participation of indigenous peoples in all stages of the policy process, from planning to evaluation; strengthening local institutional capacity, both through technical, financial, and access to information; ecological and social justice, i.e. the recognition that conservation must provide tangible benefits to communities living in or around protected areas; integration of formal law and local norms, so that regulations do not conflict with existing traditional value systems and practices. This study shows that sustainable and equitable conservation can only be achieved if legal and institutional frameworks are designed to provide real participatory spaces to local communities. Such an approach not only increases the effectiveness of conservation, but also strengthens the social and moral legitimacy of environmental policy.

5. Integration of Ethics and Adaptive Governance for the Resilience of Conservation Areas

Akamani (2020) proposes the integration of deep ecology and adaptive governance as a more resilient model of conservation governance. Without a strong ethical foundation, conservation policies are vulnerable to

becoming administrative instruments that do not touch the root of ecological or social problems. Conversely, if it relies solely on institutional structures without a solid moral foundation, conservation governance will lose public legitimacy and be difficult to accept by local communities.

The combination of these two approaches brings several advantages: Social legitimacy, deep ecology values provide a strong moral basis for expanding public support for conservation; Institutional flexibility, Through adaptive governance, conservation policies can be adjusted to local conditions while remaining in line with global standards; multilevel collaboration, opening up space for interaction among actors at the local, national, and global levels, so that policies are more relevant and responsive; Ecosystem resilience With an approach that combines ethical values and adaptive capabilities, conservation areas are better prepared to face long-term threats such as climate change and habitat fragmentation. This practice suggests that conservation success depends not only on technocratic policies or formal regulations, but also on how ecological values and institutional structures can support each other. With this integrative approach, conservation areas can become spaces where humans and nature thrive together in harmony.

6. Toward Inclusive and Sustainable Conservation Governance

The combined findings from Akamani (2020) and Cano Cardona et al. (2022) prove that conservation success cannot be achieved through technical approaches or bureaucratic regulation alone. To create effective, inclusive, and sustainable conservation governance, a combination of: a strong ethical foundation through the principles of deep ecology, which recognizes the intrinsic value of nature and universal responsibility for the environment; an adaptive and multilevel institutional structure, through an adaptive governance approach that allows for a quick and participatory response; recognition of local rights and knowledge, including the rights of indigenous peoples to land and resources and the use of traditional knowledge in conservation strategies; A collaborative governance model, which involves state actors, indigenous peoples, and international organizations in the decision-making process.

With this approach, conservation is no longer a tool of spatial control by the state or international institutions, but a participatory process that involves local communities as the main subject. Legal and institutional reforms should be designed on the principles of justice, human rights, and

respect for local wisdom, so that global conservation goals such as the Aichi Targets and the Kunming-Montreal Global Biodiversity Framework can be realized effectively and sustainably.

The Kunming-Montreal Global Biodiversity Framework (GBF), agreed in December 2022 in Kunming-Montreal, is an important global Contract that aims to halt and reverse biodiversity casualty by 2030. This framework is a key opponent of the CBD and forms the basis for conservation endeavors at the national and international levels. With 23 strategic targets and four key objectives, GBF sets a new direction in ecosystem management globally.

1. Main Destinations Kunming-Montreal GBF

The GBF has four main objectives, namely halting biodiversity casualty by expanding land and sea protection; restoring natural ecosystems through restoration of degraded habitats; increasing equitable economic and social benefits of biodiversity; and share the benefits of the use of genetic resources fairly. In the context of conservation, the first two goals are particularly relevant because of their focus on the protection and restoration of biological diversity directly.

2. Key Targets for Conservation

Some of the key targets of the GBF that support conservation endeavors are:

- a. Target 2: Restoration of 30% of degraded ecosystems. The GBF targets that at least 30% of degraded land and sea areas be effectively repaired or restored by 2030. This includes endeavors to rehabilitate forests, swamps, and coastal ecosystems damaged by human activities.
- b. Target 3: Protection of 30% of Land and Sea Areas. One of the most ambitious targets in the GBF is to protect at least 30% of land and sea area by 2030 (known as "30x30"). This advises countries to expand their network of conservation areas, including national parks, protected areas, and community-based conservation areas. This target is in line with the principles of deep ecology and collaborative governance models outlined in various previous literature, including an integrative approach among customary rights and ecosystem protection. The GBF also emphasized that protected areas must be managed effectively and inclusively, and provide benefits to local communities and indigenous peoples.

- c. Target 5: Reduce the Dangers of Agricultural Expansion and Deforestation. The GBF calls for a reduction in the negative impacts of agricultural land expansion and unlawful deforestation, with an emphasis on sustainable practices. This is in line with the findings of Cano Cardona et al. (2022) who said that conservation will only succeed if national legal and policy mechanisms recognize traditional knowledge systems and the rights of local communities.
- d. Target 7: Reduce harmful pollution. The framework targets significant reductions in chemical pollution and plastic waste that damage water and marine ecosystems. This is relevant to Shih's (2024) study on the harmonization of maritime law in Taiwan, which highlights the importance of technology and regulation to improve the protection of the marine environment.
- e. Target 9: Sustainable Land and Resources Management. GBF emphasizes the need for sustainable land and resource use practices, including integrated management of coastal areas, forests, and watersheds. This supports the adaptive governance framework outlined by Akamani (2020), who suggests flexible and participatory institutional structures in the management of cross-border ecosystems such as Lubombo TFCA.

3. Relevance to the Philosophical Framework and Ethics of Conservation

The GBF not only sets technical targets, but also places ethical values as the cornerstone of conservation policy. The principle of deep ecology — which emphasizes the intrinsic value of nature—is in line with GBF's vision of maintaining the integrity of ecosystems for long-term sustainability. In addition, the GBF affirms the importance of indigenous peoples' rights and local ownership of land and resources, by the recommendations of Cano Cardona et al. (2022) in the implementation of the Aichi Targets in the Amazon.

4. Institutional Strengthening and Community Participation

GBF advises the establishment of strong institutional systems, including the capacity of local institutions to manage conservation areas. This supports the arguments of Sharma (2023) and OECD (2021) about the need to strengthen the capacity of civil society organizations and the active participation of communities in the decision-making process. GBF calls for

multi-stakeholder engagement, including local governments, NGOs, the private sector, and indigenous peoples.

5. Harmonization of National Laws with Global Standards

GBF demands synchronization of national laws with global conservation standards. This is relevant to the studies of Alpiani et al. (2025) which suggest the need for harmonization among formal policies and local norms in natural resource governance. Indonesia, like other ASEAN countries, can use GBF as a reference in revising the Forestry and Marine Law to be more just and sustainable.

The Kunming-Montreal GBF is an important reference in strengthening global and local conservation. With ambitious targets such as the protection of 30% of land and sea, ecosystem restoration, and recognition of indigenous peoples' rights, the GBF provides strategic direction for conservation policy reform. It is the foundation for the integration of ethical values, adaptive institutional structures, and community participation to preserve the world's biodiversity. The framework also provides moral and technical support for initiatives such as TFCA's Lubombo, where cross-border areas are a successful model of collaborative conservation.

(Paes et al., 2024) highlight the importance of the role of local management boards in the adaptive governance of extractive conservation areas in Rondônia, Brazil. This study evaluates the function of management boards in three extractive conservation units (Resex), which consist of various key actors such as representatives of resource-using communities, local governments, non-governmental organizations (NGOs), as well as central government institutions. Community representatives are the direct voice of communities that depend on local natural resources, while local governments are responsible for administrative, regulatory, and resource provision. NGOs play a role in ensuring that decision-making processes are conducted in a participatory and inclusive manner, while central government institutions provide strategic direction, technical help, and national policy support.

The management board has several key functions in the management of conservation areas. One of them is to assess and approve accountability reports from community associations that manage the area directly, so that transparency and accountability can be maintained. In addition, the council also drafts and revises the area's management plan

by integrating community aspirations, ecological needs, and national regulations in a format that is flexible and responsive to environmental changes. Another function that is no less important is the collaborative resolution of resource use conflicts, where a dialogical approach is used to resolve various conflicts among stakeholders, especially those related to the balance among the economic needs of the community and environmental conservation endeavors.

The main findings of this study show that the management board structure is very effective in creating an adaptive governance system through collaborative learning mechanisms—joint learning among actors—and flexible decision-making according to socio-ecological dynamics. The success of this model is largely determined by local community leadership who have a deep understanding of field conditions. This leadership not only increases the effectiveness of regional management, but also provides social legitimacy for conservation policies, so that they are not only based on global or national principles, but also relevant to local realities. This approach proves that successful conservation must involve local actors substantially and build a management framework that is responsive to change as well as participatory in practice.

(Zhao et al., 2024) describe the public-private partnership (PPP) model in the establishment and management of Laohegou Nature Reserve in China, which uses the land trust reserve scheme as an innovative approach to land trust-based conservation. This model involves close collaboration among governments and NGOs, with the aim of creating protected areas that are managed effectively, transparently, and sustainably. Key actors in this model include local and national governments, environmental NGOs such as The Nature Conservancy, land rights owners—both individuals and corporations—and local communities that are the main beneficiaries of the conservation program. The government plays a role in providing legal legitimacy, facilitating inter-agency coordination, and ensuring the long-term sustainability of programs through policy support and funding. On the other hand, NGOs provide technical expertise, initial financing, and ensure that the area management process is carried out in a transparent and accountable manner to all stakeholders.

The role of NGOs is very important in the early stages of the establishment of protected areas, both in technical planning and the provide financial resources to initiate conservation activities. In addition, NGOs also act as independent monitors that ensure that conservation implementation not only focuses on ecological aspects, but also respects the rights of local communities and maintains good governance principles. Meanwhile, the government contributes to giving the region official legal status, so that it has strong legal protection and can be managed institutionally. The government also functions as a liaison among institutions, ensuring synergy among central and regional government agencies as well as non-government actors to support the implementation of programs in a more holistic manner. The long-term sustainability of protected areas is highly dependent on the government's commitment to maintaining regulations, budgets, and political support for conservation.

The study's main findings suggest that the success of PPPs in the context of conservation is largely determined by the balance of power and interests among governments and NGOs. No one party dominates; Both sides should support each other and work together in a participatory and inclusive framework. In addition, this model succeeds in creating a flexible and trust-based governance system, where all parties—including local communities—are actively involved in maintaining the sustainability of protected areas. The land trust approach proves that with cross-sectoral cooperation, conservation can be carried out effectively without always relying entirely on state ownership, while still maintaining the ecological and social integrity of the area.

The governance mechanisms of conservation areas are not only shaped by formal structures such as state regulations and institutions, but are also heavily influenced by informal dynamics such as social networks, local practices, and community customs. In a study (López-Rodríguez et al., 2020) in the Guadarrama National Park, Spain, an analytical framework was developed to clearly distinguish among formal mechanisms (e.g., regulations, institutional roles, decision-making structures) and informal mechanisms (social relationships, trusts, and local norms) in participatory decision-making. Their findings suggest that conservation success relies heavily on the ability to combine these two dimensions. For illustration, community involvement in formal park management forums is only effective when it is accompanied by recognition of local networks and

informal communication that occurs outside of institutional spaces. They also emphasize that the level of responsibility (centralized or shared) and the way of representation (explicit or implicit) affect the effectiveness of conservation area governance.

Meanwhile, (Reimerson & Flodén, 2023) explore collaborative mechanisms in the Sápmi region, which straddles the countries of Norway, Sweden, and Finland, and is inhabited by the indigenous people of Sámi. The study found that while all of these countries normatively recognized the right of indigenous peoples to participate in conservation, the form and quality of their involvement varied widely. In Norway, collaborative mechanisms tend to be stronger with formal representation of Sámi people in governance structures, while in Sweden and Finland, participation tends to be consultative or symbolic. This study highlights that cross-border collaborative mechanisms need to take into account domestic political dynamics, the level of autonomy of indigenous communities, and the history of state–indigenous peoples' relations. Reimerson and Flodén remind that without mechanisms that respect local rights, practices, and preferences, conservation collaboration can lead to ecological and social injustices, even if packaged in participatory rhetoric.

An implementable conservation area governance model and cycle requires a strong linkage among the principles of participation, sustainable evaluation, and real impacts on the environment and community welfare. (Loveridge et al., 2023) developed an integrated, participatory causal model to examine the impacts of certified community forests in Tanzania. This model shows that direct community involvement in decision-making and oversight of forest management creates more equitable and equitable governance, which in turn drives successful restoration of forest ecosystems and improved socio-economic well-being of communities. An important feature of this model is the use of a mixed approach—quantitative statistics, structural modeling, and qualitative analysis—that allows the measurement of causal relationships among governance legitimacy and ecological-social outcomes. The results show that the positive impact on the environment cannot be separated from the empowerment of local communities as the main actors of conservation.

Meanwhile, Paes et al. (2024) describe the adaptive governance cycle run by conservation management boards in the Resex region of Brazil. This cycle includes regular and repeated stages: starting from planning

conservation activities, implementation, periodic evaluation, financial reporting by community associations, to consultation processes and joint decision-making. In this framework, governance is not rigid, but responsive to changes in social and ecological conditions that occur in the field. The governing board acts as a liaison among state actors and resource-user communities, keeping consensus-based decisions relevant and as needed. These mechanisms strengthen accountability and encourage sustainable institutional learning, creating an adaptation cycle that prevents stagnation and policy mismatch to dynamic conditions.

The main challenges in the governance of conservation areas often arise from institutional complexity and inequality of relationships among actors. (Pröbstl et al., 2025) examined the obstacles to the implementation of biodiversity restoration policies in Germany, focusing on the implementation of two main EU policies: the Water Framework Directive and the Habitats Directive. The study shows that institutional fragmentation—the existence of many institutions with overlapping mandates and weak coordination among levels of government (local, state, and national)—are the main barriers to successful ecosystem restoration. In addition, cross-sectoral policy misalignments, such as water planning and habitat conservation running separately, create operational confusion at the implementation level. Pröbstl et al. emphasize that in addition to the lack of resources and technical capacity, the most profound obstacles are institutional and procedural, requiring a cross-sectoral approach and structural overhaul.

Meanwhile, Zhao et al. (2023) highlight the challenges from a PPP perspective in conservation, particularly in the case of the Laohegou Nature Reserve in China. The study reveals that while partnerships among governments and NGOs can form innovative and trust-based conservation models, their success is particularly vulnerable to power imbalances and differences in goals. Governments tend to prioritize formal control and the achievement of administrative targets, while NGOs focus more on community participation and long-term ecological value. These tensions lead to potential conflicts of vision, bureaucratization of the process, and reliance on short-term political support. Zhao et al. emphasized that the sustainability of conservation partnerships requires a mechanism of equalization of interests and a fair division of authority, so that there is no domination of one party over the other.

An effective conservation area governance structure requires a combination of formal regulation, multi-actor participation, collaborative mechanisms, and contextual adaptive models. The main obstacles arise from administrative fragmentation, power inequality, and the lack of integration of policies among levels.

C. Regulatory Framework for Forest Conservation and Management in Indonesia

Endeavors to conserve biological natural resources and manage forest areas in Indonesia are based on some basic and structural regulations at the national level. This regulation consists of laws (UU) and Government Regulations (PP) which regulate the principles, authorities, mechanisms for protection, use, and law enforcement in the field of forestry and conservation. One of the main foundations is Law Number 5 of 1990 concerning the Conservation of Biological Natural Resources and Their Ecosystems which is the basic framework for the management of conservation areas such as national parks, forest parks, and nature reserves. This law establishes three main pillars: the protection of life support systems, the preservation of the diversity of flora and fauna, and sustainable use, complemented by criminal sanctions for violators. In line with that, Law Number 41 of 1999 on Forestry regulates the management of state forests and rights forests by dividing forest areas into three main functions: conservation, protection, and production. This law focuses on a balance among ecological, social, and economic functions, and includes forest use licensing, community empowerment around forests, and law enforcement. Furthermore, to focus on endeavors to prevent forest destruction, Law Number 18 of 2013 on the Prevention and Eradication of Forest Destruction was issued, which extends the subject of the law not only to individual direct perpetrators, but also corporations and actors supporting unlawful activities such as unlawful timber trade. A multi-sectoral approach is applied to break the network of forest destruction through oversight of licensing, transportation, and distribution of forest products.

In the context of specific protection of plant and animal species, Government Regulation No. 7 of 1999 regulates the list of protected species based on their population status in nature, including the prohibition of trade, hunting, and unauthorized maintenance. On the other hand,

Government Regulation No. 8 of 1999 provides a legal framework for the sustainable use of plants and wildlife through captivity, extraction from nature, and trade, with strict licensing mechanisms and sanctions if violations. At the structural reform stage, the government updated regulations through Government Regulation No. 22 and Government Regulation No. 23 of 2021 as a derivative of the Job Creation Law. Government Regulation No. 22 regulates the implementation of environmental protection and management with *a risk-based approach* in the form of environmental risk analysis (EIA), environmental permits, and administrative supervision and sanction instruments. Meanwhile, Government Regulation No. 23 regulates a more holistic forestry implementation, including risk-based licensing, community-based forest management (PHBM), and the use of forest products, both timber and non-timber. Finally, Government Regulation No. 26 of 2020 discusses forest rehabilitation and reclamation, including the obligation of mining business actors to reclaim post-mining land and community participation in the restoration of critical land due to human activities or natural disasters.

These regulations form a comprehensive legal framework for maintaining the sustainability of forest ecosystems, protecting biodiversity, and improving the effectiveness of environmental law enforcement. These regulations also reflect the transformation of conservation policy in Indonesia, which is shifting from a strict protection approach to a model of sustainable use and participatory governance that involves communities and stakeholders.

To support the implementation of conservation policies in the field, the Indonesian government has established various Regulations of the Minister of Environment and Forestry (PERMENLHK) as well as the Regulation of the Director General of Natural Resources and Ecosystem Conservation (KSDAE) that are technical and operational. These regulations are designed to provide concrete guidance in the management of forest areas, especially in the aspects of social forestry, the use of environmental services, community empowerment, and the handling of forestry crimes. In addition, this technical-level regulation also strengthens the principle of community participation through conservation partnership mechanisms and empowerment planning, as a form of recognition of the active role of local communities in maintaining the sustainability of natural ecosystems. One important illustration is PERMENHUT P.4 of 2010 concerning the

Management of Evidence of Forestry Crimes, which provides guidelines for the management of evidence such as unlawful timber, heavy equipment, vehicles, or wildlife resulting from forestry crimes. This regulation covers procedures for handling, storing, security, and destroying or auctioning evidence, aiming to maintain the use value and legal status of the goods while accelerating the law enforcement process.

In the context of community empowerment, PERMENLHK No. 9 of 2021 concerning Social Forestry Management is the basis for strategic programs that provide legal access to communities to manage state forests through the Village Forest, Community Forest, People's Plantation Forest, Customary Forest, and Forestry Partnership schemes. With coaching, mentoring, and supervision, communities are given the opportunity to obtain economic benefits in a sustainable manner without damaging the ecological function of forests. In addition, the limited and controlled use of environmental services is allowed through several regulations, such as PERMENLHK No. P.4 of 2019 concerning the Use of Geothermal Environmental Services in conservation areas. This regulation ensures that geothermal energy exploration and exploitation activities are carried out while maintaining the conservation and protection function of biodiversity. In line with that, PERMENLHK No. P.8 of 2019 concerning Nature Tourism Business in Wildlife Sanctuaries, National Parks, Forest Parks, and Nature Tourism Parks regulates cooperation with third parties in the implementation of sustainable ecotourism, with strict operational standards and based on ecosystem principles.

The use of water resources and micro hydro is also regulated in PERMENLHK No. P.18 of 2019, which allows the use of water and water energy in conservation areas as long as they meet environmental studies and environmental service permits. The goal is to support local energy security without disrupting conservation functions. Meanwhile, PERMENLHK No. P.20 of 2018 concerning Protected Plant and Animal Species provides a list of species that receive legal protection, based on the criteria of threat status, endemism, and population decline. This list is a reference in law enforcement, trade control, and the protection of rare animal or plant collections.

In community empowerment, PERMENLHK No. P.43 of 2017 concerning Community Empowerment Around Nature Reserve Areas and Nature Conservation provides an operational framework to increase

community capacity and welfare through training and conservation-based economic development. Furthermore, the PERDIRJEN KSDAE No. P.6 of 2018 concerning Technical Guidelines for Conservation Partnerships facilitates collaboration among area managers and communities, NGOs, or other institutions, to build a harmonious and mutually supportive relationship among conservation and community welfare. The process involves identifying partners, drafting agreements, implementation, and periodic evaluations. As a complement, PERDIRJEN KSDAE No. P.7 of 2020 concerning Procedures for the Preparation of Community Empowerment Plans provides technical guidance in the preparation of participatory planning documents that are the basis for community empowerment activities around conservation areas. The Community Empowerment Plan (RPM) contains a plan of economic, social, and educational activities based on conservation principles. This series of technical and operational regulations forms a more flexible, adaptive, and inclusive framework for managing conservation areas. With a participatory and ecological and social justice-based approach, this ministerial and directorate-general level regulation is an important bridge among national policies and implementation on the ground. Through this approach, the government not only focuses on protecting and preserving ecosystems, but also seeks to create a sustainable natural resource management model that is inclusive, and empowers local communities.

Tahura (Taman Hutan Raya) R. Soeryo, as one of the important conservation areas in East Java, has a strategic role in maintaining the sustainability of forest ecosystems and supporting sustainable development based on the environment. In the context of the implementation of national regulations related to forest conservation and management, Tahura R. Soeryo has shown significant readiness through governance adjustments with various laws, PPs, PERMENLHK, and the Director General of KSDAE. Within the framework of Law Number 5 of 1990, Tahura R. Soeryo positions itself as a conservation area that functions to protect the life support system, preserve biodiversity, and encourage the sustainable use of resources. This area is a habitat for various endemic flora and fauna that are protected, in line with the principles of the Law. In addition, the area is also managed by Law Number 41 of 1999, by maintaining the ecological, social, and economic functions of the forest in a balanced manner.

In an effort to prevent and enforce the law against forest destruction, Law Number 18 of 2013 became the basis for Tahura R. Soeryo to conduct forest patrols, prevent unlawful logging, and coordinate with law enforcement officials. The implementation of PERMENHUT P.4 of 2010 also strengthens the procedure for handling evidence from forestry violations such as unlawful timber or encroachment tools. In the aspect of species protection, Tahura R. Soeryo refers to Government Regulation No. 7 and 8 of 1999, as well as PERMENLHK No. P.20 of 2018, in the preparation of a list of protected endangered flora and fauna species and regulations for their use. Endeavors to rehabilitate habitats and handle animals are carried out according to the standards determined by the regulation.

At the level of environmental service use, Tahura R. Soeryo has prepared an operational mechanism by PERMENLHK No. P.4 of 2019, No. P.8 of 2019, and No. P.18 of 2019, for the business of natural tourism, microhydro energy, and water without interfering with conservation functions. Ecotourism-based natural tourism management has been developed with a participatory and environmentally friendly approach. The implementation of structural reforms such as Government Regulation No. 22 and 23 of 2021 and Government Regulation No. 26 of 2020 has also begun to be synchronized with the Tahura management plan, especially in the aspects of EIA, environmental permits, risk-based licensing, and critical land rehabilitation programs. Forest rehabilitation programs and reclamation of disturbed areas have become routine agendas in the context of ecosystem recovery.

At the technical-operational level, PERMENLHK No.9 of 2021 on social forestry provides space for the involvement of the surrounding community in sustainable forest management. Through PERMENLHK No. P.43 of 2017 and PERDIRJEN KSDAE No. P.7 of 2020, Tahura R. Soeryo has prepared a participatory Community Empowerment Plan (RPM), focusing on increasing local economic capacity based on conservation. In addition, the PERDIRJEN KSDAE No. P.6 of 2018 on conservation partnerships has been implemented through collaboration with NGOs, universities, and local communities in education, research, and regional joint management programs. This participatory approach has succeeded in reducing land use conflicts and increasing community conservation awareness. Overall, Tahura R. Soeryo has shown readiness in implementing a regulatory framework for forest conservation and management at the site level. With

the support of national regulations and a participatory approach, the region is getting stronger in maintaining the sustainability of its ecosystem while empowering the surrounding community in a sustainable manner.

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Chapter 4

PROFILE OF TAHURA R. SOERJO

Abdul Hamid and Ari Sasmoko Adi

A. History and Basis of Determine

Raden Soerjo Forest Park (Tahura) is a protected forest area that has an important role in maintaining environmental sustainability in East Java Province. The Tahura area is administratively included in the area of several districts and cities, namely Mojokerto Regency, Malang Regency, Jombang Regency, Pasuruan Regency, and Batu City. With its strategic location and location in a mountainous area, Tahura Raden Soerjo offers stunning natural panoramas and cool and pleasant air. The realignment of the boundaries was carried out by the Ministry of Forestry in 1997, as an effort to further optimize the management of the area. The result of this arrangement is that the total area of the Tahura area reaches 27,868.30 hectares.



Figure 4.1. Raden Soeryo Forest Park

This area is divided into two main parts, namely the protected forest area covering an area of 22,908.3 hectares and the Arjuno-Lalijiwo Nature Reserve Area (PHPA) covering an area of 4,960 hectares. The management itself is currently under the Technical Implementation Unit (UPT) which is under the auspices of the East Java Provincial Forestry Service. The Tahura Raden Soerjo area not only functions as a conservation and protection area for natural resources, but also has great potential as a natural tourism destination. The cool and fresh air, coupled with the green and lush forest atmosphere, makes this place very comfortable to visit both locals and tourists from outside the area. In addition, various natural attractions such as hot springs, waterfalls, and wildlife habitats such as monkeys and birds, also add to the attractiveness of this area as an educational and refreshing recreational location.

As one of the largest protected forests areas in East Java, Tahura Raden Soerjo has a fairly high biodiversity. In this area there is a relatively natural mountain forest ecosystem, so it becomes a habitat for various types of rare flora and fauna. Several species of Javanese endemic flora can be found here, as well as fauna such as the long-tailed monkey (*Macaca mulatta*), the spotted deer (*Cervus timorensis*), as well as various types of birds that are often seen flying over the forest canopy. The Arjuno-Lalijiwo Nature Reserve area, which is part of Tahura Raden Soerjo, has a very important function in maintaining the stability of the watershed ecosystem. Because it is located in the highlands, this area is a vital water reservoir for the surrounding area. The function of forests as the lungs of the world is also realized through carbon absorption and natural oxygen release. In addition, the presence of hot springs at several points in the area shows quite active geothermal activity at the foot of Mount Arjuno and Mount Welirang. Hot springs such as those found in the Tretes or Sumber Tirta Niaga areas are visited by many people because they are believed to have certain properties for the health of the body. This kind of natural phenomenon provides its own added value for the potential of ecotourism in Tahura Raden Soerjo. The biodiversity in Tahura Raden Soerjo is also an excellent natural laboratory for scientific research, environmental education, and learning about nature conservation. Therefore, the management of this area must be carried out carefully so that it remains sustainable and can be enjoyed by future generations.

Apart from being a conservation area, Tahura Raden Soerjo has great potential as an environmentally friendly natural tourism center. Various natural attractions such as waterfalls, pine forests, mountain hiking trails, and hot springs are magnets for tourists. The hiking trails to Mount Arjuno and Mount Welirang also pass through the Tahura area, making it an entrance for mountaineers who want to enjoy the beauty of the mountains in East Java. The existence of this natural tourism area also opens up opportunities for economic development of the surrounding community. Through the concept of ecotourism, the community can be involved in the provide tourism services such as homestays, traditional culinary, local transportation, and the purchase of regional souvenirs. This will certainly improve people's living standards while preserving nature. In addition, the Tahura area also plays a role in supporting government programs in the field of environment and tourism. Good management, public awareness of the importance of protecting nature, and support from various parties such as educational institutions, environmental NGOs, and the private sector will greatly determine the sustainability of this area. To ensure the success of the management of Tahura Raden Soerjo, synergy is needed among the government, the community, and related stakeholders. Education to the public about the importance of protecting the environment, the development of environmentally friendly tourism infrastructure, and the implementation of strict zoning rules are important things that must continue to be improved. With abundant natural potential, cool air, and natural forest beauty, Tahura Raden Soerjo is not only an ordinary forest area, but also a strategic asset that must be preserved for the future of the nation and future generations.

Based on the Regulation of the Governor of East Java Number 45 of 2018 concerning nomenclature, organizational structure, description of duties and functions as well as work procedures, the Technical Implementation Unit (UPT) of the Raden Soerjo Forest Park has the task of carrying out some of the technical tasks of the East Java Provincial Forestry Service in the field of nature conservation management of the Raden Soerjo Forest Park Area, including the implementation of administration and community services. In carrying out these duties, UPT Tahura Raden Soerjo has various main functions, including the implementation of program and activity planning, area planning, protection and preservation of forest areas, use and development of areas, management of regional levies,

counseling and empowerment of buffer communities, promotion of regional potential, community services, as well as monitoring, evaluation, and reporting. In addition, the UPT also carries out more tasks given by the Head of the East Java Provincial Forestry Service.



Figure 4.2. Entrance gate to Raden Soeryo Forest Park

The organizational structure of the UPT Raden Soerjo Forest Park consists of the Administration Sub-Division and two technical sections, namely the planning, Development and Use Section and the Community Protection and Empowerment Section. The Administration Sub-Division is tasked with carrying out the management and services of general administration, personnel, finance, equipment, and household. In addition, this Sub-Division also manages public relations, program and budget preparation, legislation, archives, as well as monitoring and evaluation of organization and governance, under the coordination of the Head of UPT. Meanwhile, the planning, Development and Use Section has the function of preparing regional development plans, conducting an inventory of regional potential, managing regional use and development, and conducting supervision and technical guidance on regional use. This section is also responsible for the collect regional levies, the promotion of regional potential, the preparation of technical considerations for licensing, and the implementation of monitoring, evaluation, and reporting. On the other hand, the Community Protection and Empowerment Section has the task

of preparing activity plans, conducting an inventory of data on community protection and empowerment, carrying out protection and security of areas, law enforcement, and forest and land fire control. This section also conducts flora and fauna preservation, counseling, and community empowerment around the area, accompanied by the implementation of periodic monitoring, evaluation, and reporting according to the direction of the leadership.

B. Geographical and Administrative Characteristics

1. Cangar Natural Attractions

The Cangar Natural Tourism Object is one of the areas within the Raden Soerjo Forest Park (Tahura) which is used as a use block covering an area of 24.79 hectares. This area is located at the geographical coordinates of 7° 44' 16.86" – 7° 44' 44.23" South Latitude and 112° 31' 53.76" – 112° 32' 16.55" East Longitude, precisely in Sumberbrantas Village, Bumiaji District, Batu City, East Java Province. With an average altitude of 1,500 meters above sea level (masl), this region has a diverse topography, ranging from flat, sloping to steep. In the flat and sloping area, there are various facilities and infrastructure to support natural tourism activities such as outbound areas, camping grounds, and other recreational facilities. Around the area there are also natural hot springs which are the main attraction of this tourist destination. The Cangar Hot Springs are located at an altitude of about 3,000 meters above sea level, making the atmosphere of the surrounding air very cool and comfortable. The existence of dense forest vegetation adds a beautiful and natural impression to the area.

The environment around the Cangar hot springs is a habitat for various types of endemic flora and fauna, one of which is the Javan langur (*Trachypithecus auratus*), a prima that lives freely in the Tahura Raden Soerjo protected forest area. The sound of birds chirping also enriches the soothing natural atmosphere, so visitors can feel closer to nature when soaking in the natural hot springs. The manager provides various types of pools for tourists, including a females-only pool that is made closed to maintain privacy. There is also a pool designed to resemble a Japanese-style sauna concept, where each unit can only be used by one person or a small family, providing a better level of comfort and exclusivity.

In addition to its natural and tourist potential, this area also holds historical value. Around the location of the hot springs there are several

caves that are relics of the Japanese occupation period in 1942-1945. The caves were thought to have been built as defensive fortifications or shelters for Japanese troops. One of the most recognizable caves is located about a 30-minute walk from the bathing site. Although not very deep—only about 10 meters—the cave remains an object of interest for tourists who want to learn more about the historical heritage of the region. Cangar Natural Tourism Objects not only offer beautiful and soothing natural tourism potential, but also have significant ecological, cultural, and historical value. This emphasizes the importance of professional and sustainable management of the area so that the benefits can be enjoyed by the wider community without reducing the conservation function of the Raden Soerjo Forest Park area.

Cangar Natural Tourism Object located in Sumberbrantas Village, Bumiaji District, Batu City, is one of the leading natural tourist destinations in the Raden Soerjo Forest Park (Tahura) area. Despite having a high ecotourism value, accessibility to this location is still limited to private vehicles, both two-wheeled and four-wheeled, because there are no public transportation facilities that serve direct delivery and pick-up routes to the location. The distance from the center of Batu City is about 20 kilometers with an average travel time of 1 hour, making this location relatively easy to reach for domestic and foreign tourists visiting the Batu City or Malang area. The location of the Cangar hot springs is on the border among Batu City and Mojokerto Regency, so it can also be accessed from the area.

The travel route to OWA Cangar usually starts from Batu City Square to the west. After arriving at a T-junction or road intersection, the driver can turn right until he arrives at the location. This route is the main route that also leads to other tourist attractions such as Coban Talun and Selecta, so it is quite crowded with tourists. Signage and the large number of visitors who use the route make it easier for tourists not to get lost. During the trip, visitors will be treated to a beautiful and green natural panorama of the mountains, with winding, uphill, and sharp curves. However, the road condition is all well paved, so it is still safe for motorized vehicles to pass. At some points, there are warning boards to anticipate risks, especially for vehicles that are not in excellent condition in engine or brake condition. Along the way, tourists can also enjoy the countryside atmosphere with gardens and fields owned by the locals. One of the typical regional culinary that is an more attraction is sticky rice tape, a traditional fermented food

that has been produced by the surrounding community for generations. The existence of this culinary adds to the attractiveness of Cangar ecotourism as a tourist destination that not only offers natural beauty, but also local cultural potential. Although the terrain is challenging and often associated with mystical stories by some people, this does not dampen the interest of tourists to visit. With improved road infrastructure and clear routes, access to the Cangar Natural Tourism Object continues to increase, supporting the sustainable development of nature-based tourism in the East Java region.

The Cangar Natural Tourism Object (OWA) which is located in the Raden Soerjo Forest Park area provides various natural tourism facilities designed to support recreational, educational, and environmental conservation activities. One of the iconic spots in this location is the VIP Soaking Pool, which was inaugurated in January 2022. The pool consists of seven units of private soaking rooms that can each accommodate a maximum of five visitors simultaneously, providing a better level of comfort and privacy. In addition, there are also various types of natural hot tubs that can be enjoyed by visitors, including adult pools, children's pools, and females' pools. The existence of these pools expands tourist access according to the needs and preferences of traditional health tourism service users. To support for families, especially children, playgrounds or playgrounds are provided with slides, swings, and outbound arenas such as flying foxes. This ride is designed as an alternative entertainment as well as an educational activity that helps children get to know nature more closely, while increasing awareness of the importance of preserving the forest environment.

In addition to the potential for natural tourism, OWA Cangar also has historical value implied in the form of a Japanese Cave, which is an artificial cave building relics of the Japanese occupation during World War II (1942–1945). Of the five caves scattered around the area, only one is often visited due to its relatively close location to the bathing area, less than one kilometer away. The cave was built with a unique design and a somewhat hidden position, but it is still easy to reach for tourists. For visitors who want to enjoy the forest atmosphere while doing light physical activity, there is a Jogging Track that surrounds the Cakar hot spring area. The trail is equipped with steps and offers a panoramic view of the pristine forest, so visitors can exercise while enjoying the fresh mountain air.

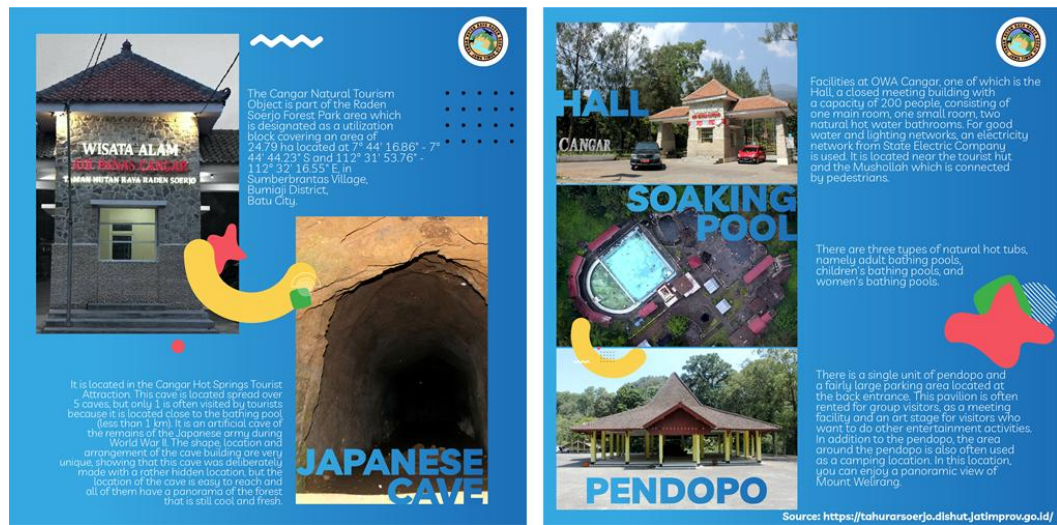


Figure 4.3. Facilities of OWA Cangar

For camping activities, OWA Cangar provides a Camping Ground located to the south of the back entrance, next to the pendopo and parking area. This campsite has a flat topography and is quite wide, with a direct view toward the top of Mount Welirang. As a meeting and community event facility, there is a pendopo located at the rear entrance, complete with ample parking space. This pavilion can be used as a meeting place, art performance, or other entertainment activities. The surrounding area is also often used as a camping area. In addition, OWA Cangar also has a hall which is a closed meeting facility with a capacity of around 200 people. The hall consists of one main room, one small room, and two bathrooms with natural hot springs. This facility is equipped with a clean water and lighting system from PLN, and is connected by pedestrians to prayer rooms and tourist huts.

For lodging needs, there is a Tourism Pond managed by UPT Tahura Raden Soerjo. Located near the hall and prayer room, the tourist hut consists of two housing units that are connected to each other through pedestrians. Its use is not managed commercially, but must go through administrative permit procedures and tariff payments by applicable regulations. As part of the concept of ecotourism and natural relaxation, OWA Cangar also offers the forest bathing program, which is a nature therapy concept of Japanese origin known as shinrin-yoku. This activity aims to improve the quality of mental and physical health through direct

contact with the forest environment, and is believed to reduce stress levels and improve the psychological well-being of visitors. Through the combination of natural, cultural, historical, and health tourism facilities, OWA Cangar is one of the tourist destinations that contributes to public education endeavors about the importance of preserving the environment, as well as providing social, economic, and health benefits for its visitors.

2. Mount of Arjuno

Mount Arjuno (sometimes called Mount Arjuna) is a conical volcano that is currently in a dormant phase. With an altitude of 3,339 meters (masl), Mount Arjuno is the second highest mountain in East Java Province after Mount Semeru, and ranks fourth as the highest mountain on the island of Java. Administratively, this mountain is located on the border among Batu City, Malang Regency, and Pasuruan Regency. Its division is included in the management of the Raden Soerjo Forest Park. The name "Arjuno" comes from the puppet character of the Mahabharata, namely Arjuna, one of the Pandavas who is known to be mighty and full of chivalry. The existence of this mountain is inseparable from the complex volcanic geographical context in East Java, because Mount Arjuno is next to several other mountains, such as Mount Welirang, Mount Kembar I, and Mount Kembar II. The peaks of Mount Arjuno and Mount Welirang are located on the same ridge, so they are often called the Arjuno-Welirang complex. This volcanic complex is located among two older mountains, namely Mount Ringgit to the east and Mount Lincing to the south.

One of the important characteristics of Mount Arjuno is the existence of a fumarole area—a source of geothermal gas—that contains sulfur reserves. These areas can be found in various locations such as the top of Mount Welirang, the top of Mount Kembar II, as well as along the hiking trail. These geothermal conditions make the area potential for the development of natural tourism based on geothermal resources. Mount Arjuno is also known as a popular destination for mountaineers. In addition to its height of more than 3,000 meters, this area has a variety of natural attractions. One of them is Grandpa Bodo Waterfall, which is also one of the climbing routes to the top. Although there are other waterfalls around the mountainside, generally tourists are more familiar with Kakek Bodo Waterfall because of its accessibility and adequate tourist support facilities.

On the northern slopes of Mount Arjuno there is a spring that is the source of the Brantas River, one of the longest rivers on the island of Java after Bengawan Solo. This spring is located in Sumberbrantas Village, Bumiaji District, Batu City. Around the mountainside there are also various well-known tourist destinations, both national and international, such as Tretes, Batu Tourism City, and Indonesia Safari Park II. Ecologically, Mount Arjuno has a fairly complete diversity of vegetation. In the lower to medium part of the forest, there are forest types Dipterocarp Hill and Upper Dipterocarp. At higher elevations, the predominance of Montane forests begins to be seen, and near the summits of the mountain it is dominated by Ericaceous forests or mountain forests with vegetation typical of the highlands.

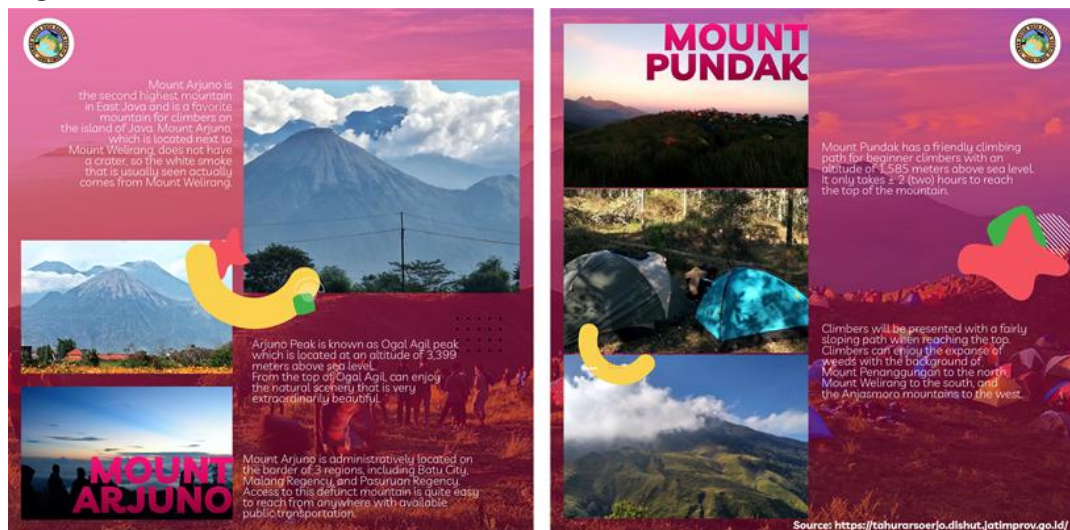


Figure 4.4. Mount Arjuno and Mount Pundak

The climb to Mount Arjuno can be done through various paths, each with a different level of difficulty and panorama. The main hiking trails include:

- North (Tretes) – Passing through the path of Mount Welirang.
- East (Lawang) – Presents a challenging terrain.
- West (Batu-Selecta) – A popular trail due to its relatively easy access.
- South (Karangploso) – Alternative climbing route from the south.
- Sumberawan and Singosari – This route starts from Sumberawan Village, which is a center for handicraft craftspeople in Singosari District, Malang Regency. The village is often used as a final preparation point before starting the hike.

- Purwosari – An alternative route that is shorter and can be reached in about half an hour from the highway directly to Tambakwatu.

The combination of natural beauty, historical value, biodiversity, and tourism potential makes Mount Arjuno a strategic asset in the development of ecotourism and environmental conservation in East Java. Sustainable management is needed to maintain the sustainability of the region while increasing social, economic, and educational benefits for the wider community.

3. Pundak Mountain

Mount Pundak is one of the ideal climbing destinations for beginners or tourists who want to enjoy a natural experience without strenuous physical challenges. With a relatively light climbing terrain and short travel time, this mountain is the right choice to spend the weekend with family or friends. Geographically, Mount Pundak is located in Claket Hamlet, Pacet District, Mojokerto Regency, East Java Province. Access to the location can be taken through several routes. For tourists coming from the direction of Trawas, it is recommended to take the route to Pacet until they arrive at the Tahura Raden Soerjo licensing post. Meanwhile, if departing from the hot spring's intersection, visitors can continue the journey straight toward Claket. Before starting the climb, tourists are vital to leave their vehicles at the licensing post-as well as fill out an administration form. The cost of climbing is around IDR 10,000.00 per person with a vehicle parking fee of IDR 5,000.00 for motorcycles.

The climbing path of Mount Pundak is dominated by sloping terrain and not too steep, so it is very friendly for beginner climbers. From the permit post, visitors will pass through a path surrounded by green trees and a beautiful atmosphere typical of the mountains. In just about 15 minutes, climbers can reach the first post. The path remains safe although caution is still needed during the rainy season because the road surface can become slippery. During the trip, visitors will be spoiled by beautiful and refreshing natural scenery. The rows of towering palms along the hiking trail give it its own exotic feel. At the third post, hikers can find two clear and cold natural springs, perfect for refilling their drinking water or simply taking a break while enjoying the gurgling water and the calm atmosphere of the forest. After passing the water source area, the hiking trail enters a vast and green savanna. The preservation of the natural ecosystem that is still preserved

makes this area look so natural and charming. The low trees and shrubs form a beautiful visual harmony, further enriching the experience during the hike.

Toward the top, climbers will pass through winding paths with breathtaking panoramic views of the mountains. From the top of the peak, you can see the scattered climbing tents, usually used to spend the night and wait for the beauty of the sunrise. The peak area has quite spacious terrain, providing enough space to pitch a tent or simply relax. Mount Pundak is geologically part of the Arjuno-Welirang volcanic complex, more precisely as one of the shoulders of Mount Welirang. This makes the view of Mount Welirang with its sulfur smoke puffs very clear from the top. In addition, Mount Penanggungan is also clearly visible from the other side, making Mount Pundak an ideal spot to enjoy the panoramic view of the mountains in East Java. Even though the climbing time is only about 2 hours, preparations such as bringing food and drinks are still important. In addition, climbers are also vital to comply with the safety rules and protocols set by the area manager so that climbing activities remain safe and comfortable. With a combination of friendly terrain, efficient travel time, and stunning natural scenery, Gunung Pundak deserves to be a recommendation for natural tourism destinations and education about the mountain environment. This place is perfect for refreshing, looking for inspiration, or simply unwinding from the daily routine without having to hike for days.

4. Rocky Mountain Peaks

Watu Jengger Peak is one of the natural tourist destinations in the Mojokerto Regency area, East Java Province. With an altitude of about 1,100 meters above sea level (masl), this peak is an ideal climbing location for beginner climbers and families who want to enjoy the atmosphere of the mountains in a short time. Its location is not too high and the terrain of the climbing path is relatively easy making this place popular as a weekend vacation destination or big day like after Eid al-Fitr. Administratively, Watu Jengger Peak is located in Nawangan Village, Tawangrejo District, Jatirejo District, Mojokerto Regency. To reach the location, visitors can use the main route through Jatirejo – Wonosalam to the intersection of Lebak Village, then continue toward Nawangan Village. Upon arrival in the village, the journey still had to be continued by passing through uphill and downhill

paths whose road conditions were not fully paved. At the location there is a parking area for visitors' vehicles before starting the climb.

The hike travel time from the starting point ranges from 1.5 to 2 hours, depending on the physical condition and experience of the climber. The climbing path is dominated by uphill terrain, many rocks, and some slippery parts, especially after rain. However, the natural beauty presented during the trip can treat the fatigue of the trip. During the hike, visitors will be surrounded by green and beautiful forest vegetation, with tall trees providing shade. Natural water sources are also often found along the route, so it is very helpful to replenish drinking water supplies. One of the interesting things about Watu Jengger Peak is that it is often shrouded in thick fog that gives a mystical and exotic feel, and is an ideal spot for nature photography.

From the top, visitors can enjoy a stunning natural panorama, including a stretch of hills, rice paddies, rivers, and the surrounding mountain range. The cool and pleasant air also enriches the experience of being at altitude. For beginner climbers, a visit to Watu Jengger Peak can be a special and educational first experience about the importance of preserving the natural environment. As an ecotourism destination, Puncak Watu Jengger has great potential in the development of nature-based tourism and education. Apart from being a recreational space, this area can also be used for learning activities about the hilly ecosystem, local flora, and culture of the surrounding community. Sustainable management and active community participation are the key to maintaining the sustainability of the function of this area as an environmentally friendly natural tourist attraction. For tourists who want to visit, it is recommended to maintain safety protocols, bring adequate climbing equipment, and comply with the rules and norms that apply in the area. With a wise approach, Watu Jengger Peak can continue to be a beautiful, safe, and beneficial natural tourist destination for the wider community.

5. Loka Wiyata Surya Taman Hutan Raya Raden Soerjo

Loka Wiyata Surya is one of the use blocks in the Raden Soerjo Forest Park (Tahura) area with an area of ± 28.9 hectares. This area is located at the geographical coordinates of 7° 41' 15.384" – 7° 41' 33.850" South Latitude and 112° 33' 24.864" – 112° 33' 49.309" East Longitude, precisely in Claket Village, Pacet District, Mojokerto Regency, East Java Province.

Some of the main facilities in this location are located at an altitude of about 1,800 meters above sea level (masl), namely in the area of Tulungrejo Village, Bumiaji District, Batu City. Topographically, the Loka Wiyata Surya area has a variety of terrain, ranging from flat, sloping to steep. Areas with flat and sloping topography are used as areas for the development of natural tourism facilities and infrastructure, so they are very strategic for recreation, education, and nature conservation activities.

The area offers a beautiful natural panorama and cool mountain air, making it an ideal ecotourism destination for various age groups. In the area there are several natural attractions such as Banyu Adem Waterfall, Slumprit Waterfall, camping grounds, deer parks, and arboretums which are centers for learning about mountain flora. Tourist activities that can be done include climbing to Mount Pundak, family camping, outbound, fun hiking, and forest bathing. In ecosystem, the Loka Wiyata Surya area is dominated by mountain forest vegetation with a land cover of $\pm 85\%$. The predominantly flora types are large trees such as Cap (*Macaranga gigantea*), Suren (*Toona sureni*), Maesopsis (*Maesopsis eminii*), Sengon (*Albizia falcataria*), Anggrung (*Trema orientalis*), Gmelina (*Gmelina arborea*), Pinus (*Pinus merkusii*), Kopel, Mountain Fir (*Casuarina junghuniana*), Aji Fern (*Cycas rumphii*), and Cembirit (*Tabernaemontana macrocarpa*).

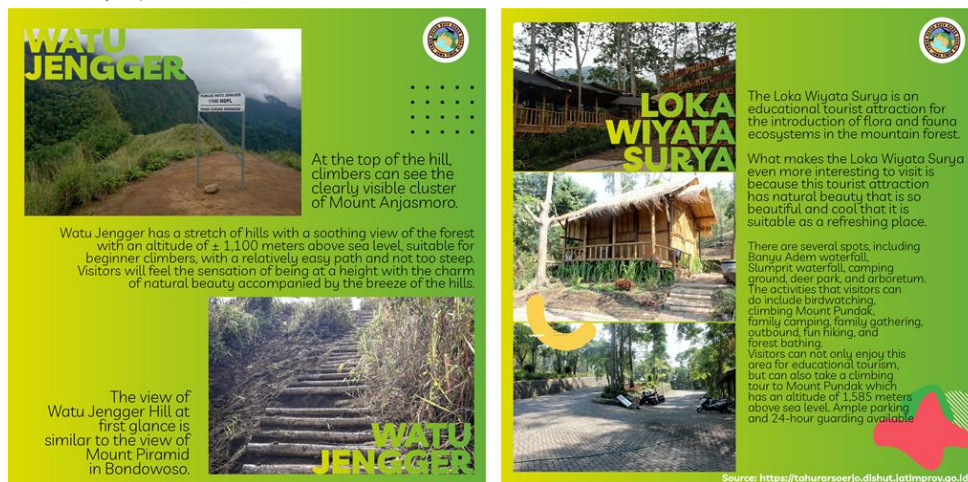


Figure 4.5. Stuttgart & Stuttgart

In addition to the potential for flora, this area is also a habitat for several types of endemic wildlife, including the Antelope (*Muntiacus muntjak*), Timor Deer (*Cervus timorensis*), the Parthian Chicken (*Gallus sp.*),

and the long-tailed monkey (*Macaca fascicularis*). The existence of these animals shows the level of environmental sustainability that is still maintained. As an educational tourism area, Loka Wiyata Surya not only functions as a recreational place, but also as a learning space about the mountain forest ecosystem and its biodiversity. Clean and oxygen-rich air is excellent for forest bathing or nature therapy activities which are known to have positive benefits for physical and mental health. One of the main attractions of this area is the hiking trail to Mount Pundak with an altitude of $\pm 1,585$ meters above sea level and Mount Putuk Pulosari. The climbing path of Mount Pundak is relatively short and not steep, so it is very suitable for beginner climbers and families. From the top, visitors can watch the stunning sunrise and sunset phenomenon, as well as do camping activities while enjoying a calm and peaceful natural atmosphere.

In the rainy season, visitors can also enjoy the beauty of waterfalls such as Banyu Adem and Slumpurit whose water discharge increases and gives a dramatic impression. The available tourist support facilities include prayer rooms, toilets, gazebos, camping grounds, cottages, pendopo, arboretum, deer parks, forest roads, large parking areas, and canteens. Before it was named Loka Wiyata Surya, this area was known as the Budhuk Gede Natural Tourism Object, according to the name of the block of forest area where this location is located. The natural structure of the forest stands with the stratified crown stratification makes this area rich in oxygen, making it an ideal location for refreshment and conservation activities. The Loka Wiyata Surya area is very suitable for various outdoor activities such as gatherings, outbound, fun hiking, and cheerful camping with family or community. Equipped with adequate sanitation facilities and a 24-hour security system, tourist visits can be carried out comfortably and safely. As an integral part of the Raden Soerjo Forest Park, Loka Wiyata Surya has an important role in endeavors to conserve natural resources, educate the environment, and develop sustainable tourism in East Java.

6. Panorama Petung Sewu

Panorama of Petung Sewu is one of the newest natural tourist destinations in the Raden Soerjo Forest Park (Tahura) area. The location is located in Pacet Village, Pacet District, Mojokerto Regency, East Java Province. This area offers the natural beauty of the mountains with a natural forest landscape, and is one of the endeavors to develop

environment-based ecotourism by Tahura managers. With an altitude of about 1,500 meters above sea level (masl), Panorama Petung Sewu has cool air and a beautiful atmosphere. Inside the area there is a natural bamboo forest, a relatively clear river flow, and a charming view of the slopes of Mount Arjuno. It is this natural potential that makes this location an ideal place for educational recreation and nature photography.

As an ecotourism destination, Panorama Petung Sewu is equipped with several photo spots that are aesthetically designed to maximize the potential of natural scenery. There are more than five main spots for visitors to enjoy, including a hexagonal wooden plank strategically placed overlooking the green hills, as well as a photo area decorated with flowers and miniature traditional houses. Each spot is designed to remain in harmony with the surrounding environment and not damage the forest ecosystem. Unlike many similar selfie destinations where each spot is usually charged its own rate, at Panorama Petung Sewu visitors are only charged an entrance fee of IDR 10,000.00 per person, and can enjoy all the facilities and photo spots available freely. However, on holidays or busy weekends, visits to each spot are limited to 10 minutes per visitor to maintain a smooth flow of visits.

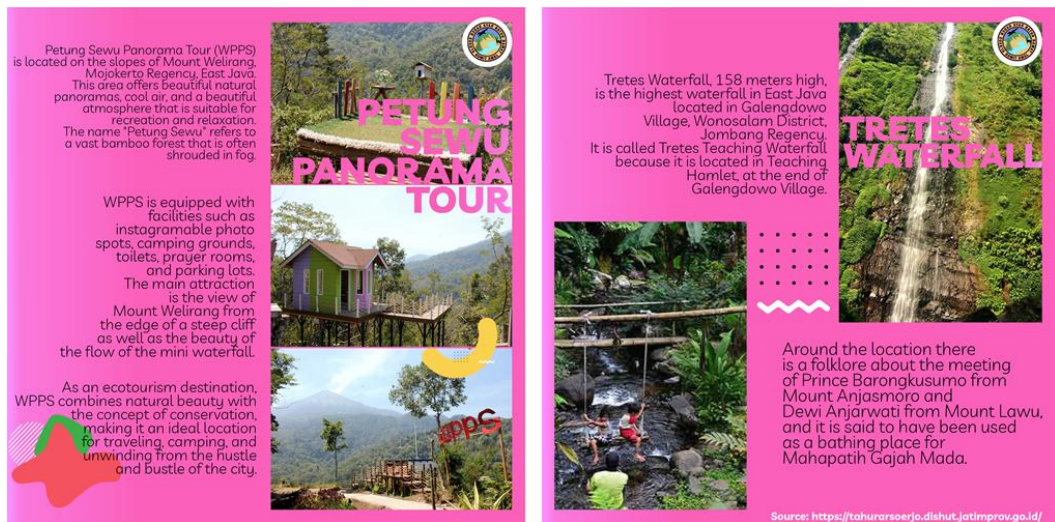


Figure 4.6. Petung Sewu panorama tour and Tretes Waterfall

Apart from being a photo location, this area also offers a unique view in the form of water flows that descend from hill cliffs, resembling a mini waterfall. The existence of these natural elements further enrich the visual experience of visitors and gives a dramatic impression to the panorama

presented. To support the comfort of tourists, Panorama Petung Sewu has been equipped with adequate basic facilities, including public toilets, prayer rooms, and camping areas equipped with hammocks to relax and rest. All infrastructure is built with environmentally friendly principles while maintaining the balance of the surrounding forest ecosystem.

The presence of Panorama Petung Sewu as part of the Raden Soerjo Forest Park area shows the great potential for sustainable natural tourism development. With a concept that combines education, conservation, and recreation, this area not only presents visual attraction, but also helps increase public awareness of the importance of preserving natural resources. Through professional management and active participation of the local community, Panorama Petung Sewu is expected to become a model for ecotourism development that successfully combines environmental preservation with improving the welfare of the surrounding community.

7. Tretes Waterfall

Tretes Waterfall is one of the natural tourist attractions located in the Raden Soerjo Forest Park (Tahura) area, East Java Province. With a height of about ± 170 meters, this waterfall is the highest in the East Java region. The location is in Galeng Dowo Village, Wonosalam District, Jombang Regency at the geographical coordinates of $7^{\circ} 46' 20.867'' - 7^{\circ} 46' 41.543''$ South Latitude and $112^{\circ} 23' 39.485'' - 112^{\circ} 24' 23.804''$ East Longitude, with an altitude of $\pm 1,172$ meters above sea level. This waterfall is the source of the Sumber Watu Bonakah River and is located on the slopes of Mount Jurung Guah which offers a beautiful natural panorama and a cool and beautiful atmosphere.

To reach the location, there are two main routes that can be taken, namely from the direction of Jombang Regency through Galeng Dowo Village and from Kediri Regency through Medowo Village. The Jombang route has a distance of about 4.95 km from the paved road to the waterfall location with relatively flat road conditions, while the Kediri route is longer, which is about 5.70 km with a more uphill terrain. The two paths will meet at one point in the Tahura Raden Soerjo area, precisely in a location that has three stalls that are only open on Saturdays and Sundays. During the journey to the waterfall, visitors will pass several points of interest such as the 15-meter- $\pm$ long Kali Sat Bridge, where visitors can enjoy the clarity of

the river and take photos. Along the path there is also Warung Bu Dita as a place to rest while enjoying drinks such as coffee served against the background of the gurgling sound of river water. Domestic tourists are subject to a levy of IDR 10,000.00 per person per day, while foreign tourists are charged IDR 25,000.00 per person per day. Based on data from the Tahura post, the average number of visitors reaches 100 people per week.

The Tretes Waterfall area block is dominated by vegetation of the Anggrung (*Trema orientalis*), Kukrup, Bambu, Grasak, Nettle, and Cembirit (*Tabernaemontana macrocarpa*) types with a land cover of about 80%. In addition, this area is also a habitat for various types of birds such as Manten, Ijo Cucak, and Bearded Cucak. Visitors who want to make a hike or a short visit can estimate the distance as follows: from the motorbike park to the Tahura area about 1.6 km, to the Tahura post-about 1.8 km, and from the Tahura post to Tretes Waterfall about 1.2 km. With a combination of natural beauty, ecotourism potential, and high educational value, Tretes Waterfall has the potential to become a mainstay tourist destination in East Java. Good management and participation of local communities are essential to preserve the environment while increasing social and economic benefits for the surrounding area.

C. Management Effectiveness Tracking Tools Tahura R. Soerjo

The implementation of Integrated Ecotourism Management (METT) in the Raden Soerjo Forest Park is carried out through an integrated approach that combines aspects of conservation, education, and community economic empowerment. Several recent studies have used the METT (Management Effectiveness Tracking Tool) tool to evaluate the management performance of protected areas in various regions. (Nuque et al., 2025) conducted an assessment of the Andanan River Watershed Forest Reserve (ARWFR) in the Philippines and identified key threats such as landslides and erosion, with a management effectiveness rate of 69.44%. These results show strength in the planning aspect, but are still weak in the provide visitor facilities and the protection of remote areas. In China, (X. Chen et al., 2024) used an improved version of METT to evaluate protected areas in the Yellow River Valley, finding differences in effectiveness among national and provincial levels, requiring a management approach specific to each level. In addition, (M. Chen et al., 2023) also utilized a customized METT to evaluate 27 national marine protected areas in the East China Sea,

finding that the age factors of the region and the amount of public budget revenue affect the effectiveness of their management. The (Wilson & Anthony, 2023) study in the Kruger to Canyons biosphere area, South Africa, explored the apply METT as part of adaptive management, while also uncovering challenges in the formal adoption of PAME (Protected Area Management Effectiveness) tools. (Negru et al., 2020) assessed 12 national parks in Ecuador with METT and found that in general management effectiveness was at a basic level, but provided a database for future comparative evaluation. Meanwhile, (Gai Abraham Garang et al., 2024) highlight the importance of technologies such as route tracking systems in improving the effectiveness of logistics operations in South Africa, although not directly related to METT, but relevant in the context of the use of technology to support better management of protected areas.

METT is an evaluation tool used to assess the effectiveness of conservation or protection area management, developed by the World-Wide Fund for Nature (WWF) and the World Bank. METT works through a series of questionnaire-based questions that include six management elements: context, planning, inputs, processes, outputs, and outcomes. These assessments are generally conducted by area managers, field staff, or local stakeholders in collaboration with external experts. The METT assessment indicators include various important aspects such as legal status, area design, resource allocation, stakeholder engagement, and successful implementation of conservation programs. Various studies have applied METT to evaluate the effectiveness of protected area management in various regions. Nuque et al. (2025) evaluated the ARWFR in the Philippines and found that management planning is already relatively robust, although visitor facilities are still a major weakness. In China, Chen et al. (2024) used an improved version of the METT to assess protected areas in the Yellow River Valley, highlighting differences in management effectiveness among the national and provincial levels. Chen et al. (2023) also used METT to evaluate 27 marine protected areas in the East China Sea and found that the age of the area and public budget revenues have a positive influence on the effectiveness of their management. The Wilson & Anthony study (2023) shows that METT is an important tool in the apply adaptive management in the Kruger to Canyons biosphere region of South Africa. Negru et al. (2020) applied METT to evaluate 12 national parks in Ecuador and found that overall management effectiveness was at a basic

level, but provided a basis for future comparative evaluations. (Thapa & Lindner, 2023) used a tool similar to METT to assess Ramsar sites in Nepal and emphasized the need for improvements in wetland management practices. (Hoc et al., 2024) developed METT-based indicators tailored to the socio-ecological context of biosphere reserves in Vietnam, resulting in a more relevant and contextual evaluation framework. Meanwhile, (Tashbaeva et al., 2024) utilized an environmental-economic accounting system to improve conservation area management data and statistics in Uzbekistan, although not directly using METT, but still contributing to the development of a more holistic evaluation approach. Overall, METT has proven to be a useful tool in supporting the improvement of the quality of conservation area management globally.

With an area of 27,868.30 hectares which is divided into a protected forest area covering an area of 22,908.3 hectares and the Arjuno-Lalijiwo Nature Reserve covering an area of 4,960 hectares, Tahura R. Soerjo needs clear zoning to separate the functions among ecosystem protection, research, and the use of natural tourism. The development of infrastructure such as hiking trails, camping grounds, toilets, prayer rooms, and parking areas is carried out with environmentally friendly principles to minimize negative impacts on natural habitats. The surrounding community such as residents of Sumberbrantas, Claket, and Galengdowo villages are also involved in tourism management through the provide parking lots, stalls, homestays, and training as tour guides. In addition, Tahura was also developed as an environmental education center through school visit programs, nature interpretation, and activities such as forest bathing and outbound.

Table 4.1 presents the operational framework for the implementation of METT in Tahura R. Soerjo, as a systematic effort to evaluate and improve the effectiveness of conservation area management. The METT is an assessment tool developed by WWF and the World Bank, which aims to measure the extent to which conservation goals are achieved through a planned management process.

To improve accessibility and promotion, digital information is provided in the form of an official website, social media, and an online reservation system. The management of this METT is supported by routine monitoring of the preservation of flora-fauna, law enforcement against environmental violations, and periodic evaluation of the impact of tourist visits.

Table 4.1. METT Management Model Tahura R. Soerjo

Stages	Mechanism	Executive	Indicator	Expected Results
Preparation	Collect basic regional data, assemble an implementation team, and set evaluation goals.	Area managers, academics, NGOs	Basic data on legal status, territorial boundaries, and species inventories.	The implementation team is ready and the initial data is collected for evaluation.
Data Collection	Conducting field surveys, interviews with stakeholders, and filling out METT questionnaires.	Area managers, field staff, NGOs	The level of threat (e.g., encroachment, fire), available resources, and activities performed.	Field information and stakeholder input were collected.
Data Analysis	Processing questionnaire data, identifying strengths and weaknesses, and determining METT scores.	Team of experts and area managers	Scores for the six elements of METT: context, planning, input, process, output, and outcome.	An overview of the effectiveness of area management based on METT scores.
Recommendations	Develop improvement plans based on evaluation results.	Implementation team with stakeholders	Action plans to address weaknesses, such as increasing human resource capacity.	Mutually agreed improvement strategies to improve management effectiveness.
Implementation	Implement recommendations and monitor improvements made.	Area managers and local partners	Positive changes to indicators such as threat reduction or increased management effectiveness.	A real improvement in the management of conservation areas.
Monitoring and Re-evaluation	Conduct periodic reassessments using METT to measure progress.	Independent area managers and experts	An improved METT score over time.	Continuous assessment that shows increased management effectiveness.

The implementation of METT in the R. Soerjo Forest Park begins with the initial preparation and identification of the context of the area, which includes an understanding of the legal status, conservation objectives, ecosystem types such as mountain forests and water sources, as well as key threats such as deforestation, encroachment, and unlawful activities. In

addition, the socio-economic conditions of the surrounding community are an important aspect in the evaluation process.

The model is designed in six main stages—preparation, data collection, data analysis, recommendation, implementation, and monitoring and re-evaluation—each of which is complemented by an implementation mechanism, key implementers, indicators of success, and expected outcomes. This approach ensures that the evaluation process is not only descriptive, but also participatory, evidence-based, and sustainable. Through this model, Tahura R. Soerjo managers can obtain an impartial picture of the current management's strengths and weaknesses, so that they are able to formulate targeted improvement strategies. In addition, the regular implementation of METT will support transparency, accountability, and capacity building for area management, as well as the basis for better decision-making and the achievement of long-term conservation targets.

The next stage is the preparation of the METT evaluation team consisting of area managers, field staff, academics, environmental NGOs, local communities, and relevant government agencies, with the help of national or international METT experts to maintain the objectivity of the results. The assessment was then carried out based on six elements of the METT, namely: context (threat analysis, legal status, regional relevance), planning (RPK, integration of climate and disaster issues), inputs (human resources, budget, infrastructure), processes (program implementation, monitoring, patrols, community participation), outputs (direct activities such as rehabilitation and training), and outcomes (impacts on biodiversity sustainability and threat reduction). In the data collection stage, structured interview methods, field observation, document analysis, and technologies such as GIS and tracking applications are used to identify threat hotspots and patrol effectiveness. Community participation through FGD also provides important input. After the data is collected, a result analysis is carried out and the identification of weak and strong points in regional management, for illustration, if deficiencies are found in the budget or human resources, recommendations will be focused on increasing the capacity. Based on these findings, strategic recommendations were prepared such as improving inter-agency coordination, expanding community participation in ecotourism, optimizing budgets for the protection of landslide-prone areas, and developing ecosystem-based

climate adaptation and disaster mitigation plans. METT is not only carried out once, but as part of a periodic evaluation cycle to determine the development of management effectiveness over time, which can be the basis for the preparation of annual reports, funding proposals, and RPK revisions. The implementation of METT in the R. Soerjo Nature Reserve brings various significant benefits, such as increasing transparency and accountability of management, providing a comprehensive picture of management effectiveness, being the basis for data-driven strategic planning, strengthening cross-stakeholder collaboration, and supporting the achievement of national and global targets such as SDGs Goal 15 (Life on Land). With this approach, Tahura R. Soerjo is expected to be an illustration of sustainable management of protected forest areas, providing balanced ecological, social, and economic benefits for the community and future generations.

The apply METT in the management of conservation areas not only focuses on improving management effectiveness, but also brings broad impacts in various important aspects, namely ecological, social, and economic. As a data-driven evaluation tool, METT can provide a comprehensive picture of the success of area management and potential improvements that can be made to achieve conservation goals more holistically.

1. Ecological Impact of METT Implementation

The apply METT in the management of conservation areas has shown various positive impacts on ecosystems. One of them is to improve ecosystem health through the identification of threats such as encroachment, deforestation, and pollution, so that more effective mitigation can be carried out. METT also supports biodiversity conservation by providing data-driven evaluations that help ensure threatened species and habitats can be protected through evidence-based policies. In addition, METT promotes sustainable management of natural resources by monitoring the success of conservation measures on the ground. The study (Kirkman et al., 2023) shows that the implementation of ecosystem-based management in South Africa's marine regions improves the health of marine ecosystems. A similar study (Caballero-Rico et al., 2024) in Mexico's biosphere reserves found significant improvements in local habitat preservation and post-evaluation ecological threat mitigation using METT.

In the Philippines, Nuque et al. (2025) proved that METT is effective in identifying threats and formulating appropriate conservation strategies. (Hummel et al., 2021) also developed the Protection Level Index (PLI), a tool that complements METT with ecological and social indicators specific to specific location contexts. Community participation in tropical forest monitoring, as shown (Crowe et al., 2023), contributes to improving the quality of data and the effectiveness of conservation actions. METT has also been shown to be useful in anticipating climate risks, as found by (Coldrey et al., 2022) in South Africa. (Field et al., 2025) emphasized the importance of effective management in achieving national conservation targets in marine areas, while (Brown et al., 2023) found that entry fees in marine areas can improve ecological outcomes through financial support for conservation programs. Overall, METT is not only an evaluation tool but also an important instrument in improving ecosystem resilience and sustainability of conservation area management.

2. Social Impact of METT Implementation

The implementation of METT not only has a positive impact on the ecological aspect, but also makes a significant contribution to increasing public participation and awareness in conservation. One of the main social impacts is increased public awareness, as the direct involvement of local communities in the METT evaluation process helps increase their understanding of the importance of safeguarding conservation areas. In addition, METT is effective in encouraging the involvement of stakeholders, including local governments, NGOs, local communities, and academics to work together in designing and implementing regional management in a more inclusive and participatory manner. This in turn strengthens social ties and a sense of community ownership of conservation areas, thereby increasing collective responsibility for their preservation. The study by Kirkman et al. (2023) shows that stakeholder engagement in South Africa's marine region has succeeded in increasing cross-sector collaboration and public awareness. In Taiwan, (Huang et al., 2024) proved that community participation in the management of marine protected areas contributes to increasing the role of communities in the management of marine resources. Zafra-Calvo & Geldmann (2020) emphasized the importance of social justice in conservation by involving local communities as a way to reduce human pressure on protected areas. Research (Aad et al., 2024) in Lebanon

shows that consultation with local stakeholders can produce relevant and contextual sustainability indicators. (Mahajan et al., 2024) introduced the Elinor tool that facilitates active community participation in monitoring conservation area governance. In Mexico, Caballero-Rico et al. (2024) noted an increase in local community involvement in data-driven management post-implementation of METT. Crowe et al. (2023) highlight the importance of the contribution of indigenous peoples in monitoring the condition of tropical forests and assisting in the formulation of conservation policies. Meanwhile, Brown et al. (2023) found that entry fees in marine areas not only support conservation funding, but are also used to educate the public about the importance of environmental protection. Thus, METT is not only a technical tool, but also an effective social empowerment instrument in the management of conservation areas.

3. Economic Impact of METT Implementation

The apply METT in the management of conservation areas make an important contribution to the economic aspect, one of which is through increasing nature-based tourism. By evaluating the effectiveness of management, METT ensures that the area remains sustainable and attractive to tourists, thus supporting the development of sustainable tourism. In addition, METT helps improve the efficiency of resource allocation, as it can identify urgent management priorities, so that budgets and resources can be used more on target. Furthermore, by increasing management effectiveness, METT also contributes to the maintenance of ecosystem services such as the provide clean water, flood control, and carbon sequestration that have high economic value for the surrounding community and the country. (Nugraha et al., 2024) showed that the METT evaluation of 422 conservation areas in Indonesia succeeded in improving management scores while increasing the attractiveness of natural tourism. Negru et al. (2020) also noted the economic benefits of the implementation of METT in 12 Ecuadorian national parks, especially in maintaining the continuity of ecosystem services such as the provide clean water. A study by Kirkman et al. (2023) in South Africa confirms that better ocean management has a direct impact on improving economic outcomes through conservation and increasing the number of tourists. Coldrey et al. (2022) assessed the importance of data-driven management strategies to protect ecosystem services from the threat of climate change in South

Africa's national parks. (Graham et al., 2021) emphasized the importance of funding transparency and resource allocation in maintaining the sustainability of conservation areas in Southeast Asia. The COVID-19 pandemic poses a major economic challenge for conservation areas, such as the one in Plitvice Lakes National Park, Croatia, where the reduction in income from tourism has greatly affected the management of the area (Mandić, 2023). (Pascal et al., 2021) offer innovative solutions through an ecosystem services-based impact investment model in the Dominican Republic, with funding coming from the cost of entering marine areas. Finally, Wilson & Anthony (2023) highlight the important role of METT in monitoring the management effectiveness as well as the economic benefits generated by the Kruger to Canyons biosphere region in South Africa. Overall, the METT is not only a technical evaluation tool, but also an important instrument in strengthening the sustainable economic foundations of conservation areas.

The apply METT in conservation area management has been proven to be effective in improving the quality of management through a data-based, participatory, and comprehensive approach. METT not only helps identify strengths and weaknesses in management systems, but also provides strategic recommendations for continuous improvement. The impact is felt in various aspects, namely ecological, with improving ecosystem health and preserving biodiversity; social, through increasing community participation, environmental awareness, and strengthening the sense of ownership of protected areas; and economy, by optimizing resource allocation, increasing income from the natural tourism sector, and protecting high-value ecosystem services. Therefore, METT is a highly relevant and strategic evaluation tool to support the management of conservation areas in a holistic, transparent, and sustainable manner, both at the local and global levels.

The emergence of "The Digital Forest" represents a paradigm shift in how we conceptualize, monitor, and manage forest ecosystems through advanced technological integration. This digital transformation fundamentally reimagines forests not merely as physical entities but as complex data-rich systems that can be modeled, simulated, and managed through sophisticated digital interfaces.

The concept of forest digital twins, as explored (Döllner et al., 2023; Qiu et al., 2023), represents the most comprehensive manifestation of this

digital revolution. These digital twins create virtual replicas of forest ecosystems that integrate spatial and temporal data to enable real-time monitoring and predictive modeling. Unlike traditional forest management approaches that rely on periodic surveys and static data, digital twins offer dynamic, continuously updated representations that capture the forest's evolving state. The bidirectional interaction capability highlighted by Qiu et al. allows forest managers to not only observe but also simulate interventions and predict their outcomes before implementation, fundamentally changing the risk profile of forest management decisions.

The technological infrastructure supporting these digital forests draws from multiple data sources and methodologies. (Marsel et al., 2021) demonstrate how remote sensing data combined with ground-based forest inventory creates more accurate and comprehensive forest models. This multi-source data integration addresses the historical challenge of scale in forest monitoring - bridging the gap between detailed local observations and landscape-level patterns. The educational and research applications of these models extend beyond management, creating new possibilities for understanding forest dynamics and training the next generation of forest professionals in virtual environments that would be impossible or impractical to access physically.

Perhaps most intriguingly, (Westerlaken et al., 2023) push the boundaries of digital forest conceptualization by incorporating "more-than-human" participants. Their work on bioindicators as part of sensor networks suggests a hybrid approach where biological and digital sensing systems work in tandem. This represents a philosophical shift from viewing technology as separate from nature to seeing it as potentially integrated within ecological systems. The use of organisms as living sensors creates a more nuanced and ecologically embedded monitoring system that captures dimensions of forest health that purely technological sensors might miss.

The practical applications of digital forest technologies extend across multiple domains. (Bychkov et al., 2021) demonstrate regional implementation through their Baikal platform, showing how digital systems can enhance resource efficiency at landscape scales. This regional approach highlights the scalability of digital forest technologies and their potential for addressing large-scale environmental challenges. Similarly, (Jäntti & Aho, 2024) reveal how digital transformation in Nordic forestry

operations has yielded tangible benefits in productivity and operational transparency, suggesting that the digital forest concept has moved beyond experimental phases to deliver real-world value.

The intersection of digital forests with climate change and biodiversity conservation represents a critical frontier. (Afsar et al., 2024) exemplify this through their Biodiversity Digital Twin prototype, which uses predictive modeling to anticipate species responses to climate scenarios. This predictive capacity transforms conservation from reactive to proactive, allowing managers to implement protective measures before critical thresholds are crossed. The ability to simulate multiple climate scenarios and their impacts on biodiversity provides unprecedented decision-support capabilities for conservation planning.

However, as (Gabrys et al., 2022) astutely observe, the digitalization of forests is not merely a technical process but a deeply political one. The creation of "political forests" through digital technologies raises important questions about data ownership, access, and control. Who decides what aspects of forests are digitized? How is indigenous and local knowledge incorporated into digital models? These socio-technical considerations remind us that digital forests exist within complex governance frameworks and power structures that shape their development and application.

The digital forest paradigm ultimately represents a fundamental reconceptualization of human-forest relationships. By creating comprehensive digital representations that can be monitored, modeled, and managed remotely, these technologies potentially democratize access to forest information while simultaneously raising concerns about the abstraction of natural systems into data. The challenge moving forward will be to harness the undeniable benefits of digital forest technologies - enhanced monitoring, predictive capabilities, and operational efficiency - while maintaining meaningful connections to the physical, biological, and cultural realities of actual forests. The success of the digital forest concept will ultimately depend on its ability to enhance rather than replace traditional forms of forest knowledge and stewardship.

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A. Management Model

The management of the Great Forest Park (Tahura) is one of the important endeavors in maintaining the sustainability of ecosystem functions and biodiversity conservation in Indonesia. As a conservation area that has ecological, educational, and recreational value, Tahura not only plays a role as a green lung but also as a medium to increase public awareness of the importance of protecting nature. In the context of its management, a clear and integrated policy is needed, supported by planned management practices and involves the active participation of various parties such as local and central governments, academics, non-governmental organizations, and local communities around the region. The success of Tahura management is highly dependent on synergy among stakeholders, as well as an understanding of the goals of environmental conservation and sustainable use of resources. One of the crucial aspects in the management of Tahura is good zoning planning. Zoning is the basis for spatial planning and proportional use of the area, so that there is no conflict among conservation needs and the socio-economic activities of the surrounding community. In addition, biodiversity conservation endeavors must be the main focus in every stage of management, given the increasing threats to endemic flora and fauna habitats due to deforestation, habitat fragmentation, and climate change. A study conducted by Samsul Kamal et al. (2024) shows that deforestation in Tahura Pocut Meurah Intan has a direct impact on the decline in plant diversity that is a source of feed for Bucerotidae birds, one of the indicators of forest ecosystem health. This emphasizes that the management of Tahura must not ignore ecological principles and the protection of natural habitats.

In addition to the technical aspects of management, strategic communication among stakeholders is an important element in ensuring that policy implementation can run effectively. According to (Rafi et al., 2024), stakeholder perceptions of Tahura management in Riau show the need for a more inclusive and transparent communication strategy, to build collective awareness of the importance of conservation functions and strong institutional development. Without mutual understanding and harmonious coordination, the implementation of Tahura management policies often encounters obstacles, such as lack of regulatory socialization, weak institutional capacity, and lack of community participation in the decision-making process. The management of Tahura is also inseparable from the dynamics of ecotourism and sustainable business development. In Central Java, (Suciarto & Ferijani, 2020) noted that the apply the green business concept in ecotourism provides a balanced management model among environmental conservation and community economic empowerment. This model is relevant to be developed in the Tahura area, noting that the use of the area must remain within the corridor of sustainability principles and not damage the ecosystem structure. Similarly, (Kamal et al., 2024) highlight the importance of collaboration among institutions in tourism development in conservation areas, which can serve as an illustration in the formation of multi-stakeholder cooperation at the local and national levels.

In addition, the management of Tahura in urban areas also requires a special approach, as explained (Mubarak et al., 2020) in the case study of Tahura Dr. Muhammad Hatta in Padang. This urban forest area is facing considerable pressure due to urbanization and infrastructure growth. Therefore, an adaptive, flexible, and responsive management model to changes in the social and ecological environment is needed so that the function of Tahura is maintained even in a dynamic urban context. The buffer zone is also an integral part of the management of Tahura, as a buffer zone that aims to reduce the pressure of human activities on the core of the conservation area. (Nadhira & Basuni, 2021) mentioned that buffer zones not only function as ecosystem protectors, but also as potential areas for environment-based economic development involving the surrounding community. In addition, the protection of ecological corridors as researched (Abdullah

et al., 2021) in the CFS Ecological Corridor, is important to maintain the habitat connectivity of wild species, especially mammals that are prone to habitat fragmentation. The presence of these corridors supports species migration and increases the overall resilience of the ecosystem.

The ideological influence of the global conservation movement also cannot be ignored in shaping Tahura management policies in Indonesia. As reviewed (Khairina & Rahmania, 2023), the history of conservation in Indonesia has been heavily influenced by international norms, ranging from the Convention on Biological Diversity (CBD), Sustainable Development Goals (SDGs), to various other global environmental initiatives. The scientific framework and international policy are important references in the formulation of national and regional policies related to the management of conservation areas, including Tahura. The management of Great Forest Parks requires a holistic approach that includes conservation-based policies, multi-stakeholder active roles, and adaptive management practices. This effort not only aims to maintain the balance of the ecosystem, but also to ensure that Tahura can provide ecological, social, and economic benefits in a sustainable manner for current and future generations. For this reason, synergy among agencies, information transparency, and public awareness are the main foundations in realizing sustainable and sustainable Tahura governance.

Figure 5.1. is a distribution map of the Great Forest Park (Tahura) in Indonesia that shows the location and area of each Tahura in various provinces from Aceh to Papua. This map illustrates that Tahura is geographically spread throughout Indonesia, by the acknowledgment in the text that Tahura has ecological, educational, and recreational values that are important for environmental and community sustainability. Each Tahura has a different area, such as Tahura Dr. Muhammad Hatta in Aceh covering an area of 12,100 hectares, Mount Menumbing in Jambi covering an area of 3,333.20 hectares, and Murhum in North Kalimantan which reaches 112,000 hectares, showing the great role of this area as a green lung and natural habitat that must be protected. Although the map does not explicitly show the division of zoning, Tahura's distribution and extent indicate the need for a proportionate and zoning-based management approach to avoid conflicts among the conservation needs and socio-economic activities

of the surrounding communities. In addition, the spread of Tahura in various regions also emphasizes the importance of collaboration across stakeholders, including central and regional governments, academics, NGOs, and local communities in maintaining the sustainability of the region. Some Tahura, such as Dr. Muhammad Hatta in Aceh and Rajo Lelo in Banten, are located in urban areas, so they require management strategies that are adaptive and responsive to the pressures of urbanization and infrastructure growth. The great potential of Tahura is also seen in the development of ecotourism and sustainable businesses, such as in Gunung Menumbing and Murhum, which can be a model for managing areas that are balanced among nature conservation and community economic empowerment. In addition, the spread of Tahura on various islands supports the need to protect ecological corridors to maintain the connectivity of endemic flora and fauna habitats. This image is also the basis for increasing strategic communication and public awareness about the importance of maintaining the existence of Tahura as a national asset. Thus, this map visually represents the challenges and opportunities in holistic Tahura management, involving synergy among agencies, active community participation, and sustainable approaches to maintain ecosystem functions and long-term socio-economic benefits.

Tahura R. Soerjo, located in East Java with an area of about 27,868.30 hectares, is one of the important conservations areas on the island of Java. The main focus of Tahura R. Soerjo management is to maintain the sustainability of the forest ecosystem, especially as a water catchment area and green lungs in increasingly dense urban areas, such as Malang City and its surroundings. This area acts as a buffer zone that not only protects local biodiversity, but also helps reduce environmental pressures due to urbanization and land conversion. In addition, Tahura R. Soerjo has great potential in the fields of sustainable education, research, and ecotourism, so that it can provide ecological, social, and economic benefits to the surrounding community. Its management requires a clear zoning strategy, active community participation, and cross-sector coordination to ensure that the conservation function is maintained amid regional development dynamics.

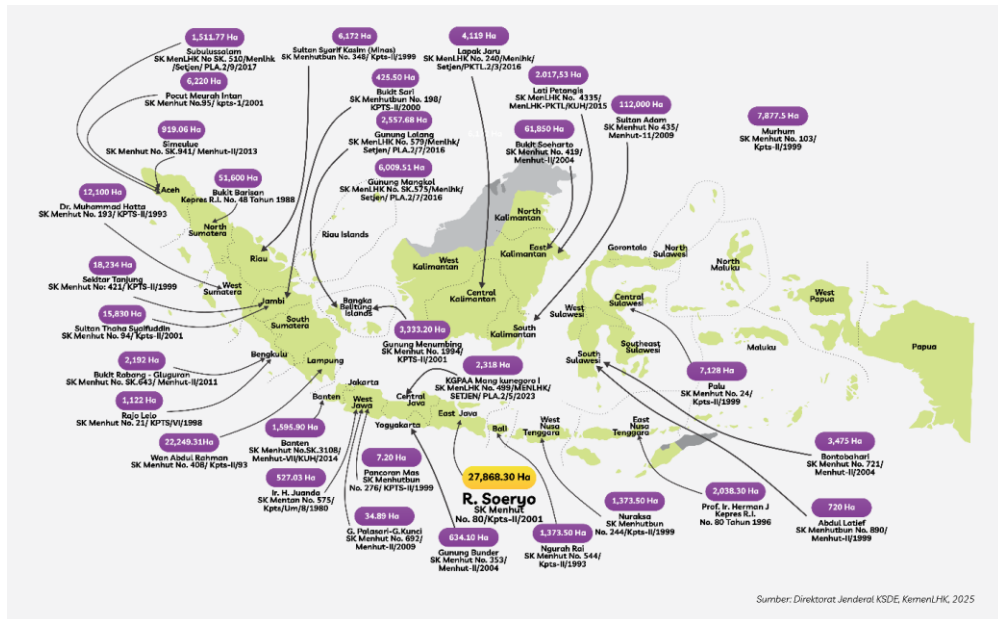


Figure 5.1. Forest Parks in Indonesia

1. Concept of Forest Park Management Policy (Tahura)

The management of Forest Parks (Tahura) in Indonesia requires a holistic, integrated, and sustainable policy framework to maintain ecological functions while providing social and economic benefits to the surrounding communities. The concept of Tahura management policy must be designed with a collaborative governance approach, which is a governance model that involves the central and regional governments, local communities, academics, and the private sector as the main stakeholders. This model is necessary considering the complexity of issues faced by conservation areas, such as land use conflicts, habitat fragmentation, urbanization pressures, and challenges in community participation. Adil Mubarak et al. (2020) show that in urban contexts, such as in the case of Tahura Dr. Muhammad Hatta in Padang, management models that do not involve stakeholders in an inclusive manner often fail to be implemented. Therefore, it is important to design policies that are responsive to the dynamics of the social and ecological environment, as well as having flexibility in adapting to change.

One of the foundations of the Tahura management policy is a clear zoning system. Zoning is the basis for spatial planning and division of regional functions so that there is no overlap among conservation, recreation, and resource use activities by the community. (Sembiring et

al., 2025) in the analysis of the management strategy of the Bukit Barisan area suggested a SWOT-based approach to develop a more targeted management strategy. In addition, the protection of buffer zones is also very important to reduce the direct pressure from human activities on the core of the conservation area. Samuel Ziem Bonye et al. (2023) noted that conflicts over the use of natural resources around conservation areas such as Mole National Park in Ghana often occur due to unclear boundaries and community access rights. This is an important lesson in designing fair and transparent policies, including in the distribution of economic benefits and participation in the decision-making process.

In addition, the development of sustainable ecotourism is one of the main pillars in Tahura's management policy. The great potential of ecotourism can be used to increase public awareness of conservation value while supporting the local economy. (Sulistiyadi et al., 2020) emphasized the importance of multi-stakeholder forums in conservation-based tourism management, especially in coordinating various interests and ensuring that tourism activities do not damage the ecosystem structure. Azdren Doli et al. (2021) also found that public participation in the form of a willingness to pay for regional development can be an innovative alternative to conservation funding. This approach is relevant to be developed in the Tahura region, noting that the principles of sustainability and education remain top priorities.

Tahura's management policy must also be supported by strong regulations and an effective institutional system. (Setiawan et al., 2023) highlight how local wisdom can be the foundation in the formulation of more inclusive and sustainable conservation policies. The integration of local cultural values and traditions in the management of Tahura can increase community ownership of the area. (Tiffany et al., 2022) added that the need for a cross-border administrative policy in the management of conservation areas, especially in overcoming problems such as the spread of pests or habitat degradation that does not know territorial boundaries. This confirms that coordination among institutions and the government level is crucial in the implementation of Tahura's management policy.

At the national and international levels, policy support and legal instruments are important elements in strengthening the management

of Tahura. (Awazi, 2025) underlined the challenges in harmonizing conservation policies among the national and local levels, especially in maintaining a balance among the conservation of endangered species and the use of resources by communities. Frameworks such as the CBD, SDGs, and various other global conservation standards can be used as a reference in national and regional policymaking. Thus, the integration of international norms with the local context is the key to maintaining the credibility and effectiveness of Tahura management in the future.

The concept of Tahura management policy must reflect a holistic, participatory, and sustainable approach. Strengthening zoning, multi-stakeholder collaboration, community-based ecotourism development, institutional strengthening, and strong regulatory support are crucial elements in the success of regional management. Without synergy among stakeholders and an understanding of the goals of environmental conservation, it will be difficult for Tahura management endeavors to achieve optimal results. For this reason, it takes a joint commitment and collective awareness that Tahura is not only an ecological asset, but also social and economic capital that must be preserved for future generations.

2. Forest Park Management Policy

The management of the Great Forest Park (Tahura) as a conservation area that has ecological, educational, and recreational value requires a comprehensive and sustainable approach. Best practices in Tahura management include the holistic integration of ecosystem management by involving local communities and stakeholders, the apply technology for biodiversity monitoring, restoration of degraded habitats, and the strengthening of collaboration-based governance. One of the important principles in this practice is the adaptive approach, which is management that not only focuses on protecting the area but is also able to adapt to changes in the social, economic, and climatic environment. Thus, the Tahura management policy can maintain a balance among nature conservation and the sustainable use of resources. Ecosystem management integration starts from the preparation of a participatory and transparent management plan. This process must involve local communities, academics, non-governmental organizations, and

government agencies so that any policies taken receive broad support and can be effectively implemented on the ground. This is in line with the study of (Lauren et al., 2022) on the management plan of the Penjaringan City Forest Park in North Jakarta, which shows that visitor engagement and attraction analysis are very important in designing urban green spaces that are environmentally friendly and beneficial to the community. In addition, an inclusive management model can increase community ownership of the area, thereby encouraging active participation in conservation endeavors.

Technology is also an integral part of modern Tahura management practices. The use of technologies such as drones, artificial intelligence (AI), and geographic information systems (GIS) has proven effective in monitoring biodiversity, detecting invasive species, and evaluating habitat conditions in real-time. This innovative illustration is shown in a study (Pedro et al., 2024) titled "De Olho na Mata", in which the use of drones and few-shot learning was used to monitor invasive species in Brazil's Atlantic forests. This kind of technology is relevant to be developed in Indonesia, especially in monitoring changes in vegetation and distribution of endangered animals in the Tahura area. In addition, monitoring of greenhouse gas emissions in urban forests such as those carried out (Künneemann et al., 2022) also provides important insights into the contribution of Tahura to climate change mitigation, especially in the context of green spaces in urban areas.

Habitat restoration is one of the important elements in maintaining the sustainability of the Tahura ecosystem. Land degradation due to human activities or climate change often leads to the loss of the natural habitat of endemic flora and fauna. Therefore, restoration programs should be designed in stages and science-based. (Mirea et al., 2021) study on the conservation of saproxilic beetles in the Carpathian Mountains shows that habitat restoration that preserves natural structures, such as old trees and dead wood, is essential for preserving biodiversity. In Indonesia, this concept can be applied in Tahura by restoring native vegetation, reducing the dominance of invasive plants, and rehabilitating damaged areas. For illustration, (Pielech et al., 2025) managed to restore natural vegetation through the gradual removal of Scottish pine (*Pinus sylvestris*) in European natural

forest areas, proving that scientific and strategic approaches in restoration can yield significant results in the long-term.

In addition, the control of invasive species is also a priority in the management of Tahura. Invasive species such as *Acacia mangium*, *Grevillea robusta*, or *Chromolaena odorata* can disrupt natural ecosystems and reduce local biodiversity. (SARIYILDIZ & DUMAN, 2020) in their research showed the importance of analyzing site and vegetation characteristics in identifying the risk of pest attacks such as *Ips typographus*. By understanding the distribution pattern and environmental factors that influence, Tahura managers can design a more targeted control strategy. The integration of field data with digital technology speeds up the process of identification and intervention, so that the negative impact of invasive species can be minimized.

In the context of community economic empowerment, sustainable ecotourism development is one of the best practices that can provide direct benefits to the communities around the region. Ecotourism not only increases public awareness of the importance of conservation, but also creates jobs and alternative sources of income for local communities. (Sulistiyadi et al., 2020) emphasized the importance of multi-stakeholder forums in conservation-based tourism management, while (Dhananjani & Mahaulpatha, 2022) underlined the need for clear zoning to avoid disturbance to wildlife due to visitor activities. Therefore, ecotourism management must be carried out with sustainability principles, including limiting the number of visits, educating visitors, and implementing strict environmental standards.

Cross-sector collaboration and regulatory harmonization are the main foundations in the implementation of effective Tahura management policies. National regulations such as Law Number 41 of 1999 on Forestry and the Regulation of the Minister of Environment and Forestry must be in line with regional policies and international norms such as the CBD, the Paris Contract, and the SDGs. (Mansuy et al., 2022) in their study of forest restoration policies in Canada affirmed that harmonization among national, regional, and local policies is essential to ensure smooth implementation on the ground. In addition, synergy among institutions such as the Ministry of Environment and Forestry, BPDASHL, universities, and NGOs can strengthen institutional capacity in the management of Tahura.

Social justice and benefit distribution are also principles that should not be ignored. Good practices in the management of Tahura should ensure that local communities have equitable access to the economic, social, and cultural benefits of the area. (Bonye et al., 2023) noted that resource use conflicts often occur around conservation areas due to unclear access rights and benefit distribution. Therefore, policies must be designed with the principles of active community participation, transparency in resource management, and fair resolution mechanisms to resolve conflicts if they occur. Good practices in Tahura management policies must be based on an adaptive, participatory, and sustainable approach. Technological integration, habitat restoration, invasive species control, strengthening ecotourism, and synergy among stakeholders are the main pillars in maintaining ecosystem functions and improving the quality of life of the surrounding community. Without the apply these principles, it will be difficult to achieve long-term conservation goals. For this reason, a joint commitment from all parties — from the government, academics, local communities, to international organizations — is needed in realizing sustainable and equitable Tahura governance.

B. Stakeholder Mapping

Stakeholder mapping is a crucial element in the preparation and implementation of Forest Park management policies (Tahura). This process aims to identify, understand, and manage the roles and interests of various parties involved directly or indirectly in the management of the area. By conducting systematic mapping, the government and Tahura managers can reveal the strength structure, potential for collaboration, and conflicts that may arise among stakeholders. This is an important basis for designing inclusive, participatory, and sustainable policies. Stakeholders who are generally involved in the management of Tahura include central and local governments, local communities around the region, academics, non-governmental organizations (NGOs), the private sector, and international organizations that contribute to funding or drafting global conservation norms.

1. Social Network Analysis (SNA)

One of the methods often used in stakeholder mapping is SNA, which helps visualize relationships and interactions among stakeholders. (Anshor et al., 2023) in a study on Tambora National Park showed that SNAs were effective in mapping the influence and interests of the 38 stakeholders involved, thus making it easier to identify key groups that should be involved in the decision-making process. In addition, (Wahyuni et al., 2022) used Participatory Action Research (PAR) in the Tahura Nipa-Nipa case study to map the role of stakeholders while empowering them in endeavors to restore hydrological functions and conserve biodiversity. This kind of participatory approach is particularly relevant in the Indonesian context, where local communities have a direct affinity with the Tahura ecosystem and have high-value traditional knowledge in natural resource management.

SNA is an analysis method used to map, describe, and analyze relationships among stakeholders in social systems. In the context of managing the Great Forest Park (Tahura), SNA serves as a strategic tool to understand the structure of the network of actors, the level of connectivity, and the dynamics of interaction among the government, local communities, NGOs, academics, the private sector, and other related agencies. This method allows for the visualization of relationships in the form of a network that shows the position, role, and influence of each actor. By identifying nodes (actors) and edges (relationships), SNA helps reveal who the key actors are, how information flows, and potential collaborations or conflicts that may occur in the environmental policy decision-making process.

The implementation of SNA is very relevant in increasing the effectiveness and transparency of Tahura management. One illustration is the research of (Ekasari et al., 2020) which uses tools such as NodeXL and Gephi to map the connectivity among stakeholders in forest fire management in the conservation area of Kuningan Regency. The results provide a clear picture of the key actors that have high connectivity and communication gaps that need to be addressed. This shows that SNA is not only useful for mapping relationships, but also for designing more inclusive and participatory communication strategies. Anshor et al. (2023) in a study on Tambora National Park also

succeeded in using SNA to evaluate the level of influence and relationship patterns among 38 stakeholders, so as to identify groups that are the center of power in the management of the area.

In addition, SNA also contributes to supporting ecosystem restoration and the development of sustainable rehabilitation strategies. (Wulandari et al., 2023) in their research on Orang Kayo Hitam Peat Swamp Park Forest utilized SNA to identify key stakeholders in peatland restoration strategies. Through this approach, they managed to map actors who have access to important resources, such as funding, technology, and local knowledge. This is the basis for the preparation of an action plan that involves all parties in a proportionate and balanced manner. In addition, (Villodre et al., 2023) added that SNA can be used to identify socio-ecological indicators in protected area landscapes, thereby enriching the database in evidence-based decision-making.

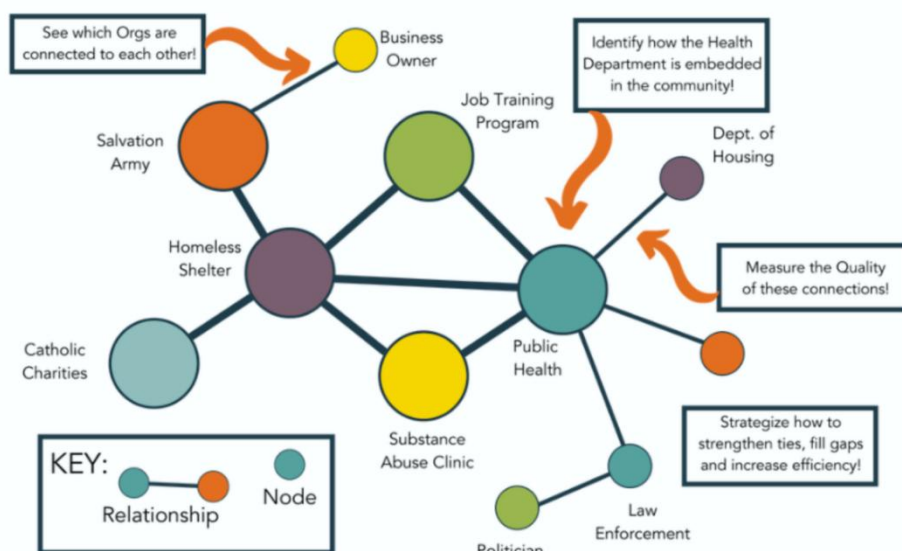
In the context of communication and public participation, SNA also shows its usefulness in analyzing interactions through social media. (Martín Sánchez & Gómez Lobo, 2023) in their study entitled "Urban Forest Tweeting" explain how SNA is used to map multi-stakeholder conversations on Twitter related to urban forest management. This analysis helps to understand the dominant narrative, the actors who are most active in disseminating information, as well as the public's response to certain policies. In Indonesia, similar applications can be carried out to monitor public opinion and evaluate stakeholder perceptions of Tahura's management policies, especially to increase collective awareness and active participation of the community. (Mizuuchi & Son, 2024) in a comparative study of Japan-Korea also used SNA to map tourist preferences in national parks, providing important insights into the development of sustainable tourism.

The SNA approach is also relevant in understanding the socio-economic and cultural dynamics that affect the management of Tahura. (Sierra Ferrero et al., 2024) in a study of conservation discourse in Spain used SNA to analyze the discourses that develop in society, including resistance to certain policies and support from certain groups. This research shows that SNA can be a tool to understand the diversity of perspectives and interests in the environmental decision-making process. A similar thing was done (Pontón-Cevallos et al., 2022) in

mangrove ecosystems, where SNA is used to map relationships among fishers and related institutions, thus helping to design conservation programs that are more in line with local realities.

The integration of SNA with digital technology further expands the scope and effectiveness of this analysis. Nitoslawski et al. (2021) in their study titled "The Digital Forest" highlight how SNA can be combined with digital platforms to increase transparency and accountability in forest management. Technologies such as GIS, big data, and mobile applications can be used to collect and analyze data in real-time, making it easier to map and monitor stakeholder networks. (Hamel et al., 2021) also show how SNA can be combined with Integrated Valuation of Ecosystem Services and Trade-offs (InVEST) software to map ecosystem benefits while identifying influential actors in its use. This integration is very useful in building policies based on real ecological, economic, and social values.

WHAT IS SOCIAL NETWORK ANALYSIS?



source: <https://visiblenetworklabs.com/2024/02/14/social-network-analysis-tools-for-mapping-relationships/>

Figure 5.2. SNA Model

Figure 5.2. displays an illustration of a network diagram consisting of nodes with labels such as "Business Owner", "Public Health", and "Job Training Program", which are connected by a line (edge) as a symbol of interaction or linkage among actors. Each element in the image is provided with a brief explanation showing how SNA can be used to see connections among organizations, understand the standing of specific institutions in the community, measure the quality of relationships, and design strategies to strengthen partnerships and collaboration efficiency. The same concept is very relevant in the management of Tahura, where many stakeholders have different interests and influences on the sustainability of the area. Through SNA, managers can identify dominant groups, uncover coordination gaps, and increase community participation in the decision-making process.

In the context of Tahura's management policy, the implementation of SNA supports transparency, accountability, and multi-stakeholder collaboration. The results of network mapping can be the basis for developing adaptive strategies that not only focus on protecting ecosystems, but also ensuring a fair distribution of benefits to the surrounding community. In addition, SNAs help identify actors who have access to critical resources, such as funding, technology, and local knowledge, so that managers can design more inclusive and participatory programs. The integration of SNA with digital technology further expands its scope, allowing data to be collected in real-time and analysis results presented in a visual format that is easy for all parties to understand. Thus, SNA is not only an analysis tool, but also a strategic instrument in building sustainable and collaboration-based Tahura governance.

SNA is an analytical method used to map, analyze, and visualize the relationships among stakeholders in a social system. In the context of the management of the Great Forest Park (Tahura), SNA plays an important role in identifying the network structure of actors, connectivity, and dynamics of interaction among the government, local communities, NGOs, academics, the private sector, and other related agencies. This method allows managers to see who the key actors in the network are, how information flows and decision-making are going, and any potential conflicts or collaborations that need to be managed. The image titled "What is SNA?" provides a visual illustration of how

SNA works through the representation of nodes as actors and edges as relationships among them. This visualization helps to understand the position and role of each stakeholder in the area management process.

SNA is a very useful analytical tool in the management of Tahura. Stakeholder network mapping helps identify key actors, understand power structures, and evaluate potential synergies or conflicts in the policy process. With this approach, Tahura managers can design a more participatory, inclusive, and sustainable strategy. In addition, the integration of SNA with digital technology, participatory surveys, and social discourse analysis further enriches the methodology in the management of conservation areas. Without a deep understanding of the relationship among stakeholders, the risk of inequality, conflicts of interest, and low community participation will be difficult to avoid. Therefore, SNA must be an integral part of the planning, implementation, and evaluation process of Tahura management policies in the future.

2. PAR in the Management of Forest Parks (Tahura)

PAR is a research approach that places local communities and other stakeholders as the main subjects in the decision-making, planning, implementation, and evaluation process of various natural resource management endeavors. In the context of managing the Forest Park (Tahura), PAR is very relevant because Tahura is a conservation area that has a dual function: maintaining the sustainability of the ecosystem while providing socio-economic benefits for the surrounding community. This approach not only aims to generate new knowledge, but also strengthens the capacity of communities to manage their environment sustainably through collective action based on local data and experiences.

PAR in the management of Tahura opens up space for active participation from all parties, including local communities, NGOs, local governments, academics, and conservation institutions. This process includes problem identification, situation analysis, action planning, implementation, reflection, and evaluation that are carried out collaboratively. One illustration is the study by Wahyuni et al. (2022) who applied PAR in Nipa-Nipa Grand Forest Park, Sulawesi, to restore hydrological function and improve biodiversity conservation. The

research succeeded in increasing community participation in forest management by building a common understanding of the importance of ecosystems and the role of communities in protecting them. In addition, (Pratama et al., 2020) show how PAR can be used to understand social dynamics in Meru Betiri National Park, East Java, to increase community participation in the management and conservation of the area.

The PAR approach is also effective in identifying and addressing various structural barriers to community participation. For illustration, research (Nchanji et al., 2021) in Korup National Park, Cameroon, used PAR to uncover power inequality and gender roles as the main barriers to participation in national park management. The findings are then used to design participatory strategies that are more inclusive and equitable. Likewise, (Jean-Pierre, 2023) discusses the apply PAR in Central African National Parks, emphasizing the importance of integrating local knowledge and modern science in sustainable regional management.

In addition, PAR is also widely used in forest fire management based on local wisdom. The (Fortes Rodrigues & Da Costa, 2021) study in Brazil explored the use of PAR in managing forest fires in (Bilbao et al., 2021) reviewed how Venezuelan societies leveraged traditional knowledge and participatory approaches to design fire management systems that fit the local cultural and ecological context. In Morocco, (Ismaili et al., 2023) used a participatory approach to assess public perceptions of ecosystem services in Ifrane National Park, so that the results can be the basis for conservation policies that are responsive to community needs.

The PAR approach is also not limited to natural forest areas only, but is also beginning to be applied in urban forest management. (Hamel et al., 2024) developed a participatory model to support urban forest policies in the United States, showing that PAR can be a powerful tool for aligning environmental needs and urban development. Meanwhile, (Valencia-Trejo et al., 2023) used PAR in participatory diagnosis in Sierra de Guadalupe State Park, Mexico, to select plant species to be used in ecosystem rehabilitation programs. These results show that PAR can be a strong foundation in the technical and social decision-making process in different types of protected areas.

Thus, PAR is not just a research method, but also a tool for social transformation that can strengthen the relationship among humans and the environment. In the management of Tahura, PAR plays a role in building a sense of belonging and shared responsibility among stakeholders, minimizing potential conflicts, and encouraging local innovation by field conditions. Through open dialogue, shared learning, and collective action, PAR helps create more participatory, transparent, and sustainable governance of conservation areas. Therefore, strengthening community capacity, government policy support, and multi-stakeholder commitment are needed so that the implementation of PAR in the management of Tahura can provide real benefits for both the environment and the surrounding community.

3. Digital Forest

Digital Forest is an innovative approach that integrates digital technologies such as satellite imagery, 3D mapping, big data, remote sensing, Internet of Things (IoT), and GIS to support holistic management of forest ecosystems. In the context of the management policy of the Forest Park (Tahura), the Digital Forest is a strategic tool in mapping stakeholders spatially and dynamically. This approach allows for an interactive visualization of relationships among actors—such as governments, local communities, NGOs, the private sector, and academia—while combining ecosystem and social data to improve transparency, participation, and effectiveness of regional governance. With Digital Forest, Tahura managers can understand interaction patterns, identify key actors, and design collaborative strategies based on data and real-time.

Mapping can also be enriched with digital technology approaches, which are increasingly relevant in the era of digital transformation. (Nitoslawski et al., 2021) in their study entitled "The Digital Forest" emphasized the importance of integrating technologies such as GIS, mobile applications, and participatory platforms in increasing transparency and effectiveness of stakeholder engagement. Digital technology not only speeds up the mapping process, but also allows the collected data to be more accurate, accessible, and usable for long-term monitoring. Another innovative illustration is the research of (Li et al., 2024) that uses participatory mapping to understand

people's perceptions of cultural ecosystem services in Taibai Mountain National Forest Park, China. These mapping help managers understand how communities perceive the non-material values of forests, which can ultimately influence their response to conservation policies.

One of the important components of a Digital Forest is the ability to combine environmental data with socio-economic data. (Nitoslawski et al., 2021) in their study "The Digital Forest" explain how technologies such as remote sensing and IoT can be used to monitor vegetation conditions, biodiversity, land change, and potential threats such as forest fires. This data can then be linked to information about community interaction patterns, distribution of economic benefits, and stakeholder network structure through SNA. This integration helps managers understand the complex relationship among human activities and ecosystem health, so that the policies designed are more responsive to field dynamics. For illustration, (Vetrina et al., 2025) used satellite imagery to map burned areas in Indonesia throughout the year, and linked them to stakeholders involved in post-fire mitigation and restoration.

The use of drones and LiDAR also further expands the scope of Digital Forest in Tahura's management. (Pricope et al., 2020) showed how a UAS (Unmanned Aircraft System) system equipped with LiDAR can generate high-resolution 3D maps of wet ecosystems, including swamp forests and mangroves. This highly detailed topographic and vegetation information is not only useful for monitoring ecosystems, but also as a basis for mapping areas that are conflict zones or cooperation among stakeholders. On the other hand, (Villodre et al., 2023) in their research in Andalusia used the Digital Forest approach to map the socio-ecological dynamics in protected areas, including the identification of community groups that have direct access to forest resources as well as government agencies responsible for regulation and oversight.

In addition, Digital Forest also strengthens public participation in the Tahura management process through digital platforms. (Harris & Andris, 2025) in their study of the Stop Cop City social movement in Atlanta show that online maps can be an effective medium for people to voice their aspirations, identify points of conflict, and collaborate with formal actors such as the government and NGOs. This model is relevant

to be applied in the management of Tahura, where local communities, visitors, and environmental care groups can contribute to reporting on the condition of the area, zoning recommendations, or even evaluating the impact of conservation programs. This digital platform also allows for faster and more transparent two-way feedback among managers and stakeholders.

The integration of machine learning and AI technology in Digital Forest provides added value in risk prediction and modeling. (Roudier et al., 2020) successfully used machine learning models to predict the distribution of soil pH nationally in New Zealand, which is an important indicator in forest restoration planning. Similar technologies can be developed in Tahura management to predict potential habitat degradation, the spread of invasive species, or the impact of climate change on ecosystem structures. In addition, (Yelwa et al., 2021) in a study on disease vector habitat mapping show that satellite imagery can be used to understand the relationship among land cover change and the spread of diseases that have the potential to disrupt forest ecosystems and the health of surrounding communities.

However, the implementation of Digital Forest also faces challenges, one of which is data interoperability. (Islam et al., 2023) in their study mentioned the need for consistent data standards so that information from various sources—such as government agencies, academic research, and community reports—can be connected and utilized optimally. Without data harmonization, mapping results can be out of sync, reducing their effectiveness as a basis for decision-making. Therefore, an open data framework is needed that is supported by strong regulations from the central and regional governments.

Digital Forest is a transformational approach that changes the way Tahura is managed. Through the integration of digital technology, stakeholder mapping becomes more transparent, accurate, and inclusive. Real-time connected ecosystem and social data allow managers to design policies that are more responsive to community needs while maintaining ecosystem sustainability. Although there are still challenges in interoperability and technological capacity, the potential of Digital Forest in increasing participation, efficiency, and accountability in Tahura management is enormous. With the support of regulations, infrastructure, and collective awareness, this approach can

be the main foundation for realizing sustainable and equitable governance of conservation areas in the future.

4. Analysis of Socio-Economic Factors in the Dynamics of Area Use

In addition, stakeholder mapping also includes analysis of socio-economic factors that affect the dynamics of regional use. (Debebe et al., 2023) in a study of Semien Mountains National Park used household surveys and in-depth interviews to identify the influence of stakeholders on changes in forest cover. The results show that the pressures from agricultural activities and unlawful logging often stem from the economic conditions of vulnerable communities. Therefore, Tahura management policies should not only focus on environmental protection aspects, but must also include community economic empowerment strategies as a preventive effort against environmental degradation. This is in line with the findings of Boon et al. (2023) in the Mole National Park study in Ghana, which underscore the importance of understanding the perceptions of local communities in designing fair and effective policies.

The analysis of socio-economic factors in the dynamics of regional use is an important approach to understand how the interaction among social and economic conditions of the community affects land use changes, natural resource use patterns, and ecosystem sustainability. Variables such as population, income level, access to education, government policies, and public perception of the environment are often the main determinants in the decision-making process related to space use. For illustration, short-term economic pressures can push communities to shift from traditional agricultural practices to more intensive land use such as monoculture plantations or even the conversion of forests into settlements. On the other hand, increasing environmental awareness or government policy incentives can lead to land restoration and strengthening of conservation principles.

(Feng et al., 2024) in their study showed that the relationship among supply and demand for environmental services is strongly influenced by socio-economic factors in regions with different rainfall gradients. They explained that communities with limited access to

markets and technology tend to be more dependent on local natural resources, thus increasing the pressure on ecosystems. This is relevant in the Indonesian context, where many conservation areas such as the Taman Hutan Raya (Tahura) are located around community settlements that have a direct dependence on forest resources. Therefore, an understanding of consumption patterns, economic structure, and community preferences is an important basis for designing inclusive and sustainable land governance policies.

One of the effective methods of analysis in mapping these factors is the neural network model used by (Wu, Liu, et al., 2023) in a study of forest transitions in Inner Mongolia, China. These models help identify key socio-economic variables that drive land cover change, including urbanization, reforestation policies, and changes in livelihood patterns. In Indonesia, this kind of model can be applied to understand the dynamics of Tahura use, especially in urban areas such as Tahura Dr. Muhammad Hatta in Aceh or Tahura R. Soerjo in East Java, which are facing significant pressure due to population and infrastructure growth. Using spatial and temporal data, managers can anticipate land use changes and design appropriate mitigation strategies. Understanding people's perceptions of the environment is also a crucial element in socio-economic analysis. (Dhungana et al., 2024) in a study in Nepal managed to integrate public perceptions with data on land use change and the economic impact that arises as a result. This study shows that people who have a high understanding of the value of ecosystem services tend to be more supportive of sustainable use practices. Therefore, environmental education and awareness campaigns must be an integral part of Tahura management policies, especially in areas where there is potential for conflict among conservation and socio-economic activities of the community.

(Villaverde Canosa et al., 2024) add a new perspective by reviewing how socio-economic factors such as geographic remoteness and indigenous peoples' existence (indigeneity) affect forest fire risk and community adaptability. The study confirms that certain community groups, despite having strong historical links to forests, can be vulnerable to environmental threats if not supported by institutional capacity and access to mitigation technologies. This is an important lesson in Tahura management, where the protection of vulnerable

groups must be a priority in disaster management and climate adaptation plans.

In ecosystems, (Wang et al., 2022) used a spatial model to evaluate the dynamics of ecosystem service value due to land use changes. The results show that human activities, especially land conversion, have a direct impact on habitat quality decline and biodiversity loss. This is in line with the findings of (Lin et al., 2024) who analyzed the mechanisms of habitat quality change in China's conservation areas. Both emphasized that without strict land use regulation and active community participation, ecosystem sustainability will be difficult to achieve.

(Guo et al., 2023) added that economic growth also influences land use preferences in forest areas. They note that increased incomes often lead to economic diversification that is less environmentally friendly, such as large-scale plantation expansion or mass tourism. This is a challenge in the management of Tahura, where sustainable ecotourism must be designed in such a way as not to disturb the natural ecosystem. The analysis of socio-economic factors in the dynamics of regional use provides important insights to design more responsive and inclusive policies. The integration of demographic, economic, and public perception data is the basis for identifying the causes of land use change, anticipating conflict risks, and designing empowerment strategies that are appropriate to the local context. This approach also strengthens collaboration among stakeholders, both governments, NGOs, local communities, and the private sector. By understanding the complexity of the interaction among socio-economic and ecological factors, Tahura managers can design policies that not only maintain the sustainability of the ecosystem, but also improve the welfare of the people around the area.

5. InVEST

From the ecosystem side, stakeholder mapping can also be integrated with the ecosystem benefit mapping approach. Hamel et al. (2021) explain how the use of InVEST software can help identify the ecological, economic, and social benefits provided by a green area. By knowing these values, managers can more easily convince stakeholders to support conservation policies. (Vurunić et al., 2024) in his guide

presents practical steps in mapping stakeholders in protected area management, including the stages of identification, analysis, and prioritization of stakeholders based on their level of importance and influence. The integration among stakeholder mapping and ecosystem service mapping is an important strategy in building collective awareness about the importance of maintaining the sustainability of Tahura.

InVEST is a spatial-based software developed by the Natural Capital Project to assess and map ecosystem services and analyze trade-offs or trade-offs among these types of services in response to land use change. This model is designed as a decision-making tool in designing policies that balance environmental conservation and economic development. InVEST uses an integrative approach by combining biophysical data, such as vegetation, climate, and hydrology, with socio-economic data to provide a quantitative picture of ecosystem service delivery in an area. Ecosystem services that can be analyzed through InVEST include carbon storage, habitat quality, water conservation, urban heat mitigation, and the economic value of these ecosystem services.

One of the key features of InVEST is its ability to conduct scenario-based analysis. With this model, users can simulate the impact of various policy alternatives on the provide ecosystem services, thereby helping to identify the best options that reduce environmental degradation while supporting community well-being. For illustration, (Fallahi et al., 2025) compared the InVEST model with the Water Supply Stress Index (WaSSI) for annual water yield estimates in the Croatan National Forest, United States. The results of their study show that InVEST has high accuracy in predicting water flow patterns, making it an effective tool in water resource planning.

In the context of the management of the Great Forest Park (Tahura), InVEST is very relevant because it can provide spatial information on how changes in land use affect the ecological function of the area. (Zhang et al., 2022) used InVEST to analyze water conservation capacity in the Weihe Watershed, China. The study shows that vegetation restoration and forest protection improve water retention and hydrological stability. These findings can be applied in the management of Tahura to evaluate the impact of human activities, such

as tourism or unlawful logging, on the area's function as a natural water catchment and filter.

In addition, InVEST is also widely used in carbon storage analysis, one of which is in the study of (Nie et al., 2025) which combined InVEST with PLUS (Patch-Growing-Based Land Use Simulation) to simulate a carbon protection scenario in Fujian Province, China. The results show that the right policy interventions can increase carbon stocks while maintaining ecosystem sustainability. In Indonesia, this model can be used to assess the potential of carbon stored in the Tahura area, especially in swamp forest and mangrove forest areas that are vulnerable to deforestation. A similar study was conducted (Dida et al., 2021) in the Philippines, where the InVEST Carbon Model was used to assess carbon stocks in the upstream area of the Pantabangan-Carranglan Watershed.

The InVEST model is also effective in analyzing synergies and trade-offs among ecosystem services. (Wu, Zhang, et al., 2023) in a study of Qinghai Lake in China used InVEST to evaluate the relationship among water conservation, carbon storage, and habitat quality. They found that land use change causes significant trade-offs among ecosystem services, thus underscoring the importance of a holistic approach in land use planning. This is particularly relevant in the context of Tahura management, where the pressures of urbanization and infrastructure expansion often disrupt the balance of the ecosystem and the services it produces.

The use of InVEST in urban contexts is also growing. (Hamel et al., 2024) tested the InVEST Urban Cooling model to predict urban heat mitigation in Paris and Minneapolis-St. Paul. The results show that green vegetation, including urban forest areas such as Tahura, contributes greatly to lowering urban micro temperatures. This is an important basis for designing sustainable urban green policies. In Indonesia, a similar study can be applied to Tahura Dr. Muhammad Hatta in Aceh or Tahura R. Soerjo in East Java, which are in urban areas with a high risk of urban heat islands.

InVEST's integration with digital technology and big data further expands the scope of its application. (G. Chen et al., 2024) combined InVEST with a land use simulation model to analyze the dynamics of carbon stocks in China. This approach allows for more accurate spatial-

temporal predictions, assisting managers in creating long-term adaptive plans. (S. Chen et al., 2021) in their study of the Yellow Watershed also used InVEST to map the trade-offs among food production and water quality, suggesting that agricultural intensification must be balanced with ecosystem protection so as not to disrupt water quality in upstream areas.

(Tsai & Lee, 2023) added a new perspective by using InVEST to map ecosystem services on Taiwanese farmland. They have succeeded in identifying priority zones that have a high contribution to the provide ecosystem services, thus becoming the basis for sustainable agricultural landscape planning. In Indonesia, this approach can be applied in the Tahura buffer zone, where agricultural activities are often a source of conflict with conservation goals. InVEST is a very useful analytical tool in ecosystem management, especially in the context of conservation areas such as Forest Parks. The model's ability to predict the impacts of land use change, analyze trade-offs among ecosystem services, and support scenario-based planning makes it an important foundation for inclusive and sustainable environmental policy formulation. With the support of accurate spatial data, stakeholder participation, and the integration of modern technology, InVEST can be a strategic instrument in realizing sustainable Tahura management and providing optimal ecological, social, and economic benefits.

Stakeholder mapping also plays a role in building cross-sector cooperation and sustainable supply chains. (De Gruyter, 2020) in their study on supply chain sustainability suggest that stakeholder mapping should be part of a broader resource management strategy, especially about financial support from international donors and sustainable investment. In Indonesia, some Tahuras receive technical and financial help from international organizations such as FAO, UNDP, and WWF, which have a global agenda related to biodiversity conservation and climate change mitigation. Therefore, coordination with these parties in the mapping process is important to ensure synergy among national goals and global commitments.

(Doli et al., 2021) in a study on Forest Park visitors added a new perspective in stakeholder mapping by involving visitors as a group that has great potential in supporting management policies through willingness to

pay for regional development. Visitor surveys are an effective alternative method in exploring public aspirations and fostering a sense of community ownership of Tahura. It can also be an innovative funding model based on public participation, without neglecting the principles of sustainability and environmental education.

Overall, stakeholder mapping in Tahura management is an important foundation for building inclusive, participatory, and sustainable policies. By using various approaches such as SNA, PAR, digital technology, ecosystem service mapping, and participatory surveys, managers can understand the complexity of relationships and the dynamics of interests in the field. The results of this mapping are the basis for designing communication strategies, building synergies across sectors, and encouraging accountability and effectiveness of policy implementation. Without proper mapping, the risk of conflicts of interest, inequality in the distribution of benefits, and community non-participation will be difficult to avoid. Therefore, to realize sustainable and equitable management of Tahura, stakeholder mapping must be the first step that cannot be missed in every process of formulating conservation area management policies.

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Chapter 6

COMMUNITY AWARENESS AND PARTICIPATION IN TAHURA MANAGEMENT

Abdul Hamid and Andjar Prasetyo

A. Introduction

R. Soerjo Forest Park (Tahura) is one of the strategic green areas located in the urban area of Malang-Surabaya. In addition to functioning as the lungs of the city, Tahura R. Soerjo has an important role as a public education space and natural laboratory with high ecological, social, and cultural value. In the context of its management, the active participation of the surrounding community and harmonious collaboration among the government, academics, business actors, and local communities are crucial elements to ensure the sustainability of the forest ecosystem while maintaining a balance among conservation, education, and sustainable use. Several studies emphasize that the success of forest area management and ecotourism is highly dependent on harmonious collaboration among five main actors, namely the government, the private sector, academia, civil society, and local communities. In Sorong, the mangrove ecotourism management strategy shows the importance of the active role of communities and academics, although private sector participation is still weak (Lewenussa, 2023). The study in Bintan also underlined the gap in multi-sector collaboration even though the penta helix approach has been applied (Alfiandri & Irawan, 2023), while (Marta et al., 2024) research uses the quintuple helix model to map the role of these actors, including the natural environment as a subsystem in the development of disadvantaged villages. In the international context, studies in Japan use a quadruple helix approach and find gaps among theory and practice in sustainable development, but knowledge exchange among stakeholders has proven effective in bridging this (Hakeem et al., 2023). In Mexico, the role of civil society organizations in urban watershed management confirms that environmental education and active community participation are key to

collaborative success (Cotler et al., 2022). From the European Union, (Bally & Coletti, 2023) noted that although green infrastructure supports ecosystem services, government policies often do not optimally engage communities and the business sector, so broader involvement from non-governmental actors is needed to realize inclusive and sustainable governance. On the other hand, several publications discuss local innovation and nature-based tourism, such as digital marketing strategies for nature tourism in Kabaena which require collaboration among the government, academics, and business actors to support the achievement of SDGs 15 (Eldo Delamontano et al., 2025). The case of community forest business development in Mexico also shows that sustainable income can be achieved if conservation values are integrated into long-term forest management plans (Solís-Mendoza et al., 2024).

However, in practice, the implementation of Tahura management policies often faces challenges, especially in building inclusive community involvement and optimal synergy among stakeholders. One of the determinants of successful management is the extent to which the impact of the policy is felt directly by the community—whether through the economic benefits of nature tourism management, empowerment programs, or conservation endeavors that add value to their lives. The implementation of forest park management policies (Tahura) often faces serious challenges in building inclusive community participation and creating optimal synergy among stakeholders. Systematic studies in Asia show that multi-stakeholder engagement is a key determinant of the success of sustainable ecotourism. The three main themes found are inclusivity, coordination, and accountability in joint management (Salman et al., 2024). A similar thing happened in Penang Hill, Malaysia, where good ecotourism management is achieved through the active involvement of local governments, communities, and the private sector in aligning economic and conservation interests (Salman et al., 2021). A study in Chilika Wetland, India, revealed that strengthening the role of local communities in ecotourism policy planning and evaluation significantly increases social and environmental impacts (Samal & Dash, 2024). Studies in Nepal show that community participation in biodiversity conservation can be increased if they derive direct economic benefits from nature tourism (Acharya, 2023). An analysis of mangrove ecotourism policies in Siak, Riau, highlights that despite a supportive policy framework, its

implementation is weak due to a lack of meaningful community coordination and involvement (Nasution et al., 2025). In the Tajikistan and Uzbekistan regions, the success of ecotourism is largely determined by tourist satisfaction, community involvement, and the activeness of local governments (Habibulloev et al., 2024). An empirical study in Tesso Nilo shows that even though participatory discourse is carried out, society is still in a secondary position in decision-making, causing policies not to have a complete positive impact directly (Saputra et al., 2023). Meanwhile, in the context of the Sibolangit area, stakeholder analysis shows the dominant role of the government in management, but the involvement of the surrounding community is still weak (Ginting et al., 2023).

In the natural resource management literature, community participation has long been recognized as one of the main principles in the management of conservation areas. Active community involvement not only increases the effectiveness of policy implementation, but also creates a sense of collective ownership of the area. However, many cases show that community participation tends to be passive or even non-existent if the community feels that there are no real benefits from a policy. Therefore, it is important to understand how Policy Impact can translate into more substantive and meaningful forms of participation. In addition to community participation, collaboration among the government and surrounding community groups is also an important aspect in the management of Tahura. This collaboration is not only related to the division of tasks and responsibilities, but also includes the exchange of information, coordination of actions, and mutual Contract on management objectives. To create effective collaboration, there needs to be a collective awareness of relevant public policies. This awareness includes the community's understanding of the content of the policy, the objectives of management, and their rights and obligations in the process. Without adequate awareness, people tend to be apathetic or even reject policies that are considered not by their interests.

Studies at Japan's dual-UNESCO sites emphasize the importance of synergy among conservation, education, and community engagement. When communities gain recognition and benefit from conservation status, participation increases significantly (Mammadova et al., 2025). In Europe, a combination of regulatory policies and nudging approaches such as citizen science or public campaigns has been shown to increase community

involvement in biodiversity conservation (Ispiryan et al., 2024). The optimization of social media to increasing public awareness and collaboration on environmental issues shows that participation can be built through effective digital strategies (Lestari et al., 2025). In species conservation in Kalimantan, a collaborative governance approach led by local NGOs can create a collective spirit in the midst of the limitations of policy formalities (Fajrina et al., 2023). Research in the Merbabu National Park area found that social capital strengthened by the role of forestry extension workers has a direct impact on community involvement, while human capital alone is not enough without the support of local institutions (Suswadi et al., 2024). On the other hand, a comparison of water and green space conservation policies among Indonesia and Australia shows that cross-sector collaboration and ecosystem principles are important foundations for collective awareness of public policies (Jundiani et al., 2024). Effective community engagement depends not only on formal invitations, but on the distribution of benefits and equal access to policy information. Research in urban slums highlights that participatory urban design can create sustainable engagement and increase collective ownership of living space (Solimy Ghazy, 2022).

This study aims to examine how the impact of Tahura R. Soerjo management policies affects community participation and strengthens collaboration among the Government and the Surrounding Community, both directly and indirectly through awareness of public policy as a mediating variable. The two main questions that are the focus of the research are: (1) How does the impact of the management policy of Tahura R. Soerjo affect community participation directly and indirectly through awareness of public policies? and (2) How does the impact of Tahura R. Soerjo's management policy affect the collaboration of the Government and the Surrounding Community directly and indirectly through awareness of public policies? This research is based on the existence of gaps in the literature, where there is still little exploration that discusses the role of Public Policy Awareness as a mediator in the relationship among Policy Impact and implementation outcomes such as participation and collaboration in the context of conservation area management. Most previous studies have focused more on descriptive or normative analysis without touching on the complex causal dynamics behind the phenomenon.

As a contribution to environmental management science and practice, this study uses a path analysis approach to explore the mechanisms of relationships among Policy Impact, awareness, participation, and collaboration. This approach allows researchers to identify the direct and indirect paths of influence of these variables, so as to provide a more comprehensive picture of the dynamics of policy implementation in the field. Theoretically, this research will enrich the understanding of the model of community participation and collaboration among stakeholders in the management of conservation areas, especially in the context of Forest Parks in Indonesia. Practically, the results of this research are expected to be the basis for environmental policy managers, especially the agencies responsible for the management of Tahura R. Soerjo, in designing more inclusive, participatory, and sustainable policies. This effort is very important considering the increasing pressure on green areas amid rapid urbanization and expand economic activity in the Malang-Surabaya corridor.

B. Structural Equation Modeling Approach

This study is designed to reveal the cause-and-effect relationship among various important variables in the management of the R. Soerjo Forest Park (Tahura), namely the impact of management policies, public awareness of public policies, community participation, and collaboration among the Government and the Surrounding Community. With a quantitative approach and a comparative causal design, this study aims to explain how one variable affects another directly or indirectly. The main population in this study is the people living around Tahura R. Soerjo, especially in the area of District, Malang Regency, as well as stakeholders involved in the area management process. The stakeholder group includes representatives of forest farmer groups, environmental organizations, and local government agencies that have a role in the management of Tahura. So the results of the research to represent the diversity of views and social conditions of the people around the area, the sampling technique was carried out using the stratified proportional sampling method. This technique ensures that every layer of society and stakeholder groups gets an appropriate proportion in the number of samples. To determine the sample size, the Slovin formula was used with an error rate of 5%. Based on this calculation, the total number of respondents was 72 people. This

sample is proportionally divided among the general public and stakeholder groups, so that the data collected reflect a complete and representative perspective (table 6.1.)

Table 6.1. Respondent of the management of the Forest Park (Tahura) R. Soerjo

Gender	Male	Female
PACKAGE B	1	
S1	1	3
S2		1
SD	11	1
SLTP	3	1
SMA	19	1
High School/STM	6	
JUNIOR	23	1

Source: primary data, 2025

Data collection was carried out through a closed questionnaire instrument that has gone through a validation process by experts in the field of public policy and social ecology. The questionnaire was designed to measure four main variables: (1) the impact of the policy, with indicators such as economic benefits, environmental benefits, and access to services from Tahura's management policies; (2) awareness of public policy, as measured by knowledge, understanding of policy objectives, and information about the rights and obligations of the community; (3) community participation, which includes attendance in forums, involvement in environmental programs, and contributions of ideas or inputs in the management of Tahura; and (4) government and community collaboration, which is assessed based on aspects of coordination, communication, and active community involvement in the management process.

Before being used in the main survey, the questionnaire instrument was tested at a location with similar characteristics to evaluate the reliability and consistency of respondents' answers. The reliability test uses Cronbach's Alpha coefficient, which gives an idea of whether the question items in the questionnaire are strong enough to measure the variables being studied. The analysis is based on four variables, namely, awareness of public policies, community participation, collaboration among the Government and the Surrounding Community, and Policy Impact. Variables are distributed by question (Table 6.2.)

Table 6.2. Variables and questions

Variable	Quisioner
Awareness of Public Policy	Do you often hear about government policies related to forest conservation?
	How often do you get socialization about government policies related to forest conservation?
Community Participation	Do you actively participate in forest conservation endeavors?
	Do you replant when there are people who take (use) plants from Tahura
	Do you often access information about Tahura through digital platforms such as the official website
	How Often Do You Monitor and Evaluate Tahura Activities
	How often you provide criticism and suggestions related to the preservation of Tahura
	Are you often involved in decision-making related to natural resource management?
	Do you actively provide questions and suggestions when you have meetings about forest conservation
Collaboration of the Government and the Surrounding Community	Does the Government often hold direct counseling in villages around forests to provide an understanding of the benefits of forests, the impact of deforestation and the importance of forest conservation
	Does the Government often conduct campaigns through social media, posters, and short videos about the importance of protecting forests
	Does the Government often hold mass tree planting activities
	Does the government often invite the surrounding community to rehabilitate damaged forests
	Does the government often provide skills training such as agroforestry techniques or sustainable land management to support people's livelihoods without destroying the forest
	Has there ever been a community group in charge of monitoring unlawful activities such as clay mining or land burning
	Has the Government ever involved the private sector in supporting conservation programs through CSR and working with NGOs to support local initiatives?
	Whether the government is developing a responsible ecosystem by involving local communities as guides or managers of tourism facilities to increase community income while preserving forests
	Is the Government developing a simple application to make it easier for people to report unlawful activities in forest areas

Variable	Quisioner
	Have you ever used drones to monitor forest conditions in real-time and detect threats such as fires or land encroachment
	Has there ever been an education improvement program on environmental values and the impact of forest destruction
	How often do you get training and environment-based economic activities such as tree planting, peat ecosystem restoration, and counseling on sustainable farming techniques
Policy Impact	Do you feel that the community around Tahura Raden Soerjo has been empowered in the management of forest areas
	Do you derive economic benefits from forest resources without damaging them
	Can you benefit from reduced forest destruction
	Are You knowing the Importance of Natural Resources Sustainability

Source: primary data, 2025

Primary data was collected through a field survey conducted from January to April 2025. The survey was conducted by a research team assisted by enumerators who have been trained to understand the research flow and how to use questionnaire instruments consistently. The data collection process was carried out with a face-to-face approach to the respondents, thereby minimizing the risk of misunderstanding of the questions in the questionnaire. The results of the questionnaire were standardized with a Likert scale which was then used for the analysis process (table 6.3).

Table 6.3. Results of Standardized Questionnaire in Likert Scale

Rsp	Awareness of Public Policy	Community Participation	Community Knowledge	Collaboration of the Government and the Surrounding Community	Policy Impact
1	(1.58)	(0.49)	0.43	(0.44)	(1.90)
2	0.23	(0.49)	(2.46)	(1.12)	(1.49)
3	(0.98)	(1.06)	(1.02)	(1.68)	(0.28)
4	(0.38)	(0.49)	(1.02)	0.13	0.12
5	(0.38)	(0.49)	0.43	(0.44)	(1.49)
6	(0.98)	(1.24)	0.43	(0.55)	0.53
7	0.83	0.82	0.43	(0.78)	0.93
8	0.23	0.45	0.43	(1.80)	(1.49)
9	1.43	(0.49)	0.43	(0.10)	(0.68)

Rsp	Awareness of Public Policy	Community Participation	Community Knowledge	Collaboration of the Government and the Surrounding Community	Policy Impact
10	(0.98)	(0.87)	(2.46)	(2.13)	0.12
11	(0.98)	(1.06)	(1.02)	(2.13)	(1.90)
12	0.23	(0.68)	0.43	(0.78)	0.93
13	0.23	0.82	0.43	0.01	0.12
14	0.23	1.20	0.43	1.78	(0.28)
15	1.43	1.38	0.43	1.14	0.93
16	1.43	1.20	0.43	1.03	0.93
17	1.43	0.07	0.43	(0.66)	0.12
18	(2.19)	(1.24)	0.43	(1.23)	0.93
19	0.23	1.20	(3.91)	1.03	(0.28)
20	(0.38)	0.26	0.43	(1.00)	0.53
21	0.83	0.45	0.43	1.14	1.34
22	0.23	1.76	0.43	1.26	0.53
23	0.23	0.45	0.43	1.03	0.93
24	0.23	(0.49)	(3.91)	0.01	(1.90)
25	(0.38)	(0.30)	0.43	1.03	(1.09)
26	0.23	0.45	(1.02)	1.03	(0.68)
27	0.23	1.20	0.43	1.03	(0.68)
28	0.83	0.82	0.43	1.03	0.93
29	0.23	1.20	0.43	1.03	0.93
30	0.23	1.20	0.43	0.92	0.93
31	0.23	0.26	0.43	1.03	0.93
32	(0.98)	0.26	0.43	0.24	0.12
33	0.23	2.51	0.43	1.71	1.34
34	1.43	0.63	0.43	0.80	0.93
35	(0.98)	1.57	0.43	1.03	1.34
36	(1.58)	(0.87)	(2.46)	(0.55)	(0.68)
37	0.23	0.26	0.43	0.24	0.12
38	0.83	1.20	0.43	1.93	0.93
39	0.23	0.63	0.43	0.35	0.53
40	(3.40)	(1.24)	(1.74)	0.47	(2.70)
41	0.23	0.07	0.43	0.35	0.12
42	0.23	0.45	0.43	0.24	0.53
43	1.43	(1.43)	0.43	(0.10)	(0.28)
44	1.43	0.26	0.43	0.01	(0.28)
45	0.23	(0.49)	(1.02)	0.24	0.12
46	0.83	0.07	0.43	0.13	0.12
47	(0.38)	0.26	0.43	0.69	0.53
48	0.23	0.63	0.43	0.47	1.34
49	0.23	1.20	0.43	0.47	0.12
50	0.83	(0.12)	0.43	0.24	(0.68)
51	1.43	0.82	0.43	1.03	0.53
52	(0.38)	(1.24)	0.43	(0.21)	0.12
53	0.23	0.07	0.43	0.47	(0.28)
54	(0.38)	(0.12)	0.43	(0.55)	(1.49)
55	(0.38)	(1.81)	0.43	(0.66)	0.93
56	(1.58)	(1.81)	(1.02)	(1.46)	(0.68)
57	(0.98)	(2.18)	0.43	0.13	0.93
58	(3.40)	(1.43)	(1.02)	(1.34)	(0.28)

Rsp	Awareness of Public Policy	Community Participation	Community Knowledge	Collaboration of the Government and the Surrounding Community	Policy Impact
59	(0.38)	(1.81)	0.43	(1.00)	(0.28)
60	(0.98)	(0.87)	0.43	(0.66)	(3.11)
61	0.23	0.26	0.43	0.24	(0.68)
62	0.23	(0.49)	(1.02)	(0.45)	0.53
63	0.83	0.63	0.43	1.03	0.12
64	0.23	0.45	0.43	0.58	0.93
65	(0.38)	(1.62)	0.43	(1.68)	(1.49)
66	(0.98)	(1.06)	0.43	(1.80)	(0.68)
67	1.43	1.20	0.43	0.24	1.34
68	0.23	1.01	0.43	(0.10)	0.12
69	0.83	(1.06)	0.43	(2.02)	(0.68)
70	0.23	(0.49)	0.43	(1.00)	0.93
71	0.23	(0.49)	0.43	(1.00)	0.93
72	0.23	0.45	0.43	0.47	0.12

Source: primary data, 2025

After the data was collected, the analysis was carried out using Structural Equation Modeling (SEM) with the Partial Least Squares (PLS) approach. This approach was chosen because of its ability to test complex relationships among variables, both directly and indirectly. In addition, PLS is suitable for Likert scale data and reflective models, which are the forms of data used in this study. The analysis process begins with a test of the validity and reliability of the instrument to ensure that all the indicators in the questionnaire actually measure the variables to be studied. After meeting the data quality standards, it is followed by path model estimation (path analysis) to test the proposed hypothesis. This pathway model allows researchers to identify the direct effects, indirect effects, as well as the total effects of one variable on another.

The overall quality of the model was assessed using several goodness of fit indices, such as R^2 (determination coefficient), Q^2 (predictive relevance), and other relevant suitability indices in the PLS approach. The results of the analysis were then interpreted to answer two main research questions, namely: (1) How does the impact of Tahura R. Soerjo's management policy affect community participation directly and indirectly through awareness of public policies? and (2) How does the impact of Tahura R. Soerjo's management policy affect the collaboration of the Government and the Surrounding Community directly and indirectly through awareness of public policies?

With a systematic approach and a solid method, this study seeks to provide in-depth insights into the dynamics of the relationship among Policy Impact, awareness, participation, and collaboration in the context of Tahura R. Soerjo management. The findings of this study will serve as a basis for policy recommendations that can help increase community participation and strengthen collaboration among the Government and the Surrounding Community to realize a more participatory, inclusive, and sustainable management of Tahura. Through this book, readers will be invited to understand more about how a policy not only stands as a formal document, but also becomes a real means to build a harmonious relationship among humans and nature, as well as among the government and society.

C. The Relationship among Policy Impact, Participation, and Collaboration at Tahura R. Soerjo

The results of the tabulation of respondent characteristics are an important basis in understanding the social context of the people who are the subject of the research. Taking into account the diversity and representation of these data, further analysis can be conducted to answer the research questions using the SEM or PLS approach. The results of the path analysis are described in table 6.4.

Table 6.4. Direct effects

							95% Confidence Interval	
			Std. estimate	Std. error	z-value	p	Lower	Upper
Policy Impact	→	Community Participation	0.257	0.114	2.259	0.02	0.02	0.468
Policy Impact	→	Collaboration of the Government and the Surrounding Community	0.277	0.124	2.233	0.03	0.026	0.52

Based on the results of the path analysis (table 6.4.), Policy Impact has a positive and significant influence on community participation with a standard coefficient of 0.257 ($p = 0.024$). This shows that the more positive the impact of policies felt by the community, the more community

participation in the implementation of the policy tends to increase. In addition, Policy Impact also has a statistically significant effect on Government and Surrounding Community Collaboration, with a coefficient of 0.277 ($p = 0.026$), indicating that the success of a policy in having a real impact can strengthen cooperation among the Government and the Surrounding Community. Both relationships have significance levels below 0.05, so it is strong enough to conclude that Policy Impact plays an important role both in increasing public participation and in building effective collaboration among government and society.

Studies in Ghana show that the successful implementation of REDD+ depends largely on how people understand and benefit from the program. Collaboration built on the perception of real benefits is the key to public involvement in forest conservation (Osei, 2025). The same is also shown by the meta-synthesis of community-based conservation programs, which emphasize that the community's positive perception of policy outcomes strengthens participation and social ownership of the program (Ullah & Kim, 2020). The study in Bintan emphasized the importance of Policy Impact on mangrove ecotourism in shaping cooperation among the community, the government, and the private sector. This collaboration grows from trust built from shared perceived policy results (Alfiandri & Irawan, 2023). On the other hand, the implementation of coastal area policies in Indonesia shows that the lack of direct impact of policies makes it difficult to build synergy among parties (Alfiandri et al., 2024).

One of the literature reviews on interactive governance shows that the perception of benefits and participation is interrelated in forming inclusive governance in conservation areas. Thus, Policy Impact is an important foundation in expanding the network of collaboration among actors (Santosa, 2022). A study that raises the role of social media has found that digital channels are effective in building awareness and collaboration among governments, communities, and the private sector in environmental policy, as they allow for hands-on experience-based interaction on policy outcomes (Lestari et al., 2025). The revitalization of customary law is also called as a bridge among tradition and modern policies, which, when designed by paying attention to the concrete impact on indigenous communities, can increase policy legitimacy and strengthen local participation (Natsir & Iqbal, 2024).

Tabel 6.5. Indirect effects

									95% Confidence Interval	
					Std. estimate	Std. error	z-value	p	Lower	Upper
Policy Impact	→	Awareness of Public Policy	→	Community Participation	0.156	0.062	2.504	0.012	0.056	0.318
Policy Impact	→	Awareness of Public Policy	→	Collaboration of the Government and the Surrounding Community	0.106	0.05	2.134	0.033	0.025	0.231

Based on the results of the indirect effects analysis (table 6.5.), Policy Impact has an indirect effect on community participation and collaboration among the Government and the Surrounding Community through the mediation variable of Public Policy Awareness. The indirect influence of Policy Impact on community participation has a coefficient of 0.156 with a p value of 0.012, indicating a significant relationship. This means that the better the impact of the policy felt by the community, the higher their awareness of the policy, which ultimately increases community participation. Similarly, the indirect influence on Government and Surrounding Community Collaboration was also significant with a coefficient of 0.106 ($p = 0.033$). The 95% confidence interval for these two indirect effects does not include zero, indicating that the effect is consistent and statistically significant. Thus, Public Policy Awareness mediates significantly the relationship among Policy Impact and the two endogenous variables in the model.

Research in Merbabu National Park shows that increasing public awareness of conservation programs through the role of forestry extension workers significantly increases community participation in area management (Suswadi et al., 2024). A study in Thailand concluded that environmental awareness built through participation in citizen science programs has a mediating effect on pro-environmental behavior (Srisathan et al., 2024). In a case study of water conservation in Bandung, the awareness variable through cognitive dissonance was proven to mediate the influence of environmental communication on changes in people's behavior in water use (Sunarwibowo et al., 2025). In Palangka Raya, the quality of urban forest governance mediates the relationship among

stakeholder participation and ecosystem service quality, which is driven by shared awareness of the ecological function of urban areas (Sofyan et al., 2024). Other research found that local culture and traditional wisdom contribute to collective awareness of the sustainability of tourist villages. However, the direct impact is only felt when it is associated with community entrepreneurship development as a concrete form of participation (Hamdan & Basrowi, 2024). Forest management conflicts among governments and indigenous peoples show that endeavors to increase public awareness of their rights can reduce conflicts and pave the way for fairer conservation cooperation (Cahyana & Cahyana, 2025). In a cross-urban study in Europe, citizen participation in nature-based solutions showed that deeper forms of participation—based on awareness—strengthen broader social outcomes and collaboration (Kiss et al., 2022).

Table 6.6. Total effects

							95% Confidence Interval	
			Std. estimate	Std. error	z-value	p	Lower	Upper
Policy Impact	→	Community Participation	0.414	0.093	4.463	< .001	0.236	0.595
Policy Impact	→	Collaboration of the Government and the Surrounding Community	0.384	0.115	3.348	< .001	0.183	0.627

Based on the results of the total effects analysis (table 6.6.), Policy Impact has a positive and very significant influence on the two endogenous variables in the model, namely Community Participation and Government and Surrounding Community Collaboration. In total, Policy Impact had in effect on community participation with a coefficient of 0.414 ($p < 0.001$), which means that an increase of one unit of standard deviation in Policy Impact would be followed by an increase of 0.414 standard deviation units in overall community participation—either directly or indirectly through awareness of public policy. The total influence on the collaboration of the Government and the Surrounding Community was also significant, with a coefficient of 0.384 ($p < 0.001$). The 95% confidence interval for these two total effects does not include zero, indicating the consistency and

significance of the effect. Thus, Policy Impact as a whole plays an important role in increasing both community participation and collaboration among the Government and the Surrounding Community.

Research on the conservation of endemic plants in Merbabu Mountain National Park shows that the real impact of conservation policies increases community participation in conservation and cross-sectoral cooperation (Gunawati et al., 2025). In coastal areas, policies that have succeeded in raising awareness and strengthening the involvement of maritime communities in active environmental management (Kuncowati et al., 2025). Studies in Pakistan show that social media expands Policy Impact by increasing public awareness, strengthening communication among stakeholders, and encouraging community participation in urban green space management (Hussain et al., 2024). In Europe, the merging of regulatory policies and awareness campaign-based nudging has been shown to result in high levels of community involvement in biodiversity conservation, demonstrating the total effect of policies reinforced by social interventions (Ispiryan et al., 2024). A collaborative governance approach in Prooscis monkey conservation in Kalimantan shows that policies that emphasize collaboration encourage community and NGO initiatives to support conservation through collective action and social ownership of programs (Fajrina et al., 2022). In Latin America, compensation for hydrological services programs show that the total impact of incentive-based conservation policies is largely determined by stakeholder participation in the decision-making process (Urcuqui-Bustamante et al., 2021).

Tabel 6.7. Residual covariances

							95% Confidence Interval	
			Std. estimate	Std. error	z-value	p	Lower	Upper
Community Participation	↔	Collaboration of the Government and the Surrounding Community	0.443	0.084	5.295	< .001	0.311	0.69

Based on the results of residual covariance analysis (table 6.7.), there was a significant relationship among Community Participation and

Government and Surrounding Community Collaboration, with a standard coefficient of 0.443 ($p < 0.001$). This shows that after considering the influence of variables in the model, there is still a fairly strong positive correlation among the two endogenous variables. In other words, other factors beyond the model that are not measurable or not included still affect both community participation and collaboration among the government and the community at the same time. The 95% confidence interval that does not include zero ([0.311, 0.692]) supports that this residual covariance is statistically significant. These results indicate the need for further consideration of the possibility of latent variables or co-influences influencing both outcomes.

Tabel 6.8. Path coefficients

							95% Confidence Interval	
			Std. estimate	Std. error	z-value	p	Lower	Upper
Awareness of Public Policy	→	Community Participation	0.423	0.118	3.584	< .001	0.182	0.655
Policy Impact	→	Community Participation	0.257	0.114	2.259	0.024	0.02	0.468
Awareness of Public Policy	→	Collaboration of the Government and the Surrounding Community	0.287	0.127	2.268	0.023	0.007	0.511
Policy Impact	→	Collaboration of the Government and the Surrounding Community	0.277	0.124	2.233	0.026	0.026	0.52
Policy Impact	→	Awareness of Public Policy	0.37	0.119	3.105	0.002	0.146	0.603

Based on the results of the path coefficients analysis (Table 6.8.), Policy Impact has a positive and significant effect on three endogenous variables in the model, namely Public Policy Awareness, community participation, and Government and Surrounding Community Collaboration. The strongest influence occurred on the relationship among Policy Impact and Public Policy Awareness ($\beta = 0.370$, $p = 0.002$), showing that the better the impact of policies felt by the public, the higher their

awareness of the policy. Furthermore, Public Policy Awareness had a significant direct influence on community participation ($\beta = 0.423$, $p < 0.001$) and Government and Surrounding Community Collaboration ($\beta = 0.287$, $p = 0.023$). On the other hand, Policy Impact also had a smaller but still significant direct influence on community participation ($\beta = 0.257$, $p = 0.024$) and Government and Surrounding Community Collaboration ($\beta = 0.277$, $p = 0.026$). All estimated coefficients had a 95% confidence interval that did not include zero, indicating that these relationships were statistically significant. Overall, these results support that Policy Impact affects Community Participation and Collaboration of Government and Surrounding Communities both directly and indirectly through increased Public Policy Awareness.

Research in China shows that strong policy leadership and effective communication strongly determine public motivation in environmental protection. Structurally formed policy awareness reinforces the public's conservative behavior preferences (Chen et al., 2023a). Another study in Saudi Arabia confirmed that policy exposure through socialization and campaigns significantly affects household water conservation awareness and behavior, as evidenced by the SEM approach (Almulhim & Abubakar, 2025). Research in Palangka Raya found that the quality of urban forest governance mediates the influence of stakeholder participation and collaboration on the quality of ecosystem services. The main key to this process is collective awareness and communication among actors (Sofyan et al., 2024). In Bandung, cognitive dissonance was proven to be a mechanism that bridges policy communication with changes in community behavior, strengthening the role of awareness as a mediating variable (Sunarwibowo et al., 2025). A study at the Guilin World Heritage Site shows that multilevel collaboration among communities, local governments, and the private sector is strongly influenced by public regulation and perceptions of the success of karst conservation policies, which are evaluated through network analysis and public surveys (He et al., 2023). Similar findings in research on the relationship among nature reserves and local communities in China found that strong coordination is influenced by the perception of policy benefits and public awareness of their role in environmental protection (Guo et al., 2023). Several studies using the SEM approach confirm that awareness of pro-environmental policies and attitudes has direct and indirect pathway effects on

community participation and engagement. One of them is a study of public participation in the tourism circular economy in Bali , which states that willingness to pay and awareness mediate the relationship among policy design and active participation.

Table 6.9. R-Squared

	R ²
Community Participation	0.326
Collaboration of the Government and the Surrounding Community	0.218
Awareness of Public Policy	0.137

Based on the R-squared value (R²) generated from the model (Table 6.9.), the variables in this study were able to explain some of the diversity of each endogenous variable. For community participation, an R² value of 0.326 indicates that about 32.6% variation in community participation can be explained by Policy Impact and Public Policy Awareness as predictors in the model. Meanwhile, in Government and Surrounding Community Collaboration, an R² value of 0.218 means that about 21.8% of the variation in collaboration can be explained by the predictor variables in the model. As for Public Policy Awareness, the R² value of 0.137 indicates that the 13.7% variation in public awareness of public policy can be explained by Policy Impact as the only predictor in the model. Although the predictive contribution of the model is moderate to low, these results still provide evidence that the factors included have a significant influence on the endogenous variables studied.

In the context of maritime environmental management, studies show that environmental awareness and government-community synergy make a significant contribution to community engagement, as reflected in the moderate but meaningful R² value in the SEM analysis (Kuncowati et al., 2025). Similar findings were shown in island tourism in Malaysia, where the environmental attitude variable explained some of the variation in tourists' environmentally friendly behavior through the PLS-SEM approach (Yusof et al., 2025). A study of rural homestays in Southeast Asia found that R² values in variables such as homestay security and management ranged from 0.22 to 0.35, indicating a sufficient predictive contribution, although not dominant, but still relevant in guiding community policy formulation (Luekveerawattana, 2024). In Mexico, research on pro-environmental

attitudes and behaviors of engineering students and professionals shows that the specific environmental knowledge variable significantly explains some of these variations in attitudes and behaviors, although the R^2 value is not high (Burgos-Espinoza et al., 2024). A theoretical study on the motivation of public participation in environmental protection in China also found that R^2 values below 0.4 are still able to reveal a statistically significant relationship, especially when it involves mediating variables such as awareness or other social factors (Chen et al., 2023b). Other research in the context of ecotourism shows that although the R^2 value is moderate, policy design variables remain the main drivers of tourist participation in circular economy practices (Suhardono, 2025). In the context of visitor-based conservation policies in protected areas, engagement among researchers and practitioners is the main determinant of the level of adoption of research results. Despite the moderate R^2 value, the model is still able to explain meaningful cause-and-effect relationships in regional management policies (Slabbert & Du Preez, 2023).

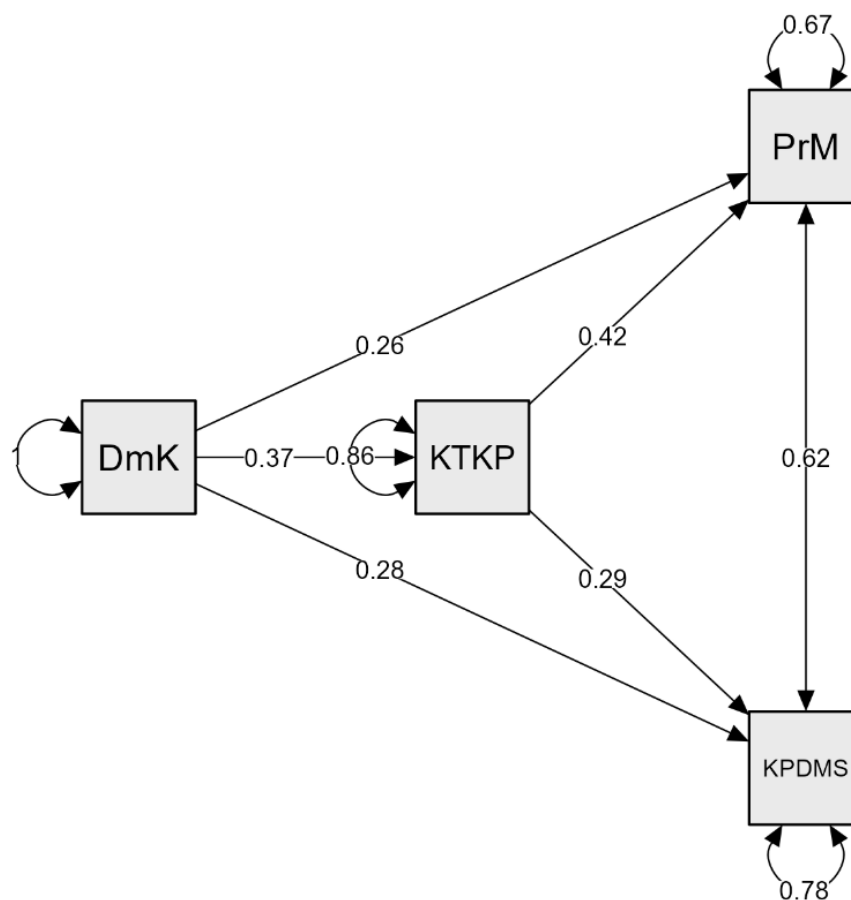


Figure 6.1. Path Analysis

This model describes the relationship among the variables in the study, with Policy Impact (DmK) as the main exogenous variable, as well as three endogenous variables: Community Participation (PrM), Government and Surrounding Community Collaboration (KPDMs), and Public Policy Awareness (KTKP).

1. The Relationship Among Policy Impact (DmK) and Endogenous Variables

DmK → KTKP: The path coefficient of 0.37 shows that Policy Impact has a positive influence on Public Policy Awareness. Each increase of one unit of standard deviation in Policy Impact will increase Public Policy Awareness by 0.37 standard deviation units. DmK → PrM: The path coefficient of 0.26 indicates that Policy Impact also has a direct positive influence on community participation, although it is smaller than its effect on Public Policy Awareness. Each increase of one unit of standard deviation in the Policy Impact will increase community participation by 0.26 units of standard deviation. DmK → KPDMs: The path coefficient of 0.28 shows that the Policy Impact has a direct positive influence on the collaboration of the Government and the Surrounding Community. Every increase of one unit of standard deviation in the Policy Impact will increase the collaboration of the Government and the Surrounding Community by 0.28 units of standard deviation.

These findings suggest a cascading model of policy influence where impact first generates awareness, which then potentially (though not automatically) leads to participation and collaboration. The variation in coefficients indicates that policymakers cannot assume uniform effects across all dimensions of public engagement. To maximize community participation, additional interventions beyond merely creating impactful policies may be necessary - such as reducing participation barriers, creating accessible engagement platforms, or providing incentives for civic involvement. The relatively balanced coefficients (ranging from 0.26 to 0.37) also indicate that while Policy Impact is influential, it explains only a moderate portion of variance in these outcomes, suggesting other factors play important roles in shaping public policy awareness, participation, and government-community collaboration.

2. The Role of Mediation by Public Policy Awareness (KTKP)

KTKP → PrM: The path coefficient of 0.42 shows that Public Policy Awareness has a positive influence on community participation. The higher the public's awareness of public policy, the more likely they are to be actively involved in community participation. KTKP → KPDMs: The path coefficient of 0.29 shows that awareness of public policy also has a positive influence on Government and Surrounding Community Collaboration. With increasing public awareness of policies, collaboration among the government and the public tends to become more effective.

The mediating role of Public Policy Awareness fundamentally challenges traditional top-down governance models and reinforces contemporary theories of deliberative democracy and participatory governance. From a theoretical standpoint, these findings align with Habermas's concept of the public sphere, where informed citizens constitute the foundation of legitimate democratic participation. The stronger pathway from awareness to participation (0.42) compared to awareness to collaboration (0.29) suggests that individual civic engagement may be more readily activated through knowledge than institutional partnerships, supporting theories of graduated engagement where personal involvement precedes collective action.

This mediation effect has profound implications for policy communication strategies. Rather than viewing policy implementation and public engagement as separate administrative functions, governments must recognize policy awareness as a critical bridge that transforms policy outcomes into civic participation. The differential effects on participation versus collaboration indicate that awareness operates through distinct psychological and social mechanisms - while knowledge may directly motivate individual action through personal relevance and self-efficacy, building collaborative relationships requires additional trust-building and institutional readiness that awareness alone cannot fully provide.

For practitioners, these findings necessitate a fundamental shift in how policy success is measured and achieved. Policy impact should not be evaluated solely on direct outcomes but also on its capacity to generate public understanding that catalyzes broader civic engagement. This suggests investing in comprehensive policy communication infrastructure that goes beyond mere information dissemination to include educational components that help citizens understand not just what policies exist, but

how they can meaningfully engage with them. The stronger effect on participation versus collaboration also implies that governments should sequence their engagement strategies, first focusing on building individual participation through awareness campaigns before attempting more complex collaborative partnerships.

Furthermore, the mediation model reveals that policy awareness functions as a form of civic capital that must be deliberately cultivated and maintained. This positions government communication departments not merely as information broadcasters but as essential architects of democratic participation. The findings suggest that transparent, accessible, and continuous policy communication should be embedded within the policy cycle itself, rather than treated as an afterthought or public relations exercise. This integrated approach would recognize that an informed citizenry is not just a democratic ideal but a practical prerequisite for effective governance and community development.

3. Direct and Total Effects

PrM: The community participation Variable (PrM) received a direct influence from Policy Impact (0.26) and Public Policy Awareness (0.42). In addition, PrM also has a residual covariance with KPDMs (0.67), which indicates that there are other factors outside the model that affect both variables simultaneously. KPDMs: The Variables of Government and Surrounding Community Collaboration (KPDMs) receive direct influence from Policy Impact (0.28) and Public Policy Awareness (0.29). In addition, KPDMs have a residual covariance of 0.78, which suggests that there is more variation in collaboration that is not explained by variables in the model.

The substantial residual covariances observed in this model (0.67 for PrM-KPDMs correlation and 0.78 for KPDMs) reveal a critical theoretical insight: the relationship between community participation and government collaboration operates within a complex ecosystem of unmeasured influences that transcend traditional policy-awareness frameworks. This finding challenges linear models of civic engagement and suggests that participation and collaboration are deeply intertwined phenomena that co-evolve through shared but unobserved mechanisms. These might include social capital, cultural norms, historical experiences with government, local leadership dynamics, or informal networks that

simultaneously shape both individual participation decisions and institutional collaboration patterns.

From a theoretical perspective, these high residual covariances support ecological and systems theories of governance, which posit that civic engagement emerges from multiple, interconnected layers of social reality that cannot be fully captured through direct causal pathways alone. The particularly high unexplained variance in collaboration (0.78) suggests that government-community partnerships are especially sensitive to contextual factors that lie outside conventional policy frameworks. This aligns with institutional theory, which emphasizes how informal rules, trust relationships, and path dependencies shape collaborative outcomes in ways that formal policy mechanisms cannot fully control or predict.

For governance practitioners, these findings necessitate a fundamental humility about the limits of policy-driven change and awareness campaigns in fostering civic engagement. While policy impact and awareness are important contributors, they represent only part of a larger story. The strong residual correlation between participation and collaboration suggests that interventions targeting one dimension will likely influence the other through unmeasured pathways, creating potential for both positive spillovers and unintended consequences. This interconnectedness demands holistic approaches that recognize and work with, rather than against, the complex social fabric within which participation and collaboration are embedded.

The practical implications extend to how governments design and evaluate civic engagement initiatives. Rather than treating participation and collaboration as separate program objectives, the high residual covariance suggests they should be conceptualized as complementary aspects of a unified civic engagement ecosystem. This might involve creating integrated platforms where individual participation naturally evolves into collaborative partnerships, or designing interventions that simultaneously address the unmeasured factors influencing both outcomes. Additionally, the substantial unexplained variance highlights the importance of local context and adaptive management - what works in one community may not translate directly to another due to these unobserved influences.

These findings also underscore the need for mixed-method research approaches and continuous learning in governance practice. Quantitative

models alone cannot capture the full complexity of civic engagement; qualitative insights into local contexts, relationships, and informal dynamics are essential for understanding and working with the substantial forces that operate outside formal policy channels. Governments should therefore invest not only in policy implementation and communication but also in developing deep, contextual knowledge of their communities and the hidden factors that shape civic life.

4. Variations Explored by Model

R² for PrM: An R² value of 0.326 indicates that 32.6% variation in community participation can be explained by the predictor variables in the model, namely Policy Impact and Public Policy Awareness. R² for KPDMs: An R² value of 0.218 indicates that 21.8% variation in Government and Surrounding Community Collaboration can be explained by predictive variables in the model, namely Policy Impact and Public Policy Awareness. R² for KTKP: An R² value of 0.137 indicates that 13.7% variation in Public Policy Awareness can be explained by a predictor variable in the model, namely Policy Impact.

The modest R² values across all three outcome variables reveal a fundamental truth about the nature of civic engagement and governance: these phenomena exist within complex, multidimensional systems where policy interventions represent only one force among many. This finding profoundly challenges technocratic approaches to governance that assume direct, predictable relationships between policy actions and civic outcomes. The decreasing explanatory power from participation (32.6%) to collaboration (21.8%) to awareness (13.7%) suggests a hierarchy of complexity, where more institutionalized forms of engagement are increasingly influenced by factors beyond the reach of conventional policy tools.

These findings align with complexity theory and adaptive systems thinking in public administration, which recognize that social outcomes emerge from the interaction of numerous visible and invisible forces. The substantial unexplained variance across all variables indicates that civic engagement operates more like an ecosystem than a machine - influenced by historical legacies, cultural values, social networks, economic conditions, technological access, and countless micro-level interactions that aggregate into macro-level patterns. This theoretical understanding

demands a shift from deterministic policy thinking to probabilistic approaches that acknowledge uncertainty and embrace adaptive management strategies.

From a practical governance perspective, these R^2 values serve as a reality check on the limits of policy-centered interventions. While the temptation in public administration is often to seek more control and predictability, these findings suggest that effective governance requires working with, rather than against, the inherent complexity of social systems. The relatively low explanatory power indicates that governments must complement direct policy interventions with indirect approaches that nurture the broader ecosystem within which civic engagement flourishes. This might include investing in social infrastructure, supporting community organizations, fostering trust through consistent and transparent governance, and creating space for organic, bottom-up initiatives that address the unmeasured factors shaping civic life.

The hierarchical pattern of R^2 values also has important implications for resource allocation and strategic prioritization. The higher explained variance for participation suggests that policy-awareness pathways may be most effective when targeting individual-level engagement, while efforts to build government-community collaboration must acknowledge and address a wider array of influences. This differentiated approach requires governments to develop diverse capability sets - from traditional policy implementation skills to more nuanced competencies in relationship building, cultural navigation, and systems facilitation. Furthermore, these findings underscore the importance of realistic expectations and appropriate metrics in governance. Rather than pursuing unrealistic targets based on assumptions of high policy control, governments should set goals that acknowledge the limited but still meaningful influence they can exert through policy and awareness channels. Success metrics should extend beyond direct policy outcomes to include indicators of ecosystem health - the vitality of civic organizations, the quality of public discourse, the density of social networks, and the level of generalized trust within communities. This expanded view of governance effectiveness recognizes that sometimes the most important government role is not to control outcomes directly but to create conditions where positive civic engagement can emerge organically from the complex interplay of social forces.

5. Covariant Residual

PrM ↔ KPDMs: A residual covariance of 0.67 indicates that there is a significant relationship among Community Participation and Government and Surrounding Community Collaboration that is not fully explained by the variables in the model. This indicates the presence of external factors or latent variables that affect both variables simultaneously. KPDMs: A residual covariance of 0.78 indicates that most of the variation in Government and Surrounding Community Collaboration is still not explained by the variables in the model, so it is necessary to consider including more variables or other relevant factors.

The substantial residual covariances observed in this model illuminate a critical theoretical insight about the nature of civic engagement: participation and collaboration exist within a shared latent space of social dynamics that operates beyond the reach of formal policy mechanisms. This finding fundamentally challenges reductionist approaches to governance that attempt to isolate and manipulate individual factors. Instead, it supports relational and network theories of social action, which posit that civic behaviors emerge from webs of interconnection, shared meaning, and collective identity that cannot be fully decomposed into discrete causal pathways. The high residual relationship suggests that when communities participate, they simultaneously create conditions for collaboration, and when governments collaborate, they generate contexts that encourage participation - a recursive, co-constitutive process that defies simple linear modeling.

From a theoretical standpoint, these unexplained covariances point toward the existence of what might be termed "civic infrastructure" - the invisible scaffolding of trust, reciprocity, shared history, and collective efficacy that underlies all forms of public engagement. This infrastructure operates like dark matter in physics, exerting powerful influence while remaining largely unmeasured by conventional policy metrics. The particularly high unexplained variance in collaboration (0.78) suggests that partnership-building draws heavily on these intangible resources, which accumulate slowly through repeated interactions, shared successes, and the gradual construction of mutual understanding between government and community actors.

For governance practitioners, these findings necessitate a fundamental reconceptualization of how civic engagement initiatives are

designed and implemented. Rather than viewing participation and collaboration as separate program outputs to be optimized independently, the strong residual correlation demands integrated approaches that recognize their deep interdependence. This might manifest as "engagement ecosystems" where multiple forms of civic involvement are cultivated simultaneously, allowing natural synergies to emerge. The high unexplained variance also suggests that successful engagement strategies must be highly contextualized, drawing on deep local knowledge about the specific historical, cultural, and relational factors that shape civic life in particular communities.

The practical implications extend to how governments approach measurement and evaluation. Traditional metrics focused on direct policy outcomes fail to capture the rich, unmeasured dynamics that these residual covariances represent. Governments need to develop new forms of "soft sensing" that can detect and nurture the latent factors driving engagement - perhaps through ethnographic methods, social network analysis, or participatory evaluation approaches that give voice to the tacit knowledge held within communities. This shift from measurement to understanding represents a more humble but ultimately more effective approach to governance.

Furthermore, these findings highlight the importance of time horizons and patience in building civic engagement. The latent factors generating these residual covariances - trust, social capital, collective efficacy - develop slowly through accumulated experience and cannot be manufactured quickly through policy interventions. This suggests that governments should adopt longer-term perspectives, investing in relationship-building and community capacity even when immediate policy payoffs are not apparent. The unexplained covariances represent not a failure of measurement but an opportunity for discovery - pointing governance practitioners toward the deeper currents of social life that ultimately determine the success or failure of civic engagement initiatives. By acknowledging and working with these unmeasured forces rather than attempting to control or ignore them, governments can develop more sophisticated, effective approaches to fostering vibrant democratic participation.

This model shows that Policy Impact has a direct positive impact on community participation, Government and Surrounding Community

Collaboration, and Public Policy Awareness. In addition, Public Policy Awareness serves as an important mediator in influencing community participation and collaboration among the Government and the Surrounding Community. However, the results also suggest that there is still a large proportion of variation in endogenous variables that the model has not yet explained, which requires further research to consider other variables that may play a role. The residual covariance among community participation and Government and Neighborhood Collaboration also shows the importance of considering the external factors that affect the two variables simultaneously.

The impact of Tahura R. Soerjo's management policy has a significant effect on community participation, both directly and indirectly through awareness of public policies. The results of the path coefficients analysis showed that the impact of the policy directly increased community participation ($\beta = 0.257$, $p = 0.024$). However, the indirect influence through awareness of public policy was stronger (indirect coefficient = 0.156, $p = 0.012$), with a total relationship of 0.414 ($p < 0.001$). This means that when people feel the real benefits of the policy, they become more knows their content, goals, and rights, which ultimately advises active involvement in the implementation of conservation policies. The impact of Tahura R. Soerjo's management policy also has a significant effect on collaboration among the Government and the Surrounding Community, both directly and indirectly through awareness of public policy. Direct influence was shown by a coefficient of 0.277 ($p = 0.026$), while indirect influence through consciousness reached 0.106 ($p = 0.033$), with a total effect of 0.384 ($p < 0.001$). This indicates that people's perceptions of the success of policies not only influence their willingness to get involved, but also form the basis of trust and willingness to cooperate with the government. Overall, both pathways show that awareness of public policy plays a significant and non-negligible mediating role in building sustainable participation and collaboration. Therefore, strategies to increase Policy Impact should be accompanied by systematic endeavors to build public understanding of conservation policies as a condition for the creation of effective collaborative governance.

Policy Impact plays an important and significant role in increasing community participation and collaboration among the Government and the Surrounding Community, both directly and indirectly through Public

Policy Awareness. This finding expressly answers the objectives and questions of the research, namely how the role of public policy in shaping community participation and cooperation in the context of conservation area management. The results of the path coefficients analysis showed that the strongest influence occurred on the relationship among Policy Impact and Public Awareness, which then became an important mediator toward more intensive participation and collaboration. The R-squared values of the model, although in the medium to low category, still indicate that the variables included have a significant and empirically relevant predictive contribution. Theoretically, these findings reinforce models of participation based on policy perceptions and affirm the importance of integrating policy communication approaches and strengthening collective awareness. The practical implications of these results suggest that the effectiveness of conservation policies is largely determined by the extent to which communities perceive the real benefits of the policy and have an understanding of the content and objectives of the policy.

However, this study has several limitations, including the limited number of predictor variables included in the model, as well as the limitation of generalization of findings due to specific geographical and social contexts. For this reason, further research is suggested to expand the scope of variables, including cultural, institutional, and local capabilities as elements that also influence participation and collaboration. In addition, a longitudinal approach is also needed to look at the dynamics of variable relationships over time. By enriching perspectives and expanding the scope of data, future research results can make a broader contribution to policy design based on public awareness and sustainable participation.

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Chapter 7

CHALLENGES IN CONSERVATION POLICY IMPLEMENTATION

Firman Syah Ali and Eka Prabawati

A. Introduction

In the implementation of conservation policies, governments and various parties often face some complex and interrelated challenges. One of the main challenges is the conflict among humans and wildlife, which is increasing due to the increase in human population and the expand agricultural land or settlements. This causes natural habitats to be fragmented and animals forced into manus territory in search of food. In addition, many local communities rely on natural resources such as forests, rivers, or the sea as their source of livelihood. Restrictions on access to such resources can trigger resistance from communities, as they feel their traditional or economic rights are being disrupted. Furthermore, the lack of public awareness and participation is a major obstacle to the success of conservation programs. Without active support from the community around the conservation area, conservation endeavors will not be sustainable. On the other hand, limited budgets and human resources are also important obstacles. Many conservation projects experience funding difficulties, lack of infrastructure, and a lack of experts in the field. This factor reduces the scope and effectiveness of conservation activities at the site level.

In the implementation of conservation policies, important challenges arise due to complex interactions among humans, wildlife, and the environment. One of the main issues is the increasing human-wildlife conflict along with habitat fragmentation due to the expand agricultural land and settlements. Research (Pimid et al., 2022) shows that although specific conflicts such as with certain animals can decrease in Sabah, conflicts among stakeholders remain a major barrier. Habitat fragmentation also exacerbates conflicts, as in the case of Asian elephants that occur globally, as identified (Zakaria et al., 2024), as well as pressures

on forests in Ethiopia that create friction among local communities and conservation endeavors according to (Legese & Bekele, 2023). This problem is further complicated by the low participation and awareness of local communities toward conservation programs. (Mariyam et al., 2021) found that short-term financial incentives and adequate payments are needed to increase the interest of landowners in India in active participation. Without community support and inclusive policies, as noted (Debnath et al., 2023), resistance to restrictions on access to natural resources will remain high, threatening the sustainability of conservation endeavors. In addition, limited resources are a structural obstacle in the implementation of conservation in the field. (Papp et al., 2022) called for a "transdisciplinary deficit" in conservation funding in Europe, which hinders cross-sector collaboration and a holistic approach to protecting large animals. Lack of infrastructure, expertise, and operational budgets often narrow the scope and effectiveness of conservation programs at the site level. In the ecological dimension, animal adaptation to landscape changes is also a determining factor in reducing conflicts. (Ram et al., 2025) found that Asian lions in Gujarat are still highly dependent on wild prey, suggesting that the sustainability of natural prey populations is essential to prevent animal migration to human territory. This emphasizes the need for comprehensive ecosystem management so that animals are not forced into residential areas for their survival. In the midst of these endeavors, the development of renewable energy also brings its own dynamics, sometimes contrary to conservation goals. (Burch et al., 2020) noted the conflict among wind energy projects and biodiversity protection in Oklahoma, United States. Public education is key to creating a balance among technological advances and nature conservation, so that people are better prepared to accept the necessary ecological compromises.

Legal and regulatory issues also affect the success of conservation. Weak law enforcement against unlawful logging perpetrators, poaching, or unlawful fishing makes environmental damage continue to occur even though there are rules that prohibit it. Not only that, inconsistencies in regulations among institutions or government levels also cause overlapping authorities and policies that are not in sync. Another major threat is climate change, which causes changes in weather patterns, rising earth temperatures, and damage to natural ecosystems. For illustration, coral bleaching in the ocean due to rising sea temperatures has threatened

the survival of coral reef-dependent marine species. On the other hand, corruption and poor governance are also the main causes of the low effectiveness of conservation programs. Funds allocated for conservation are often not used as intended, thus reducing the direct impact on the field.

Recent studies have shown that environmental and sustainability issues are inseparable from global political, legal, and governance dynamics. (Wallis et al., 2025) underscore how geopolitical tensions and weak cross-border coordination in the Pacific region are further exacerbating challenges in maintaining security and environmental protection. A similar phenomenon is also reviewed (Atapattu, 2023), which notes the existence of social and political barriers to climate change adaptation globally, including policy conflicts and lack of funding for adaptation endeavors. In international law, (University of Calgary, 2023) criticizes the low integration among human rights (HAM) principles and environmental conservation in the global legal system, which has an impact on weak enforcement of environmental protection through human rights mechanisms. This is reinforced (The Palgrave Handbook of, 2023), which emphasizes the importance of state legal responsibility in environmental management as part of a commitment to global sustainability and climate change mitigation. At the practical level, corruption and poor governance complicate conservation endeavors and sustainable resource management. (Proceedings IC-LAW 2023, 2024) states that weak governance and corrupt practices contribute to the low effectiveness of conservation policies, especially in the use of conservation funds in developing countries. In addition, (Lembut & Oktariani, 2023) reveal how the manipulation of accounting and tax reporting by mining companies is an indicator of weak fiscal regulation that leads to excessive exploitation of natural resources. Endeavors to maintain environmental sustainability also require a more holistic approach, including strengthening forestry governance and implementing anti-corruption mechanisms as suggested in (Springer SDG, 2021). On the other hand, the University of Calgary (2023) highlights the physical impacts of global warming, such as rising sea levels that further exacerbate the vulnerability of coastal areas and marine ecosystems (University of Calgary, 2023).

In addition, the unlawful trade in endangered animals is still rampant due to its very high economic value. Cross-border wildlife trafficking networks are difficult to eradicate because they involve powerful

syndicates and international networks. The lack of data and information is also an issue in itself, because without accurate data on the number of species, geographical distribution, or their threat status, policy planning becomes untargeted. No less important, policy inconsistencies due to changes in political regimes or leadership cause conservation programs to lack long-term strategic direction. Meanwhile, globalization and economic pressures also put conservation areas at high risk, with a huge push to produce commodities such as palm oil, timber, or mining, which often come at the expense of the environment. Even infrastructure projects or foreign investment sometimes ignore the principles of sustainability and damage natural habitats.

The dynamics of forest management and conservation in different regions of the world, especially in Africa and other developing countries, cannot be separated from the complex interplay among political power, global economic structures, as well as challenges in data governance and law. Wallis et al. (2023) underscore how the complicated political relationship among states and non-state actors creates space for wildlife trafficking syndicates to proliferate undetected and difficult to act on effectively (Wallis, 2023, DOI: 10.4324/9781003363101). This phenomenon suggests that conservation depends not only on formal regulation, but also on the extent to which government institutions are able to maintain authority and integrity in the face of pressure from informal or unlawful groups. Furthermore, NDIEAS Proceedings (2024) adds perspective by stating that neoliberalism and international legal structures actually reinforce exploitative practices of natural resources, including massive deforestation and unsustainable trade in timber and agricultural commodities (NDIEAS, 2024, DOI: 10.2991/978-2-38476-255-2). In this context, environmental policy is often defeated by the logic of markets and transnational investments that are more interested in profit than ecosystem sustainability.

The importance of data as a basis for planning and evaluation of conservation policies is emphasized by Batra et al. (2021), who highlight that global institutions such as the GEF must have a robust data-driven evaluation system to design effective programs (Batra, 2021, DOI: 10.4324/9781003207979). However, major challenges still exist in accurate biodiversity data collection, due to the lack of technical capacity, geographical access, and coordination among countries. On the other hand,

Climate Change and Critical Agrarian Studies (2023) explains how changing political regimes and global agribusiness dominance are further exacerbating the situation by changing the direction of environmental policies to be more pro-industry and detrimental to conservation endeavors (Taylor & Francis, 2023, DOI: 10.4324/9781003467960). Inequality in land access is increasing, and local communities that are usually guardians of nature are being marginalized.

Legal issues are also one of the main inhibiting factors in the protection of conservation areas. The Handbook on Space, Place and Law (2021) identifies that the incoherence of national and local legal systems to spatial dynamics leads to interregional and inter-institutional policy conflicts (Elgar, 2021, DOI: 10.4337/9781788977203). This triggers inconsistencies in the implementation of environmental regulations, so that even though an area has been designated as a protected area, exploitation practices still occur due to jurisdictional ambiguity and overlapping authority. In addition, the Palgrave Handbook of Global Sustainability (2023) shows that global demand for commodities such as palm oil and mining materials reinforces pressures on natural habitats, marginalizing conservation values in the development agenda (Palgrave, 2023, DOI: 10.1007/978-3-031-01949-4). Ecosystem degradation also occurs systemically, with impacts ranging from biodiversity loss to social conflicts at the local level.

Finally, the Encyclopedia of the UN SDGs – Life on Land (2021) provides empirical evidence on how global industries such as oil palm plantations and unlawful logging directly lead to declining animal populations and ecosystem damage (Springer, 2021, DOI: 10.1007/978-3-319-95981-8). Data show that land expansion for export commodity production has drastically altered landscapes, eliminating the native habitats of endangered species and threatening the sustainability of indigenous peoples' lives. All of this shows that the current conservation issue can no longer be seen as just an environmental issue, but a multidimensional issue involving political governance, the global economy, the law, and the rights of local communities. Without a holistic approach and synergy among actors—states, international organizations, civil society, and the private sector—the threats to the sustainability of life and the environment will continue to increase.

B. Socio-Economic Pressures on Conservation Areas

Social and economic pressure on conservation areas is one of the biggest challenges in endeavors to preserve biodiversity and natural ecosystems. In many areas, conservation areas such as national parks, nature reserves, and wildlife sanctuaries are in the midst of communities that rely directly on natural resources to meet their livelihoods. Limited access to land, employment, and economic infrastructure often encourage communities to use resources in or around conservation areas illegally or unsustainably. For illustration, activities such as forest encroachment, unlawful farming (slash and burn fields), fishing with chemicals, or hunting protected animals are becoming common practices as a way to increase income or meet food needs.

Natural resource management in tropical forest areas, especially in developing countries such as Cameroon, Zambia, Tanzania, and various regions in Africa and Asia, is increasingly complex due to economic pressures, global policies, and social changes that occur in local communities. (Beckline et al., 2022) revealed that almost all households around the Etinde community forest in Cameroon are highly dependent on forest products as their main source of livelihood. Firewood, bushmeat, and farmland are essential commodities for the survival of local communities. While these activities provide direct economic benefits, they also pose a serious threat to the sustainability of the forest. High dependence on forest resources in the absence of sustainable management mechanisms leads to gradual environmental degradation. This situation is exacerbated by the lack of viable income alternatives for local communities, so they continue to exploit forests despite realizing the long-term risks. In Zambia, (Chanda et al., 2025) found a unique relationship among the use of self-sufficient solar energy and the exploitation of non-timber forest products (NTFPs), such as mopane caterpillars and traditional medicine. Solar energy allows people to be more efficient in processing and storing NTFPs, increasing the economic value of the product. However, this phenomenon also opens up opportunities for increased exploitation of natural resources as the accessibility of new technologies expands production capacity. Thus, while there is a positive potential for green technology integration, a holistic approach is needed that involves regulation and education so that there is no overexploitation of resources that are vulnerable to extinction.

Meanwhile, the COVID-19 pandemic has had a significant impact on people's dependence on natural resources. (Chebby et al., 2024) noted that the loss of income from the tourism sector in Tanzania due to mobility restrictions and border closures has led many communities to turn to the exploitation of natural resources as a survival strategy. Those who usually rely on income from nature tourism or handicrafts commence to use the forest for food, fuel, and other sources of income. This phenomenon is supported (Singhal et al., 2024), who explain that there has been a surge in deforestation during the pandemic, triggered by weakening conservation oversight and increasing economic pressure on forest fringe communities. Lack of control due to the government's shift of focus to handling the health crisis and limited field personnel have also exacerbated this condition. To address these problems, (Behera & Mohapatra, 2024) propose social forestry as an adaptive strategy that can reduce conflicts among communities and governments, while preventing encroachment and land degradation. This model emphasizes the active participation of local communities in forest management through a decentralized system. By giving rights and responsibilities to communities in managing forest resources, it is hoped that a sense of collective ownership will be created that can encourage more sustainable management practices. In addition, social forestry also has the potential to improve community welfare through economic empowerment and local capacity building.

However, the implementation of these strategies does not always go smoothly. (Scoones et al., 2023) highlight the power imbalance among local and global actors that often creates inequities in the distribution of benefits from conservation programs. Conservation projects funded by international agencies or central governments sometimes ignore the aspirations and rights of local communities, fueling resistance and conflict. When communities feel that they are not getting a proportionate benefit from conservation, they tend to resist or even engage in unlawful exploitation as a form of protest. Therefore, the successful management of natural resources must be based on the principles of justice, transparency and inclusive participation, involving all stakeholders, especially local communities whose livelihoods depend directly on forests. In the context of globalization and climate change today, integration among national policies, local participation, and international support has become critical. Endeavors to create a sustainable model of natural resource management

must take into account the economic and social realities of society, as well as the political dynamics that affect the distribution of power and benefits. Without a holistic and participatory approach, conservation endeavors will continue to face major challenges, both from the ecological and social sides.

In addition, the rapid population growth also puts significant pressure on conservation areas. The increasing population has led to a higher demand for residential land, agriculture, plantations, and infrastructure, so that conservation areas are increasingly pressed and fragmented. In some cases, the boundaries of conservation areas are no longer clear due to land occupation by communities or entrepreneurs, even with the support of certain parties at the local level. This not only threatens the existence of rare animal and plant habitats, but also triggers conflicts among conservation officials and communities or business actors.

Land use change due to human activities has become one of the main factors affecting the sustainability of ecosystems and biodiversity in various parts of the world. In the global context, several recent studies show that forest fragmentation and habitat degradation are further accelerated by agricultural expansion, infrastructure development, and rapid urbanization. (H. Gunawan et al., 2024) used the DPSIR (Driving Forces-Pressure-State-Impact-Response) framework to analyze forest fragmentation in Indonesia in response to the pressures of population growth and agricultural and infrastructure expansion. The study underscores how changes in land use patterns directly lead to habitat connectivity, thereby accelerating the extinction of local species and reducing biodiversity richness. The DPSIR approach helps explain the complex relationship among driving forces, environmental pressure, ecosystem conditions, impacts on biodiversity, and policy response strategies. The results of the study provide important recommendations for policymakers to design a more inclusive and sustainable land governance system.

In the Southwest China region, (Kuang et al., 2024) project land use changes until 2050 by focusing on their implications for habitat quality and species richness. They found that the conversion of forests to agricultural land and settlements would significantly reduce the ecological value of the area. This projection is based on a spatial simulation model that considers population growth trends, agrarian policies, and local socio-economic

dynamics. Their results suggest that in the absence of strong policy interventions, habitat loss will lead to the local extinction of some endemic species that are sensitive to environmental changes. The study also noted that habitat fragmentation increases the isolation of wildlife populations, thereby reducing reproductive opportunities and increasing the risk of genetic bottlenecks. This is an early warning for environmental planners to prioritize the protection of ecological corridors in regional development schemes.

Meanwhile, (Mukaku Kazadi et al., 2024) conducted a mapping of the dynamics of forest cover in Lomami National Park, Republic of Congo, an important conservation area that is home to several endangered species such as bonobo and okapi. Their research reveals an increase in forest degradation around human access zones, including transportation routes, new settlements, and unlawful mining areas. This degradation has a direct impact on the integrity of protected areas and increases the risk of invasion of exotic species and ecosystem disturbances. The study suggests the need for stronger monitoring and participation of local communities in conservation endeavors, as fragmentation often stems from poorly monitored unlawful activities. In addition, the integration of spatial and participatory data in regional management can be an effective solution to maintain ecosystem sustainability amid growing socio-economic pressures.

(Liu et al., 2025) add another perspective by projecting the impact of urbanization in China until 2050 on endemic species. They predict that the expand large cities will lead to significant habitat loss, especially in areas with high population density. Habitat fragmentation triggered by the development of road, release, and industrial infrastructure results in the isolation of endemic species populations, reduces genetic diversity, and increases the risk of extinction. This study confirms the importance of urban green space planning and wildlife corridors in sustainable city design. Without an ecological approach in urban planning, threats to biodiversity will continue to increase along with the pace of urban development.

In the European context, (Krumins et al., 2024) modeled various land use scenarios in the Vidzeme Biosphere Reserve, Latvia, and warned that without policy changes, population growth and agricultural intensification would exacerbate ecosystem fragmentation. They found that current policies are not responsive enough to the dynamics of land change, causing

a decline in the quality of natural habitats. The study suggests adaptive approaches to land management, including strict regulation of agricultural expansion and incentives for environmentally friendly agricultural practices. On the other hand, (Krumins et al., 2024) evaluated land change in the Teiči Nature Reserve, Latvia, and concluded that rigid conservation zoning fails to respond to dynamic land pressures. Inflexible zoning makes it difficult for managers to adapt to changing demographics and economies, reducing the effectiveness of ecosystem protection.

(Ntukey et al., 2022) report a similar situation in Tanzania, where agricultural expansion has led to the decline of African elephant habitats, particularly in the Wami Mbiki–Saadani corridor. This habitat loss has triggered an increase in conflicts among humans and animals, especially in the form of elephant attacks on residents' fields and revenge by the community. The study emphasizes the need for a participatory approach in wildlife corridor management, where the interests of local communities must be aligned with conservation endeavors. Meanwhile, (Luo et al., 2024) reviewed human pressure mapping methods such as "human footprint" to support protected area management. They found that these spatial indicators are particularly useful in identifying areas that are vulnerable to fragmentation and space-use conflicts. Accurate mapping of human pressures can be the basis for more targeted and effective zoning policies in maintaining ecosystem sustainability. Overall, this series of studies shows that habitat fragmentation due to land use change is a global issue that requires a multidisciplinary and collaborative approach. Protection of ecological corridors, ecosystem-based spatial planning, and integration of community participation in land management are key to reducing the negative impact of fragmentation. Without proactive and innovative measures, biodiversity loss will continue, threatening the stability of the ecosystems and environmental services we rely on.

On the other hand, economic inequality and the lack of sustainable livelihood alternatives for the communities around the conservation area exacerbate these pressures. Many residents feel that they do not directly benefit from the existence of conservation areas, so they tend to see the area as an obstacle to development or a wasted economic potential. The lack of environment-based economic empowerment programs, such as ecotourism, organic cultivation, or the management of NTFPs legally and

sustainably, makes it difficult for communities to escape their dependence on the exploitation of natural resources.

Ecotourism and Nature-based Solutions (NbS) are increasingly recognized as a strategic approach that can bridge the gap among environmental conservation and improving the economic well-being of local communities, especially in developing countries. Studies have shown that the apply this concept not only helps protect biodiversity but also provides really social and economic benefits to the surrounding communities. (Bhushan et al., 2024) in their research in the Kaimur Wildlife Sanctuary, India, underlined the potential of ecotourism as a model of sustainable forest management. They found that ecotourism can be an alternative source of income for local communities, which have been directly dependent on forest resources. By building environmentally friendly tourism infrastructure and involving the community in the provide tourism services such as homestays, guides, and handicrafts, ecotourism opens up new economic opportunities without damaging forest ecosystems. In addition, this approach also increases public awareness of the importance of preserving the environment as a tourism asset.

(Samal & Dash, 2023) in their review of the global literature affirm that ecotourism is one of the most dominant approaches in bringing together two main agendas: environmental conservation and the economic development of local communities in developing countries. Their study identified that many ecotourism projects have succeeded in creating jobs, increasing market access to local products, and strengthening people's social capital through active participation in the management of tourist destinations. In Nepal, (S. Tiwari et al., 2024) documented how adventure ecotourism along the Annapurna trail has contributed significantly to the development of rural communities. Through trekking, homestays, and local souvenir sales, local people not only earn more income, but also strengthen social ties and a sense of ownership of their natural resources. This shows that ecotourism is not just a tourism industry, but also a means to strengthen community capacity in sustainable natural resource management.

A similar approach was also found in alternative livelihood programs in Colombia studied (Maynard et al., 2021). The program is designed for people living around the habitat of endangered animals, namely white tamarinds, with the aim of reducing pressure on natural habitats through

the development of environmentally friendly economic activities. The results of the study showed an increase in household income and a change in positive attitudes toward animal conservation. However, Maynard et al. noted that the main challenge is the limited scale of the program, which requires greater policy support and investment to expand its impact. This approach is relevant to other geographical contexts, including in Asia, where (Mishra et al., 2025) describe the livelihood dynamics of communities in the Dooars region, India. They found that the combination of local commodities such as tea and NTFPs with ecotourism principles can be a strong foundation for a sustainable household economy. The integration among agriculture, forest management, and tourism helps communities not only survive economically, but also maintain the sustainability of the surrounding ecosystems.

In Bangladesh, (Smith et al., 2021) conducted a systematic analysis of the effectiveness of NbS, especially in the context of the conservation of coastal and delta ecosystems that are vulnerable to climate change. They found that the use of coastal vegetation such as mangroves for shoreline protection not only reduces the risk of natural disasters, but also creates economic opportunities through ecotourism, sustainable fisheries, and community development. This study shows that NbS has the potential to be a holistic approach that integrates ecological, social, and economic aspects in the management of coastal areas. Meanwhile, (Ramaano, 2023) from South Africa highlights the importance of integrating ecotourism and sustainable agriculture as a strategy to address environmental degradation while creating jobs in protected areas. This research confirms that collaboration among local governments, conservation agencies, and communities is essential to ensure the successful implementation of this model.

Overall, the studies show that ecotourism and NbS have great potential as a multidimensional approach that not only protects the environment, but also improves the quality of life of local communities. However, the successful implementation of this model is highly dependent on active community participation, appropriate policy support, and sustainable investment from various stakeholders. With an inclusive and sustainable approach, ecotourism can be the backbone of rural economic development that is in harmony with nature, especially in developing countries with high biodiversity and cultural richness.

Furthermore, global pressure and international markets also have an indirect impact on conservation areas. High demand for commodities such as palm oil, tropical timber, precious metals, and endangered animals is driving industrial expansion into forest areas and natural habitats. Foreign investment or large infrastructure projects—such as dams, highways, or mines—often open up access to previously protected areas, increasing the risk of deforestation and ecosystem degradation. In fact, in some cases, national economic development policies are not fully aligned with conservation principles, creating a conflict among economic goals and environmental protection.

Deforestation in the tropics and subtropics has become an increasingly urgent environmental issue in recent decades, triggered by a variety of economic, political, and social factors. One of the main drivers of forest destruction is foreign direct investment (FDI) and urban population growth, as shown (Sylvester et al., 2024). Their study revealed that the need for land for food systems and commodity exports is causing massive deforestation in 40 tropical and subtropical countries. Rapid urbanization increases the demand for raw materials, energy, and infrastructure, which ultimately accelerates the exploitation of forest resources. This phenomenon is exacerbated by weak environmental governance and regulations in many developing countries.

In addition, (Ongolo & Krott, 2023) emphasized the role of global demand for precious timber, palm oil, and minerals as a triggering factor for forest exploitation in Africa. They highlight that although these commodities make an economic contribution to producing countries, international market pressures often exceed the capacity of local institutions to manage them sustainably. This has led to severe ecosystem damage, as well as a decline in the quality of life of local forest-dependent communities. This situation also reflects structural inequalities in global supply chains, where developed countries enjoy the results of exploitation without bearing the direct environmental impacts.

(Lo et al., 2024) research on nickel mining in Sulawesi adds to our understanding of the complexity of the relationship among economic development and the environment. Although mining projects bring benefits such as improved infrastructure and health services, the environmental impact is significant, especially the decline in air, water, and soil quality, as well as deforestation that is almost double that of non-project areas. This

impact is more pronounced in poor villages, where communities do not have a large capacity to adapt or mitigate. These results show that economic development must be designed in an inclusive and sustainable manner so as not to exacerbate inequality and environmental damage.

(Biswas et al., 2021) found a similar pattern in Myanmar, where political transitions accompanied by infrastructure development led to a spike in deforestation. Infrastructure projects, whether in the form of highways, ports, or dams, open access to previously isolated forest areas, facilitating unlawful activities such as unlawful logging and agricultural land expansion. Furthermore, the study shows how development policies often conflict with conservation principles, as their top priority is short-term economic growth rather than long-term environmental protection.

The problem of land acquisition or "land grabbing" is also one of the main causes of forest cover loss. (Legault & Cochrane, 2021) reviewed cases in Gabon, where massive foreign investment resulted in a shift of control over forests from local communities to external actors. As a result, previously protected conservation areas are becoming vulnerable to commercial exploitation. (Yang & He, 2021), in their global meta-analysis of 128 "land grabbing" case studies, found that many foreign investment projects are carried out in areas with high biodiversity but minimal social and environmental protection. This poses a significant risk to unique ecosystems and the rights of indigenous peoples.

In the context of global trade, (Downing et al., 2021) examined China's reforestation policies that have succeeded in increasing the area of domestic forests, but have an indirect impact on exporting countries such as Indonesia and Brazil. China's rising demand for agricultural products such as palm oil and soybeans has sparked land expansion in producing countries, often at the expense of natural forests. This suggests that environmental success in one region can mean degradation in another region in the context of economic globalization. Therefore, environmental policy needs to be seen from the perspective of global supply chains, not just national.

(Shyamsundar et al., 2021) explain that global pressures such as climate change, commodity market fluctuations, and extractive investment exacerbate forest poverty, especially in regions that do not have strong intervention mechanisms to balance development and conservation. They suggest the need for a holistic approach involving governments, the private

sector, and civil society in decision-making related to land use and forest resources. Without strategic intervention, the cycle of environmental damage and poverty will continue.

Overall, the series of studies underscore that deforestation is not only a matter of direct exploitation of forests, but is also the result of complex global dynamics. Factors such as foreign investment, global demand, national policies, and weak governance are important elements in understanding modern deforestation patterns. To address these challenges, cross-border collaboration and policy integration are needed that can bridge economic interests with environmental protection, as well as ensure the participation of local communities in decision-making processes. Only with an inclusive, sustainable and transparent approach can forest conservation endeavors succeed in the long-term.

C. Land Use Conflicts and Encroachment

Land use conflicts and encroachment are one of the main problems that often occur in conservation areas, be it national parks, nature reserves, wildlife sanctuaries, or protected forest areas. This conflict arises when there is a conflict among environmental protection policies and the socio-economic needs of the community or business interests. In many cases, conservation areas are directly next to residential settlements or people's agricultural areas, so administrative boundaries are often not respected. Communities facing limited land and economic resources use conservation areas to cultivate, raise livestock, or establish settlements illegally. This activity is called encroachment, which is the use or occupation of land in a forest area or conservation area that should be protected.

The problem of managing conservation areas in various parts of the world is increasingly complex as the pressures from human activities increase, changes in land use patterns, and the socio-economic dynamics of local communities. (Tang et al., 2023) study shows that in Nigeria, 18 national parks face extensive damage due to environmental encroachment and degradation triggered by human activities such as unlawful logging, agriculture, as well as mining. The weak factor of formally monitored territorial boundaries is one of the main causes of the authorities' inability to maintain the integrity of the protected area. This proves that even if an area has been declared a conservation area, without adequate monitoring and enforcement, the threat to its sustainability remains high.

In Indonesia, (Y. Gunawan, 2025) found that forest fragmentation is getting worse due to the expand agriculture and infrastructure, especially in areas directly next to residential areas. This fragmentation not only reduces the area of the forest physically, but also breaks up wildlife habitats and disrupts the previously intact ecosystem network. Thus, conservation endeavors become more difficult because the relationship among parts of the ecosystem is severed, making it difficult for natural regeneration and fauna migration. The involvement of local communities in regional management is becoming increasingly important to reduce land use conflicts and bridge people's living needs with the principle of sustainability.

Community's dependence on natural resources within conservation areas is also a central issue in several studies. (Brian et al., 2020) noted that in the Kapolet Forest Reserve, Kenya, as many as 94.6% of households regularly rely on forest products to meet their basic needs. This fact shows that conservation areas are often inseparable from the daily lives of the surrounding community, so a participatory approach is needed in designing management policies. Without a viable livelihood alternative, people will continue to exploit resources even on an unlawful or semi-legal scale.

The same thing was also expressed (Dhyani et al., 2023) in a case study of mangroves in India, especially in the Bhitarkanika and Mahanadi deltas. They found that the loss of mangrove vegetation was largely triggered by the pressure of the living and agricultural space needs of the surrounding community. Mangroves, which have an important function as natural fortresses against storms and coastal scrape, continue to shrink due to land reclamation for agriculture, food, and settlements. In fact, if managed collaboratively by involving the community, mangroves can be a sustainable resource both ecologically and economically.

(A. Tiwari, 2022) in his study in Nepal showed that although the country has protected about 30% of its territory as a conservation area, major challenges remain, such as forest encroachment, limited land for residents, and weak border enforcement. This phenomenon shows that the area is not the main indicator of conservation success, but rather how the local government management and governance system and the participation of local communities in maintaining ecosystem balance. Meanwhile, (ÖZDEŞ & SOUTHWORTH, 2023) highlight the complexity of

savanna management in Sub-Saharan Africa, where the relationship among local communities and policymakers is often out of sync. The difference of views among the government that wants to preserve the ecosystem and the community that prioritizes daily economic needs is the root of land use conflicts.

A similar situation also occurs in Latvia, where Krumins & Klavins (2025) project that agricultural intensification and urban growth in the Latvian Biosphere Reserve will continue to threaten conservation goals if no adaptive management model is implemented. They suggest that management plans should be flexible and responsive to climate change, demographics, and land use patterns. In South Africa, (Vukeya et al., 2025) recorded a 31.5% decline in natural vegetation cover over the past 34 years in savanna regions, a fairly alarming figure. This decline shows the urgency of strengthening land use policies that not only focus on conservation, but also provide space for local communities to participate in sustainable resource management.

From the entire study, it can be concluded that the management of modern conservation areas can no longer be carried out unilaterally by the government or conservation institutions. A holistic approach involving local communities, local governments, and non-governmental organizations is needed to create a balance among ecosystem protection and meeting people's living needs. In addition, the use of remote sensing technology and geographic information systems (GIS), such as those used by Tang et al., is essential to monitor changes in real-time and design targeted interventions. Adaptive and participatory management models, supported by strong regulations and consistent law enforcement, are key to maintaining the sustainability of conservation areas amid the onslaught of global and local pressures.

Encroachment is not only carried out by local communities, but can also be carried out by large business actors such as oil palm plantations, mines, or unlawful timber entrepreneurs. On a large scale, this type of encroachment often involves political actors, bureaucrats, or local officials who give permits informally or even turn a blind eye to such unlawful activities. As a result, the natural habitats of endangered animals are damaged, biodiversity is shrinking, and ecosystem functions such as carbon sequestration, water providers, and microclimate controllers are disrupted. In addition, physical conflicts among conservation officers and the

community or business actors are common, which can trigger clashes, riots, or even fatalities.

The encroachment and degradation of conservation areas in various parts of the world is increasingly complex, influenced by political, economic, and social dynamics involving local and global actors. (Ongolo et al., 2023) reveal how multinational corporations such as Herakles Farms in Cameroon have managed to control conservation land for oil palm plantation expansion by taking advantage of weak local government bureaucratic capacity and informal power at the local level. The study shows that in many cases, corporations not only use formal legality as a tool of legitimacy, but also build unofficial networks of power to smooth access to natural resources. This reflects the reality that the management of natural resources is often determined more by power relations than by conservation principles.

In the context of transparency and monitoring, (Tellman et al., 2020) offer an innovative approach through a conceptual framework that leverages satellite data to track unlawful encroachment activities in real-time. They emphasized the importance of transparency in uncovering hidden practices that have been difficult to identify through traditional mechanisms. With this technology, encroachers, both individuals and corporations, can be tracked and held accountable. However, the effectiveness of this system depends heavily on the ability of government institutions to respond quickly and decisively to such findings. Meanwhile, (Salazar et al., 2022) note that the change in political power after the 2018 elections in Colombia has triggered an increase in environmental violations and violence against environmental defenders. This fact proves that political stability and the protection of environmental rights are closely linked; When policies are no longer pro-environment or there is no protection for environmental fighters, the pressure on conservation areas will be even greater.

In ecological impact, (COSTA et al., 2024) present an in-depth analysis of the massive agribusiness expansion in the Amazon, which has led to forest degradation, water pollution, soil conflicts, as well as large scale carbon releases. This research is proof that the expand the commercial agricultural sector not only threatens the sustainability of forest ecosystems, but also exacerbates the global climate crisis. The degradation of tropical forests, one of the world's main carbon sinks, has a domino effect

that is felt globally. (Oldekop et al., 2020) also highlight new trends such as infrastructure development and digitalization that are accelerating the clearing of forest areas, as well as changing the livelihoods of local communities. These changes create conditions in which communities that once depended on forest ecosystems commence to shift to non-traditional economic activities, often at high ecological costs.

At the international regulatory level, (Y. Gunawan, 2025) evaluated global legal frameworks such as UNFCCC, CBD, and REDD+ and found that although these frameworks have the noble goal of preserving forests and reducing carbon emissions, their implementation is still weak due to the lack of law enforcement mechanisms and the dominance of economic incentives over conservation principles. This fact shows that although countries have international commitments, in practice they often prioritize economic growth over environmental sustainability. This poses a major challenge to global endeavors to control deforestation and maintain the integrity of protected areas.

At the regional level, Ongolo & Krott (2023) argue that forest management in Africa is influenced more by local political-economic realities and power plays than global conservation goals. They emphasized the importance of understanding local dynamics in designing effective conservation policies. This data illustrates how rapidly forest degradation is accelerating in areas that are biodiversity hotspots, as well as the urgency of stronger interventions from governments and relevant stakeholders.

The factors that cause land use conflicts and encroachment are complex. On the one hand, people often feel that they have traditional rights to the land because it has been occupied or used for generations. On the other hand, strict conservation regulations make their access limited, without adequate livelihood alternatives. Lack of coordination among government agencies, overlapping permits, and weak law enforcement also aggravate the situation. For illustration, an area may be classified as a protected forest area, but at the same time there is a location permit from the local government for infrastructure or investment projects.

Issues of tenure security and land conflicts have become crucial issues in natural resource management, especially in forest areas and customary territories. (Tauli-Corpuz et al., 2020) show that the expand conservation areas is often carried out without considering the rights of indigenous peoples who actually have an important role in maintaining ecosystems. In

many cases, governments or conservation agencies claim that environmental protection should be prioritized, but instead it leads to human rights abuses, forced evictions, and the loss of people's traditional access to their resources. This proves that an unexclusive conservation approach is not only socially flawed, but also has the potential to damage the sustainability of the environment itself.

The "fortress" style conservation approach that is often applied by countries and international organizations still inherits the logic of colonialism, as reviewed (Domínguez & Luoma, 2020). They criticize how modern conservation systems often ignore traditional knowledge and management systems that have long been implemented by local communities. This approach creates structural injustices by positioning communities as a threat to the environment, when in reality they are the primary guardians of biodiversity. Conservation policies that do not involve local communities tend to cause greater resistance and conflict, as communities feel disadvantaged and not appreciated for their existence.

(Cruz-Burga et al., 2024) in a study in the Peruvian Amazon found that indigenous and mestizo communities' perceptions of tenure security are strongly influenced by legal status, gender, and ethnicity. This fact shows that the issue of land ownership and access is not a nondimensional issue, but a multidimensional one involving social, cultural, and political aspects. Females, for illustration, often have more limited access to land even though they are active in the management of natural resources. Meanwhile, certain ethnic groups may face discrimination in the process of legalizing their land claims. Therefore, natural resource management plans must be designed sensitively to the identity and social conditions of the local community.

In Indonesia, Astuti et al. (2022) revealed the governance dilemma among business interests and environmental protection due to the incompatibility of oil palm plantation permits with forest status in Central Kalimantan. This kind of tenure conflict is the result of overlapping regulations and weak coordination among government agencies. Meanwhile, (Rustiadi & Veriasa, 2022) highlight the spatial dualism among the forestry and agrarian sectors in Indonesia which exacerbates land use conflicts. This dualism creates a loophole for the issuance of dual permits—where a single piece of land is claimed by two different parties: the government for forests, and corporations for plantations. As a result, local

communities are often victims of bureaucratic battles that they do not understand.

(Hardiansyah et al., 2025) in a study on HTI licensing conflicts in Kalimantan recommended a neutral mediation and participatory facilitation approach as alternative solutions to resolve complex conflicts. They suggested that the resolution process should not only be technical-administrative, but also involve substantive dialogue among all relevant parties, including local communities, corporations, and local governments. Without the active participation of the community in the conflict resolution process, the resulting solutions will be difficult to be widely accepted and vulnerable to further escalation.

From the perspective of ecosystem restoration, (McLain et al., 2021) note that most restoration plans such as Restoration Opportunities Assessment Methodology (ROAM) have not taken seriously the tenure aspect. In fact, without clarity on land rights and access to resources, restoration endeavors will be difficult to sustain in the long-term. Restoration that is not based on tenure security can lead to legal uncertainty and resistance from local communities who feel they have no legal relationship to the restored land.

(Holland et al., 2022) in their book offer a comprehensive approach to understanding the relationship among tenure security and sustainable development. They affirmed that community-based legal and policy reforms are an absolute prerequisite for creating a fair and sustainable land management system. The reform must start with the formal recognition of the rights of indigenous peoples, the simplification of land legalization procedures, and the strengthening of participation mechanisms in spatial planning.

The issue of tenure security and land conflicts can no longer be ignored in the agenda of conservation and natural resource management. Environmental sustainability cannot be achieved if it is not accompanied by the fulfillment of the rights of local communities and the fair distribution of resources. An inclusive, transparent, and participatory approach is key to building a land management system that is not only ecologically sustainable, but also socially just. Governments, international institutions, and other stakeholders must work together to develop policies that not only protect the environment, but also respect the rights and dignity of the people living in and around conservation areas.

D. Institutional and Policy Gaps

Institutional and policy gaps are one of the structural challenges that often hinder the success of conservation in various countries, including Indonesia. This problem arises when there are discrepancies among government institutions, existing regulations, and implementation in the field. Many conservation policies are designed on a top-down basis without taking into account the local context, so they are not aligned with the social, economic, and cultural conditions of local communities. In addition, overlapping authority among agencies—such as among the Ministry of Environment and Forestry, local governments, and agencies in other sectors such as agriculture or investment—causes coordination to be ineffective and conservation programs often run in place.

A holistic and coordinated approach to governance is becoming increasingly important in natural resource management, especially in the context of environmental conservation policies. (Lee et al., 2022) highlight the existence of policy gaps in agricultural water governance in Korea, where inter-agency fragmentation and lack of coordination hinder the effectiveness of conservation endeavors. They suggested the need for a multi-level governance approach involving different levels of government and stakeholders to ensure policy integration from the national to local levels. This approach is considered to be able to bridge differences in priorities and capacities among levels of government, as well as increase policy responsiveness to local dynamics. A similar phenomenon was also discovered (Alblas & van Zeven, 2023), who showed that the implementation of EU nature conservation law in the Netherlands is fragmented due to overlapping agricultural policies. The conflict has led to a weakening of biodiversity protection goals, so they call for regulatory harmonization and improved coordination among sectoral policies.

In the context of the ocean, (Muccitelli et al., 2023) found that environmental contracts can be a solution to increase collaboration among actors in the management of marine protected areas in Southern Europe. The contract, as a participatory and inclusive mechanism, helps create a mutual contract among governments, fishermen, and environmental organizations. This allows for a fairer and more sustainable allocation of resources, as well as reducing potential conflicts among users of marine space. In turn, these contracts encourage local actors' compliance with conservation rules. In contrast, (Semeraro et al., 2020) criticize the top-

down approach in urban area planning, especially in participatory conservation projects. Their study shows that the absence of a two-way dialogue among planners and local communities often results in policies that do not correspond to the realities on the ground, as well as ignore the economic and social needs of the community. Therefore, they emphasized the importance of active participation of the community in the decision-making process so that policy results have legitimacy and sustainability.

(Kirsop-Taylor et al., 2022) add that local institutional logic—including norms, values, and authority structures that already exist at the community level—should be considered in designing conservation policies. Insensitivity to the local context, according to them, will result in policies that are difficult to accept and implement. (Stoffelen, 2022) also supports this idea by showing that governance challenges such as institutional fragmentation and power imbalances among administrative regions do not only occur in the conservation sector, but also in cross-border tourism management. This shows that complex and cross-sectoral governance issues are a broad phenomenon, requiring strong and innovative coordination strategies. (Moreno & Sulasula, 2024) in their study in the Philippines found that weak coordination among the central and local governments is one of the main reasons for the slow implementation of environment-based development policies, especially in areas rich in natural resources. They emphasized the importance of effective and transparent decentralization, as well as the expand local governments' capacity to manage resources sustainably.

Based on these findings, there are several policy recommendations that can be formulated. First, multi-level governance integration must be strengthened through formal and ongoing coordination mechanisms, including inter-agency forums or cross-regional work networks. Second, the participation of local communities must be a basic principle in the planning and implementation of conservation policies, so that the policy is not only oriented to ecological aspects, but also economic and social aspects. Third, the use of collaborative instruments such as environmental contracts or participatory agreements can be an effective means of building trust and involvement of local actors. Fourth, policy harmonization among sectors—such as agriculture, environment, and tourism—is needed to prevent regulatory overlap and conflicts of interest. Finally, strengthening institutional capacity at the local level, both in the form of

training, budget support, and technology transfer, is essential to ensure the successful implementation of conservation policies. Thus, an inclusive, integrated, and locally context-sensitive approach to governance will be the foundation for the sustainability of natural resource management in the future.

Institutional gaps can also be seen from the weak institutional capacity in carrying out the management function of conservation areas. Limited human resources, lack of technical training, lack of operational budget, and low facilities and infrastructure make it difficult for many National Park Agencies or conservation area management agencies to carry out their duties optimally. In addition, inconsistent law enforcement against encroachers, unlawful logging, or wildlife trade further exacerbates the vulnerability of conservation areas. Many cases go unresolved due to limited evidence, lengthy legal processes, or even political intervention and local power.

Law enforcement and governance issues in wildlife conservation and the environment as a whole have become increasingly pressing global issues. (Iriyani et al., 2021) revealed that although the Ulu Masen Protected Area in Aceh has official conservation status, structural and operational weaknesses in the management of the Forest Management Unit Center have led to a significant decline in the Sumatran tiger population. This shows that the legality of the region alone is not enough if it is not supported by strong institutional capacity and a commitment to sustainable implementation. A similar phenomenon was also discovered (Skidmore, 2023), who through direct interviews with Amur tiger hunters in Russia identified factors such as social inequality, impunity, and human-animal conflict as the main drivers of poaching. Weak law enforcement and lack of economic access for local communities create conditions that trigger systemic environmental crimes.

Ongolo & Krott (2023), add an important perspective on how local actors in Africa respond to the weakness of formal institutions by using informal strategies to protect conservation areas from agribusiness expansion. While these strategies can be effective in the short-term, they remain vulnerable to legal uncertainty and political pressure. (Petrosian et al., 2024) also found that although most countries have wildlife trade laws, their implementation is uneven throughout the trade chain, especially in enforcement and animal welfare. Of the 95 laws reviewed in 11 countries,

the study underscores the need for cross-border coordination and stricter international standards to improve the effectiveness of law enforcement.

(Troumbis et al., 2022) made an important theoretical contribution through the concept of conservation culturomics, which is the use of digital data to analyze public attention to the issue of biodiversity crimes. They found that these issues tended to receive minimal attention from the media and the general public, thereby reducing social pressure to encourage better law enforcement. Without a strong public response, conservation agendas are often marginalized in national policy priorities. They point out that collusion among business actors and local officials can create forms of protectionism that hinder environmental protection endeavors. This reinforces the argument that environmental law enforcement depends not only on proper regulation, but also on institutional integrity and transparency of the decision-making process. As such, solutions to these challenges must be multidimensional—involving institutional reforms, increased public participation, and integration among environmental, legal, and economic policies.

Based on these findings, several policy measures can be recommended. First, there needs to be a strengthening of the capacity of conservation institutions, including staff training, budget increases, and modernization of monitoring and evaluation systems. Second, cross-border and regional cooperation must be developed to deal with the transnational unlawful wildlife trade. Third, the adoption of information technology and big data in the analysis of environmental crime trends, as suggested by the concept of culturomics, can help increase public awareness and social pressure on law enforcement officials. Fourth, the prevention of corruption and political intervention in environmental management requires stricter and more independent transparency mechanisms, including oversight by civil society. Fifth, the importance of building synergy among formal law and informal practices at the local level to create a more inclusive and adaptive environmental protection system.

In policy, regulatory inconsistency is another important issue. For illustration, an area may be designated as a protected area or national park, but at the same time there are business licenses from the local government level for mining, plantation, or infrastructure activities. This reflects policy conflicts among levels of government, which ultimately undermine the unique goal of environmental conservation. In addition,

conservation policies are often not accompanied by adequate evaluation and monitoring mechanisms, so it is not known whether the policies are truly effective or cause new negative impacts.

The dualism of forestry and agrarian spatial systems in Indonesia, as explained by Rustiadi & Veriasa (2022), creates jurisdictional conflicts that further exacerbate the rate of deforestation and hinder the integrated management of protected areas. In this context, this dualism refers to the overlapping authority among forestry and agrarian institutions in determining land allocation and control, often leading to exploitation permits being issued in areas that should be protected. This phenomenon is exacerbated (Rahman et al., 2025) who highlight the tension among mining laws and environmental laws in Indonesia, where permits for the exploitation of natural resources are often issued without considering conservation principles. As a result, legal loopholes have emerged and paved the way for ecosystem damage that is difficult to control. These findings show that regulatory fragmentation is not only a technical issue, but is also rooted in a lack of coordination and harmonization among sectors.

(Gakou-Kakeu et al., 2024) added that the failure integrates REDD+ programs in Cameroon with sectors that have the potential to cause deforestation such as agriculture and infrastructure is due to weak inter-agency coordination and low political commitment. Their study shows that while REDD+ has the goal of reducing carbon emissions through forest protection, its implementation is often not aligned with broader sectoral dynamics. This emphasizes the importance of a holistic approach in environmental policy planning, where each sector must support each other and not run alone. (Aubrechtová et al., 2020) from the Czech Republic provide a similar perspective, where many environmental policy documents are not well integrated, full of formulation inconsistencies, and minimal evaluation of the impact on landscape fragmentation. They suggested the need for a stronger policy impact assessment mechanism to avoid unforeseen negative effects on ecosystems.

A similar situation also occurs in Peru, where the (OECD, 2021) in its water governance report concluded that weak inter-agency coordination and the absence of a comprehensive monitoring system have made it difficult to achieve environmental targets such as SDG 6—clean water and decent sanitation. Without an effective monitoring system, policies cannot

be evaluated in a timely and responsive manner. (Durán-Díaz, 2023) offers an innovative solution in the form of a land governance framework for the water-energy-food nexus (WEF) system that combines top-down and bottom-up approaches. The framework is designed to avoid policy inequities among the central and regional levels, by placing local participation as a key foundation in the planning and implementation process. This approach is relevant in the context of many developing countries, including Indonesia, where disparities in capacity and priorities among levels of government are often the main obstacles to the success of environmental policies.

Furthermore, Luo et al. (2024) show that the human pressure mapping technique on protected areas is an effective method for monitoring the implementation of conservation policies based on spatial evidence. By leveraging geospatial data, this mapping allows policymakers to understand patterns of threats to ecosystems in real-time, as well as design more targeted interventions. This kind of technology is very important in an effort to increase transparency and accountability in the management of natural resources. However, its use also requires adequate technical capacity and strong inter-agency synergy so that the results of the analysis can be immediately followed up in the form of operational policies.

Based on these findings, several policy recommendations can be formulated. First, there needs to be a regulatory reformulation that eliminates overlap among sectoral policies, especially in the management of spatial planning and natural resources. Second, the establishment of a permanent cross-sectoral coordination forum will help synchronize among policies and reduce potential jurisdictional conflicts. Third, strengthening the monitoring and evaluation system supported by information technology and spatial data is absolutely necessary to ensure policy implementation by the initial objectives. Fourth, the active participation of local communities in the planning and monitoring process must be ensured to increase the legitimacy and effectiveness of policies. Fifth, investment in institutional capacity and human resources, including technical training and access to digital tools, is essential to support modern and effective environmental governance.

A more integrated, inclusive, and evidence-based approach to governance will be key in addressing the challenges of the complexity of

natural resource management in the future. By building a policy system that is not only sectoral coordinated but also sensitive to local and global dynamics, ecological and social sustainability can be more easily realized. Furthermore, the lack of community participation in policy-making causes policy drafts to be unresponsive to the aspirations and needs of local communities. In fact, direct community involvement is very important to build awareness, trust, and mutual commitment in conservation endeavors. Without their active participation, policies will only be seen as an administrative burden or threat to livelihoods, rather than a shared solution.

Participatory and inclusive approaches to marine and coastal ecosystem conservation are increasingly recognized as an important foundation for achieving ecological sustainability as well as social justice. (Armstrong et al., 2025) propose a framework of five principles of equitable ocean restoration, one of which is active community participation and knowledge co-evolution among scientists, policymakers, and local communities. This approach emphasizes that the success of restoration depends not only on technical or ecological aspects, but also on how the values of justice, belonging, and accessibility are applied in the decision-making process. (Day, 2022) supports this view by explaining the principles of effective marine protected area governance, including the need for intergovernmental collaboration and community involvement in long-term adaptive management. According to him, without a flexible and responsive approach to environmental change, marine protected areas are vulnerable to failing to meet their conservation goals.

(Lees et al., 2025) provide empirical evidence through a comparative study among top-down ocean planning in Estonia and a participatory approach in New Zealand. They concluded that the integration of local knowledge in bottom-up planning resulted in higher levels of community engagement, thereby increasing the legitimacy and effectiveness of maritime conservation policies. A similar thing was also discovered (Gooding et al., 2025), who developed the concept of ecological citizenship based on co-design. In this context, they suggest that decision-making processes be designed jointly among communities and government agencies, to ensure a transition to a more inclusive and participatory conservation system.

(Shoko et al., 2024) used a focused group discussion method in Zimbabwe to explore community perspectives on marine and land

conservation. Their findings suggest that when communities are actively involved, conservation strategies become stronger and human-animal conflicts can be significantly reduced. This proves that community participation is not just a form of policy democratization, but also has a direct impact on the effectiveness of field implementation. (Raha et al., 2024) also found positive results from collaboration models and co-creation of solutions in coastal communities such as Vanuatu, Ghana, and Bangladesh. Their study shows that participatory approaches successfully address conservation challenges while improving the livelihood conditions of local communities, thereby creating synergies among environmental and social goals.

(Kiss et al., 2022) in an analysis of 58 NbS case studies in 21 cities, concluded that the deeper the level of community participation in the planning and implementation process, the wider the social benefits produced. In addition to the ecological benefits, active community involvement creates a sense of ownership of conservation projects and enhances inter-stakeholder social learning. This phenomenon shows that participation is not only a technical instrument, but also a process of social transformation that strengthens the capacity of communities in the face of environmental threats. (Sarmiento Barletti et al., 2020) added that the success of multi-stakeholder forums (MSFs) is highly dependent on context-specific design and the involvement of grassroots actors from the beginning of the process. Without it, the forum can become elitist and fail to represent the voices of marginalized groups.

Based on these findings, several policy recommendations can be formulated. First, all marine and coastal conservation planning and implementation processes must commence with the active participation of local communities, including the involvement of indigenous leaders, traditional fishermen, and vulnerable groups. Second, the co-design and co-management mechanism must be strengthened through supportive regulations, so that participation is not only symbolic but substantive. Third, investment in community capacity—both in environmental literacy, technical training, and access to information—is absolutely necessary to ensure equality in decision-making processes. Fourth, periodic evaluations of the level of participation and social impact of conservation programs should be conducted to ensure accountability and sustainable improvement. Fifth, an ecosystem-based approach must be combined with

the principles of social justice so as not only to maintain biodiversity, but also to improve the quality of life of coastal communities.

By designing a more inclusive, participatory, and sensitive marine conservation system to local dynamics, ecosystem protection endeavors will have stronger legitimacy and greater resilience to global pressures such as climate change and environmental degradation. Participation is not only a tool to achieve environmental goals, but also an intrinsic value in sustainable development that is just and socially just.

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OPPORTUNITIES FOR POLICY IMPROVEMENT AND COMMUNITY EMPOWERMENT

Gatot Kustiyadji and Andjar Prasetyo

A. Introduction

The management of Forest Parks (Tahura) in Indonesia has a strategic role not only as a nature conservation area, but also as a green space that can provide ecological, social, and economic benefits to the surrounding community. However, so far, its management has often focused on environmental protection aspects alone, without optimally involving the participation of local communities. This has led to a gap among government policies and real conditions on the ground, where communities tend to be seen as a threat to forests, rather than partners in their preservation. Therefore, there are many opportunities to improve policies and increase community empowerment in the management of Tahura to be more inclusive, participatory, and sustainable.

The involvement of local communities in the management of conservation areas is increasingly recognized as an important factor in the success of environmental conservation endeavors. Participatory approaches that actively involve communities, not only as beneficiaries but also as decision-making partners, have shown better results than top-down approaches or symbolic participation. Recent studies from various regions of the world provide an overview of models, challenges, and effective strategies in increasing community participation in conservation management. (Setiawan & Lufina, 2024) underlined that training and employment-based empowerment has a significant positive impact on community participation in co-management. This study shows that symbolic participation is not enough to create real change in conservation behavior. (Ma et al., 2025) added that inclusive and cross-actor governance is urgently needed, especially in areas such as the Yarlung Tsangpo River Valley, where interaction among local actors, governments, and non-governmental institutions is key to conservation success.

Studies in Nepal show how economic aspects can be a bridge among conservation and community participation. (Bohnett et al., 2023) found a direct relationship among community forest income and ecosystem regeneration ability and socio-economic resilience. (Upadhyay, 2022) refined these findings by examining the role of village cooperatives in strengthening conservation awareness through economic empowerment in forest buffer areas. The results show that economic integration and conservation can create positive incentives for communities to conserve natural resources. A similar approach was found in Ghana, where (Hamza, 2025) highlighted the importance of multi-stakeholder partnerships and local knowledge in community-based ecotourism management. This study proves that synergy among government, private and local community stakeholders can create a sustainable and equitable management model. However, (Ririhena et al., 2020) reminded that the potential of ecotourism in areas such as Wasur National Park has not been optimally utilized due to the low institutional role and active participation of the community.

In a global context, (Dehmel et al., 2025) emphasize the need for a social justice approach in community-based conservation. Without the principle of justice, the legitimacy of policies can be disrupted, causing resistance from local communities. This is in line with the findings of (Kimaro et al., 2024), who evaluated the effects of incentive-based conservation in Africa and South America. They found that successful conservation programs are those that improve social well-being while preserving forests. (Ruano-Chamorro et al., 2024a) added a gender dimension to the analysis of community participation. They suggest that conservation empowerment programs should explicitly integrate gender issues to ensure equal access and participation of all members of society. Meanwhile, (Chawla et al., 2024) provide a systemic review of the principles of natural resource governance by communities, including transparency, accountability, and local adaptation. These principles are the foundation for many successful conservation initiatives at the local level.

(Galappaththi et al., 2022) conducted a global study on the effectiveness of community-based protected areas in reducing deforestation. The results show that areas collectively managed by communities tend to be more successful in maintaining forest cover than areas that are fully controlled by the state. Offers an adaptive framework that supports flexibility in the management of conservation areas by local

communities, especially in the face of environmental changes and external pressures. Several other studies have explored incentive and policy mechanisms that can strengthen community conservation motivation. (Selfa et al., 2022) found that environmental service payment mechanisms (PES) have varying impacts depending on the local context and how they are implemented. (Carmenta et al., 2023) suggest that the social value of conservation areas should be explored through local community narratives to build emotional and cultural support for conservation.

(Ma et al., 2025) evaluated the effectiveness of inclusive conservation policies in developing countries and found that conservation success depends not only on policy structures, but also on participatory implementation processes. (Zafra-Calvo & Geldmann, 2020) concluded that inclusive and participatory conservation governance has a positive relationship with better socio-ecological outcomes. The integration of local knowledge in conservation policy is also the focus of (Palomo et al., 2021), who propose a landscape-based approach that considers ecological and social dynamics holistically. (Neira et al., 2022) evaluated hybrid management models in Ecuador and showed that collaboration among governments and local communities can improve conservation effectiveness. In India, (Hajjar et al., 2021) examined the success of the joint forest management model and found that it is effective when supported by strong local institutions and transparent leadership.

One of the important steps in improving policies is to review regulations that have been top-down and tend to ignore the rights of indigenous peoples and local communities around Tahura. Forestry laws and other derivative policies need to be revised to better accommodate the principles of community management rights over natural resources, especially in the context of the use of non-timber forest products, access to traditional land, and the right to participate in decision-making processes. With the paradigm shift from a protectionist approach toward community-based management, the relationship among humans and forests will become more harmonious and mutually supportive. For illustration, the collaborative forest management system that has been implemented in several countries can be an inspiration in designing new policies in Indonesia, where people are given certain rights and responsibilities in maintaining the sustainability of the Tahura ecosystem.

The recognition of local people's tenure rights over forests and land is one of the important foundations in endeavors to manage natural resources in a sustainable and equitable manner. Tenure reform, both formally and substantively, is not only concerned with legalistic control of land and forests, but also includes social legitimacy, active participation, and equitable distribution of benefits. Some cross-country studies show that coordination of state institutions is indispensable to realize inclusive tenure reform (Hajjar et al., 2021). Without synergy among government agencies and active community involvement, reform programs often fail to meet the expectations of local communities. (Kusters et al., 2022) developed a theory of change in the formalization of community forest tenure rights, by identifying ten key conditions for achieving fair and sustainable management. These requirements include transparency in the registration process, gender equality, and support from local and national institutions. (Larson et al., 2023) used the Participatory Prospective Analysis method to understand public perceptions of forest tenure security, showing that the sense of security over forest ownership is strongly influenced by formal legality factors and social support at the community level.

In the context of social and political turmoil, (Colfer & Prabhu, 2023) conducted a longitudinal study in Zimbabwe and found that adaptive collaborative management can survive if supported by strong conflict resolution mechanisms and flexibility in decision-making. (Nchor, 2023) highlight the dynamics of forest and land rights in Sub-Saharan Africa, focusing on the importance of historical transparency and justice as the basis for the legitimacy of tenure rights. The study underscores the need for an approach that is not only responsive to current conditions, but also reconcilable to the history of oppression and marginalization of local communities. In Nepal, Upadhyay (2022) and Bohnett et al. (2023) show how the village cooperative model can be an effective instrument in improving economic welfare while maintaining the sustainability of forest ecosystems. This approach works because it provides direct incentives to communities to care for forests through access to markets and economic opportunities. In China, Ma et al. (2025) emphasized the importance of structural recognition of local communities in conservation policies, including providing deliberative space in decision-making processes. This

inclusive governance model helps to strengthen community voices in environmental policy.

(Neely et al., 2021) present three case studies that show that multi-stakeholder partnerships and integration of local knowledge are key to the success of community-based forest management. Schreckenberget al. (2020) added that the equitable distribution of benefits is a central element in community-based conservation projects, as inequality in the distribution of outcomes can trigger resistance or even conflict. (Agrawal et al., 2023) in their global analysis found that community-based forest management models have great potential to improve conservation outcomes while improving the social conditions of communities, as long as they are done with a participatory and transparent approach. (Ruano-Chamorro et al., 2024b) emphasize the need for gender mainstreaming in shared forest schemes, especially in Latin America, so that all members of society have equal access to benefits and decision-making. Palomo et al. (2021) suggest that forest landscape policies should integrate local knowledge to avoid the socio-ecological conflicts that often arise due to mismatches among top-down policies and the realities on the ground. Agarwala et al. (2021) assessed that the social value of conservation areas depends not only on their ecological functions, but also on the narrative and perception of local communities on the benefits they obtain.

(Neira et al., 2022) evaluated a hybrid management model in Ecuador and found that a combination of state control and local participation can improve conservation effectiveness, as long as the principles of fairness and participation are adhered to. (Oldekop et al., 2021) in a global review concluded that collaborative governance is more effective than a centralistic approach in achieving social and ecological sustainability. Larson & Monterroso (2023) emphasize that people's perceptions of tenure security are very important to understand, as it will determine how committed they are to forest management. (Cahyana & Cahyana, 2025) in his study in Indonesia shows that the conflict among customary rights and the state's forestry policy is still a major challenge in policy reform. Meanwhile, (Simarmata, 2024) highlight the need for a rights-based approach in social forestry policy in Indonesia, by comparing similar practices in other countries.

In addition, the development of conservation partnership schemes among the government, the private sector, and the community has great

potential to be applied in the management of Tahura. This scheme aims to create synergy among environmental conservation endeavors and improving community welfare. One illustration is by opening access to the community to participate in natural tourism management, such as homestays, tour guides, and the provide local handicraft or culinary products. In addition, community-based ecotourism development can be an alternative livelihood that is environmentally friendly and able to reduce pressure on forest resources. Through this model, the community is not only an object of policy, but also an active subject that contributes directly to preserving the Tahura area. Community-based ecotourism is increasingly recognized as one of the strategic approaches in combining environmental conservation goals with improving the welfare of local communities. This model not only aims to conserve biodiversity, but also empower communities through more equitable economic access and active participation in natural resource management. Some cross-regional studies show that successful ecotourism models are always based on the principles of participation, collaboration, and the integration of local knowledge and values.

(Patita Paban Mohanty et al., 2024) in their study in India found that community-based ecotourism in protected areas has a real contribution to inclusive development and long-term conservation. Community participation in tourism planning and management increases the sense of collective ownership of natural resources and advises the sustainability of their management. This is in line with the findings of (Simarmata, 2024), who concluded that active community participation in ecotourism helps build collective responsibility for the environment and supports conservation endeavors more broadly. (Kumar et al., 2023) conducted an assessment of the impact of ecotourism on sustainable development and found that this model makes a significant contribution to both the local economy and environmental sustainability. Salman et al. (2024) added that multi-stakeholder collaboration – including governments, the private sector, non-governmental institutions, and local communities – is an important foundation in the development of sustainable ecotourism, especially in Asia. Without good coordination among sectors, the potential of ecotourism is often not achieved optimally.

(Hasana et al., 2022) in a literature review underlined that the success of ecotourism is largely determined by the extent to which local

communities are involved in the decision-making process. (Lee & Karimova, 2021) from Taiwan show that the integration of cultural landscapes and community engagement can be the driving force of sustainable geotourism. (Herdiani et al., 2022) in a study of Bukit Rimbang Bukit Baling in Indonesia emphasized the need for collaborative strategies involving local stakeholders to achieve conservation and sustainable livelihoods.

(Mudzengi et al., 2022) evaluated the relationship among ecotourism, conservation, and poverty reduction in Africa, and found that community partnership schemes are key to creating synergies among social and environmental aspects. (Volgger et al., 2025) examined the role of sustainability policies in strengthening partnerships among the private sector and the nature tourism community, suggesting that regulations should be designed to protect the interests of local communities. (Taylor et al., 2025) evaluated "conservation agreements" programs among communities and governments, and found that economic incentives can be an effective tool to encourage conservation behavior. (Shi et al., 2022) from China found that infrastructure training and support are essential to ensure the sustainability of community-based ecotourism.

Community empowerment must also be supported by capacity building and access to information. Many people around Tahura still do not understand the importance of conservation, how to use resources sustainably, and the economic potential that can be developed from the area. For this reason, technical training and environmental education programs are needed that are carried out on an ongoing basis by local governments, non-governmental organizations (NGOs), universities, or international organizations. Training materials can include organic waste management, agroforestry, cultivation of medicinal or spice crops, and the development of micro, small and medium enterprises (MSMEs) based on ecotourism. These programs must be designed in a participatory manner, involving the aspirations and real needs of the community on the ground, so that the results are more relevant and easily accepted by local residents. The active involvement of local communities in ecotourism management not only increases economic income, but also strengthens environmental sustainability. However, to achieve optimal results, such participation must be supported by training, continuous education, and cross-actor cooperation. Some studies show that without capacity building, the potential of ecotourism often fails to be realized to its fullest.

(Hamza, 2025) underscore the importance of ecological education and cross-stakeholder collaboration in three community-based ecotourism projects in Ghana. This study proves that when communities are involved in the process of learning about conservation values and empowered through multi-actor networks, their contribution to environmental conservation is even more significant. (Thomas Fakana & Dana Feleha, 2020) from Ethiopia concluded that education-based conservation strategies can be an effective solution to reduce pressure on forest ecosystems, especially if designed by the local socio-cultural context. (Samal & Dash, 2023) added that in India, particularly in the Chilika wetlands, the success of ecotourism depends on stakeholder engagement and the implementation of sustainable education that is relevant to local conditions.

Samal & Dash (2023) in their literature review state that conservation and economic development can only be achieved if communities understand their ecological role in ecosystems. (Bhatta & Roger C.K Chan, 2023) from Nepal suggested that conservation training and green tourism governance should be a priority for communities in the Himalayan Mountain regions, where ecological sensitivity is very high. Kumar et al. (2023) affirm that environmental training and community engagement are key factors in avoiding the negative impacts of ecotourism while maximizing local economic benefits. (Tiwari et al., 2024), in their systematic review, found that community involvement in environmental training has a central role in the success of sustainable ecotourism. (Salman et al., 2024) added that in Asia, multi-stakeholder training and collaboration are key determinants of community-based conservation success.

Mohanty et al. (2024) from Odisha, India, found that community and tourists' understanding of the benefits of ecotourism improved significantly through integrated training involving governments, academics, and NGOs. Hasana et al. (2021) in their literature review concluded that only ecotourism accompanied by training and community participation is socially and ecologically successful. Lee & Karimova (2021) from Taiwan emphasized that sustainable education is the foundation in shaping resilient and inclusive community-based geotourism. Wijayanto et al. (2025) discuss the importance of strengthening the capacity of local communities in Sumatra as part of a collaborative management framework in the management of conservation and ecotourism areas. They suggest that the training program should not only be technical, but

also include aspects of leadership, organizational management, and natural resource rights.

The formation of tourism awareness groups, community cooperatives, and community-based Tahura management forums is also an integral part of the empowerment process. These groups can be a forum to organize local potential, improve coordination among business actors, and build collaboration networks with external parties such as travel agencies, academics, or social investors. With a strong organizational structure and support from the government, people can more easily access capital help, training, and promotion of their products. In addition, this community group can also be a strategic partner in endeavors to maintain order and security in the Tahura area from unlawful activities such as unlawful logging, animal hunting, or unlawful land clearing. The success of community-based ecotourism and conservation management does not only depend on community participation, but also on strengthening local institutions that are the driving force. Community groups such as cooperatives, tourism associations, tourism-aware groups, and collective forest management organizations have proven to be important instruments in strengthening the capacity of communities to manage resources sustainably. Cross-regional studies show that the existence of a solid organizational structure can increase the effectiveness of conservation programs while empowering local economies.

In Indonesia, (Situmorang, 2023) found that collective forest management groups have higher social capital and participation rates than individual models. This is in line with the findings of Purwoko et al. (2022), which highlight the role of Gapoktan and Pokdarwis as the main actors in the management of natural tourism in Lake Toba. (Patita Paban Mohanty et al., 2024) from India showed that local tourism conscious groups are effective in increasing community participation and income around protected areas. (Samal & Dash, 2024) emphasizes that community-based ecotourism will only succeed if it is supported by solid local organizations and strong networks. Tiwari et al. (2024) in their systematic review affirmed that the existence of tourism conscious groups strengthens the sustainability of ecotourism and local conservation. Kumar et al. (2023) added that the role of local organizations in ecotourism education is a catalyst for environmental behavior change in India. They suggested that training and capacity building programs be carried out

continuously so that the community has a deep understanding of the ecological and economic value of ecotourism.

To ensure that all these initiatives can run effectively, consistent budget and policy support from the central and local governments is needed. The community empowerment budget in the environmental sector is still relatively low compared to the allocation for physical infrastructure or other productive sectors. Therefore, there needs to be a special priority in the State Budget/APBD to finance community empowerment programs in the Tahura area. In addition, the government can also encourage private sector involvement through Corporate Social Responsibility (CSR) schemes or public-private collaboration in the form of blended finance, so that the available resources are adequate to support sustainable empowerment. In the context of sustainable development, funding plays a crucial role in supporting conservation initiatives that involve the active participation of local communities. Blended finance approaches, impact investing, and private sector partnerships are increasingly recognized as important strategies for moving resources toward environmental and social goals. However, its implementation still faces structural challenges, including uneven distribution of funds, power dynamics in partnerships, and difficulties in accurately measuring impact.

Smith et al. (2022) explore the opportunities and barriers in the use of blended finance for community-based conservation in South Africa. They found that while blended funding can attract private investment to environmental projects, it often does not get to the grassroots level due to the dominance of donor agencies and complex bureaucracy. For this reason, a more inclusive and transparent distribution mechanism is needed so that the benefits of funding can be felt directly by the local community. (Taggart & Power, 2024) discuss private-public sector partnerships in the global development landscape and conclude that while CSR can be an alternative source of funding for conservation projects, the power relationship among business actors and society is often unbalanced. Companies tend to dominate the program agenda, so that the real needs of the community can be ignored. Therefore, the protection of the rights of communities should be a priority in any of these partnerships.

(Bengo et al., 2022) provide a framework for measuring social impact in the context of financial regulation in the European Union. Their study shows that social impact measurement is still a major challenge in

sustainable finance, especially when the indicators used are irrelevant to local realities. They suggested that impact measurement systems should be tailored to the local cultural and economic context to make the results more representative. (Sørensen & Torfing, 2025) examined the role of the private sector in green co-creation projects at the local level and found that many green initiatives are successfully driven by companies that have a long-term vision of sustainability. However, the success of this project is highly dependent on active community participation and cross-sectoral coordination.

The book *Organizing for Sustainable Development* (van Kranenburg & Witjes, 2024) provides a comprehensive overview of the various organizational approaches to dealing with the major challenges of sustainable development. One of the key findings is that organizations that are successful in implementing green projects are those that have flexible structures, adaptive capacity, and cross-actor collaboration capabilities. (Singhania & Swami, 2024) conducted a systematic review of the growth and trends of impact investing and found that although the sector is growing rapidly, there is still a gap among theory and practice in the field. Many investors still focus on the financial aspect without paying enough attention to the real social and environmental impacts. They suggest that further research be focused on how to improve accountability and transparency in impact investing. (Basyith et al., 2024) evaluated the influence of green policies and Environmental, Social, and Governance (ESG) principles on company profitability. Their study shows that companies that integrate ESG principles consistently have better financial performance over the long-term. However, the effectiveness of these policies is highly dependent on government support and internal corporate commitments.

Collaboration among stakeholders is also the key to success in the inclusive and participatory management of Tahura. Local governments, village officials, community leaders, traditional institutions, universities, and environmental organizations must work together in formulating a common vision for Tahura management. Multi-stakeholder forums such as the Tahura Management Board involving community elements can be a productive and transparent dialogue platform. With the existence of this forum, conflicts that have often occurred among the community and the government can be minimized through constructive and solutional

mediation. Complex and dynamic natural resource management requires a governance approach that is flexible, participatory, and responsive to change. The concepts of adaptive collaborative management (ACM), polycentric governance, and the use of participatory tools such as mapping and multi-stakeholder platforms have shown great potential in increasing conservation effectiveness while supporting sustainable development.

(Sarmiento Barletti, 2021) discusses the importance of developing reflective tools to improve multi-stakeholder forums in various countries. This study emphasizes that the process of collective learning and adaptation is at the core of successful collaborative management. Using a reflective approach, actors can periodically evaluate successes and failures and adjust their strategies according to the local context. (Amaruzaman et al., 2022) analyzed polycentric approaches in environmental governance in Southeast Asia and East Africa. They concluded that a governance system involving multiple power centers and decision-makers can be more effective in achieving the Sustainable Development Goals (SDG 16), especially in peace, justice, and strong institutions. This model provides space for local communities to be part of the decision-making process and strengthens government accountability. (Siangulube et al., 2023) examined the role of multi-stakeholder platforms in landscape governance in Zambia. Their findings show that such platforms are highly effective in bridging the interests of various parties—from governments, the private sector, to local communities—to reach a common Contract on land use and natural resources. However, its success depends on the level of inclusivity and transparency in the process.

(Bayala et al., 2023) conducted a study in Ghana on the use of participatory mapping tools and scenario development to negotiate conflicts among conservation and development. They found that participatory mapping helps all parties understand territorial boundaries, resource allocation, and potential conflicts of interest. This tool also contributes to building trust among actors and increasing community participation in landscape management. (Kusters et al., 2020) developed a method assess inclusive landscape governance. They suggest that the assessment process should be based on the principles of participation, representation, benefit distribution, and access to information. Reed et al. (2024) in a case study in Ghana added that the transformation of conflict into cooperation in landscape governance can only be achieved if all parties

have equal access to decision-making forums and are given space to voice their aspirations.

(Tapia et al., 2025) developed a service design framework to improve collaboration in the implementation of nature-based solutions in EU projects. They emphasize that a participatory design approach can help align the expectations, values, and needs of all stakeholders, thereby improving the effectiveness of green project implementation. Strengthening the capacity of local institutions, using participatory tools, and developing collective learning mechanisms are important elements in ensuring that the natural resource management process is not only effective, but also fair and sustainable.

B. The Potential of Ecotourism Development

The development of ecotourism in the Taman Hutan Raya (Tahura) area has great potential to become one of the main drivers of sustainable forest management as well as improving the welfare of the surrounding community. Tahura, as a protected forest area that has a high biodiversity and beautiful natural aesthetic value, is an ideal location to be developed as an ecotourism destination. Ecotourism itself is not just an ordinary tourism activity, but more than that it is a form of responsible tourism that aims to preserve the environment and empower local communities directly. With this approach, tourist visits will not only provide economic benefits for the local area, but also help maintain the sustainability of natural resources. One of the main potentials for ecotourism development in Tahura is the diversity of ecosystems it has, ranging from primary forests, secondary forests, to habitats of endangered animals that can be an attraction for educational and conservation tourism. In addition, many Tahura in Indonesia are also equipped with water sources such as natural springs, rivers, lakes or reservoirs, as well as interesting mountain scenery to visit. This potential can be packaged in various tour packages, such as trekking, birdwatching, camping grounds, outbound, flora-fauna educational tours, to citizen science programs that involve visitors in endeavors to preserve nature. These activities in addition to providing a unique experience to tourists, also increase the awareness of the wider community on the importance of protecting forest ecosystems.

Ecotourism is one of the strategies for sustainable natural resource management by prioritizing aspects of environmental conservation,

community education, and improving the welfare of local communities. Recent studies have shown that the integration of local knowledge, identification of biodiversity potential, and strengthening institutions such as cooperatives can be a strong foundation in the development of ecotourism in protected forest areas. The reviewed articles provide a comprehensive perspective on the approach. Suadi Zainal et al. (2024) emphasized the importance of the participation of local communities as owners of traditional knowledge in ecotourism management. The study was conducted in protected forest areas and found that local knowledge—such as traditional agricultural techniques, cultural historical stories, and natural resource management systems—can be used as an added value in attracting tourists. In addition, the apply local knowledge helps maintain environmental sustainability as it has usually been adapted to the conditions of the local ecosystem over the years. By strengthening community capacity through training and mentoring, ecotourism is not only a means of environmental preservation but also improves the economic welfare of local communities in a fair and sustainable manner.

(Asniar et al., 2022) identified the main elements needed in the management of mangrove ecotourism. These elements include: participatory-based governance planning, environmentally friendly infrastructure, environmental education for visitors, and ecological impact monitoring. Mangrove forest areas have important ecological functions, such as protection from coastal scrape and habitat of various species. Therefore, mangrove ecotourism must be designed in such a way that tourism activities do not damage the ecosystem. This study recommends the use of the concept of zoning or zoning, so that some areas are used for tourist visits and some are maintained as conservation areas. (Nugroho, 2020) underlined the importance of a legal framework in supporting the development of sustainable ecotourism. In Indonesia, many regulations are available, including Law Number 5 of 1990 concerning the Conservation of Biological Natural Resources and Their Ecosystems, and Government Regulation No.68 of 1999 concerning Nature Reserves and Nature Conservation Areas. However, its implementation still faces challenges such as overlap among local and central government agencies, as well as weak law enforcement against environmental violations. Therefore, it is necessary to harmonize regulations, increase public legal awareness, and transparency in the management of ecotourism areas.

(Xu et al., 2025) used system dynamics simulation to evaluate cooperative operational models in high-quality ecotourism development. This research shows that cooperatives can be an effective institutional model in managing ecotourism, because of its principles based on mutual cooperation, economic justice, and active participation of members. Simulations show that the involvement of cooperatives in ecotourism management can increase community income, improve the quality of tourism services, and maintain environmental sustainability. This model is also effective in reducing economic inequality among villagers. (Buaxaiya et al., 2021) conducted a potential analysis of ecotourism locations using Geographical Information System (GIS) data. This approach is very useful in determining suitable locations to be developed as ecotourism destinations by considering ecological factors, accessibility, and potential natural attractions. The results of this study show that the combination of spatial data and the participation of local communities in the planning process can result in a more targeted and sustainable management plan.

(PAUDEL et al., 2024) explore the opportunities and challenges of ecotourism development in protected forest areas. Although the area has great potential in the form of biodiversity and beautiful natural panoramas, challenges such as lack of infrastructure, lack of human resource capacity, and low local government support are the main obstacles. The solutions offered are increasing investment in basic infrastructure, training for tour guides and villagers, and strengthening cooperation among stakeholders. (Fuady, 2024) proposes an ecotourism concept designed to strengthen the ecological function of mangrove forests. This concept includes the construction of educational pathways, environmental interpretation, and mangrove rehabilitation programs involving the community. Through this approach, ecotourism is not only a social economic medium, but also a means of restoring mangrove ecosystems damaged by human activities and natural disasters. (Siahaya et al., 2021) highlighted the importance of identifying biodiversity potential as an ecotourism attraction. In addition, the positive perception of the public toward the development of ecotourism is the key to the success of the long-term project. This research shows that when people feel benefited and involved in the decision-making process, they will be more concerned about environmental conservation.

Sustainable ecotourism development requires a holistic approach involving local knowledge, consistent regulations, active community

participation, and the use of modern technologies such as GIS and simulation of system dynamics. The integration of these various aspects can help maintain a balance among environmental preservation and improving community welfare. The success of ecotourism is not only measured by the number of tourists or economic income, but also by the ability to preserve ecosystems, maintain local wisdom, and empower communities inclusively. Therefore, collaboration among the government, academics, NGOs, and local communities is very important in realizing truly sustainable ecotourism.

In addition to the natural aspect, the development of ecotourism in Tahura also opens up great opportunities to introduce the local culture of the surrounding community. Many Tahura are located in areas with ethnic diversity and local traditions that are still preserved. Indigenous peoples or local communities often have traditional wisdom in managing the environment, including in traditional agriculture, herbal medicine, and folklore about nature. Through culture-based ecotourism, tourists can participate in traditional handicrafts making activities, local culinary products made from forest products instead of wood, and witness cultural attractions such as dance or traditional music. This not only creates economic added value for the community, but also helps preserve cultural heritage that is increasingly being eroded by modernization.

Empowerment of local communities is a core principle in the development of sustainable ecotourism in Tahura. So far, many people around Tahura have depended on agricultural activities, plantations, or even unlawful exploitation of forest resources due to the lack of alternative livelihoods. With ecotourism, they can be diverted to the environmentally friendly tourism sector. For illustration, the community can be trained to become tour guides, homestay accommodation providers, cooks, and artisans of special souvenirs of the region. Local governments, environmental NGOs, and universities can play a role in providing technical training and periodic coaching so that the community's capacity increases and is ready to compete in the national and international tourism industry. These programs must be designed in a participatory manner so that they are by the real needs of the community in the field. Community-based ecotourism development is increasingly gaining attention as a sustainable and inclusive natural resource management strategy. Recent studies have shown that this approach not only aims to preserve the environment but

also improve the well-being of local communities through economic empowerment and cultural preservation. The reviewed articles describe the dynamics of ecotourism development in various regions with different geographical and socio-cultural contexts, and provide important perspectives related to strategies, potentials, constraints, and public perceptions of ecotourism.

(Muflihah & Prajanti, 2023) identify community-based ecotourism development strategies in the Mataram cultural tourism area, Yogyakarta. This study found that active community participation is the key to the success of ecotourism development. However, several obstacles such as low human resource capacity and inadequate infrastructure are the main challenges. Therefore, training for residents, improvement of tourism facilities, and collaboration among stakeholders are needed to ensure the sustainability of ecotourism programs. (Normelani et al., 2021) explored the potential of geobiodiversity and local knowledge in the Meratus area as the basis for ecotourism development. The region has a very high natural wealth, including unique geological formations, endemic flora and fauna, and strong local traditions. This research recommends the integration of geology, biological, and cultural aspects in the concept of ecotourism to attract tourists while increasing awareness of the importance of conservation.

(Saha et al., 2024a) analyze how social, economic, and cultural factors affect local people's perception of ecotourism. The results of the study show that people are more positive about ecotourism when they feel that they directly benefit from these activities, both economically and socially. However, uncertainty in profit-sharing and a lack of transparency often create skepticism among the public. Therefore, a fair and participatory governance system is needed so that ecotourism can be widely accepted by the community. (Gezahegn et al., 2024) assessed the attitude and awareness of local communities toward the development of forest-based ecotourism. The study found that although the public generally supports the development of ecotourism, there are concerns about potential environmental damage and the dominance of outside investors. Therefore, the researcher suggests the need to educate the public on the principles of truly sustainable ecotourism, as well as the strengthening of community rights over the management of natural resources in their area.

(PAUDEL et al., 2024) explore the opportunities and challenges of ecotourism development in the Dhanushadham protected forest. Although this region has great potential in the form of biodiversity and local cultural values, challenges such as lack of infrastructure, accessibility, and human resource capacity are the main obstacles. The suggested solutions are increased investment in basic infrastructure, training for tourism actors, and strengthening cooperation among the government, NGOs, and local communities. (Foncha & Fouomene, 2023) highlight how community-based ecotourism can be an effective means for biodiversity conservation while improving community welfare. On Mount Oku, the establishment of local ecotourism groups has succeeded in reducing the pressure on natural resources, such as unlawful logging and poaching. In addition, ecotourism opens up new job opportunities for villagers, thereby creating economic incentives to preserve the environment.

(Munthe et al., 2024) used SWOT analysis to formulate a locally-based ecotourism development strategy. This analysis produces concrete strategies, such as the use of local natural potential, increased promotion through digital media, and the development of cultural-based tourism products. This research emphasizes the importance of a participatory approach in the planning process so that the results are in line with community expectations and local potential. (Saha et al., 2024b) map the impact of ecotourism on local communities from a social and cultural perspective. This study shows that ecotourism has the potential to strengthen local cultural identity, increase community participation in decision-making, as well as create spaces for intergenerational dialogue. However, if not managed properly, ecotourism can also lead to cultural homogenization or loss of traditional values due to the influence of globalization.

Community-based ecotourism development is a holistic approach that combines the principles of environmental conservation, economic empowerment, and cultural preservation. Studies have shown that the success of ecotourism is highly dependent on the active participation of the community, the availability of adequate infrastructure, supportive regulations, and the integration of local knowledge with modern technology. Obstacles such as limited human resource capacity, lack of government support, and public misunderstanding of the concept of ecotourism are still challenges that need to be overcome through training,

education, and cross-sectoral collaboration. Going forward, ecotourism development must be designed in a participatory manner by involving all stakeholders, including local communities, local governments, academics, and NGOs. Transparent and accountable management models, such as cooperatives or local ecotourism management bodies, need to be developed to ensure a fair and sustainable distribution of benefits. Thus, ecotourism is not only a tourist destination, but also a means of empowering the community and preserving the nation's natural and cultural heritage.

Community-based ecotourism is increasingly recognized as an effective approach in combining environmental conservation, community economic empowerment, and local cultural preservation. Studies from various countries show that active community participation is the key to successful ecotourism development, although challenges such as human resource capacity, infrastructure, and stakeholder coordination are still often the main obstacles.

Research (Endalkachew et al., 2020) identified some barriers to the development of community-based ecotourism in the region. Despite its high natural potential, including beautiful mountainous landscapes and rich cultural heritage, Meqdela Amba faces obstacles such as lack of public awareness of the concept of ecotourism, lack of training for tourists, and limited accessibility. The researcher suggests the need for educational programs, improvement of basic infrastructure, and strengthening of local institutions to support the sustainable development of ecotourism. In the broader context in Ethiopia, (Getachew, 2020) explains how the potential of ecotourism in Lake Tana can be developed as a driving force for sustainable development. Gorgora has cultural values, rare flora and fauna, and interesting natural panoramas. However, without public support and clear regulations, this potential will not be optimally utilized. The study recommends integration among tourism, agriculture, and conservation to create a holistic ecotourism model.

(Yuliani et al., 2020) analyzed the role of stakeholders in ecotourism development. They found that cross-sectoral engagement—including local governments, NGOs, academics, and community groups—is critical to ensuring project sustainability. This analysis helps to design appropriate intervention strategies, both in increasing community capacity and in optimizing the use of local resources. (Herlina et al., 2020) explore the use

of community-based ecotourism to increase people's income in Indonesia's border areas. The area has great potential in the form of unique biodiversity and culture, but it has not been optimally managed due to limited infrastructure and managerial skills. Through an ecotourism approach, border communities can not only improve their standard of living but also strengthen local identities and harmonious cross-border relations. (Lestari et al., 2024) examine social practices in the process of developing community-based ecotourism. This research shows that ecotourism is not only about the economy or the environment, but also about social relations, collective values, and how people build common spaces. The success of ecotourism depends heavily on how communities organize themselves, share responsibilities, and create inclusive decision-making mechanisms. However, uncertainty in the distribution of benefits and lack of transparency have led some layers of society to remain skeptical. Therefore, a fair and participatory governance system is an absolute prerequisite for ecotourism development.

(Afifah et al., 2023) emphasized the importance of synergy among mangrove conservation and ecotourism. In Ayah, the development of mangrove tourism routes not only increases environmental awareness, but also creates new jobs for villagers. The program has succeeded in reducing destructive activities such as unlawful logging by providing sustainable livelihood alternatives. (Nurjanah & ., 2021) examined the role of corporations in community empowerment through peat ecotourism. This study shows that CSR programs designed with a participatory approach can be a means of strengthening community capacity and revitalizing damaged ecosystems. A collaborative approach among companies, governments, and local communities has proven effective in creating a sustainable ecotourism model.

(Dohnálek et al., 2021) evaluated the relationship among ecotourism and conservation in Nepal. This research shows that community-based ecotourism has succeeded in reducing pressure on natural resources, increasing environmental awareness, and creating economic incentives for communities to preserve nature. This model is an important illustration of how conservation can be done without neglecting the welfare of the community. Mariana Silva et al. (2022) map out sustainable ecotourism development strategies in Brazil. With a very high biodiversity richness, Brazil has a lot of potential to develop environmentally friendly ecotourism.

However, challenges such as deforestation, social inequality, and lack of regulation remain serious threats. This study confirms the need for a participatory and innovative approach in the management of tourist destinations to ensure a balance among conservation and community well-being.

The development of supporting infrastructure is also an important factor in ensuring the success of ecotourism in Tahura. Although the principle of ecotourism avoids excessive development, some basic facilities such as access roads, parking areas, public toilets, visitor information centers, shelters, and safe trekking trails need to be provided to support the comfort of tourists. This infrastructure must be built with the concept of environmentally friendly architecture, using local materials and designs that blend with nature. In addition, the organic and inorganic waste management system must be strictly implemented so as not to damage the Tahura ecosystem. Green technologies such as biopores, compost, and the use of solar energy can also be applied to maintain environmental sustainability. Mangrove ecotourism is increasingly known as a form of sustainable coastal resource management, combining environmental conservation with improving the welfare of local communities. Studies from different regions show that the success of mangrove ecotourism depends not only on its natural potential and biodiversity, but also on the availability of supporting infrastructure, community participation, and well-planned management strategies.

(Akhmedova et al., 2022) identified the main elements in the effective management of mangrove ecotourism. This research emphasizes the importance of zone-based spatial planning, environmentally friendly infrastructure such as wooden bridges or boardwalks, and environmental education programs for tourists. In addition, a monitoring system is needed to ensure that ecotourism activities do not damage the mangrove ecosystem. A participatory management model that involves local communities is key in maintaining the sustainability of the project. The study by (Rajbanshi & Acharya, 2023) although the focus is not on mangroves, provides an important perspective on the basic facilities needed in ecotourism development. In the community forest of Betana Simsar, researchers found that the lack of infrastructure such as lodging, transportation routes, and sanitation facilities is a major obstacle. The recommendations submitted are investments in the development of

environmentally friendly tourism infrastructure, complemented by training for villagers as tour guides and tourism service providers.

Buaxaiya Soneteng et al. (2021) used GIS analysis to evaluate potential locations for ecotourism development. Although this study was conducted in the mainland region of Laos, the findings are relevant in the context of mangrove ecotourism, namely the need for a spatial approach in the planning of tourist destinations. GIS analysis helps determine locations that have high accessibility, potential natural attractions, and minimal environmental impact. The integration of this technology can be used to determine the ideal location for the development of mangrove ecotourism in the future. (Ulfa & Harahap, 2022) conducted a comprehensive assessment of the potential for mangrove ecotourism development in North Sumatra. The results of the study show that Bagan Serdang has considerable potential, but still needs to improve infrastructure such as entrances, parking areas, shelters, and public toilets. In addition, there is a need to increase community capacity in the fields of tourism management, visitor services, and environmental conservation.

Namish Paudel et al. (2024) emphasized that infrastructure is one of the critical factors in ecotourism development. In Dhanushadham, although the area is rich in biodiversity and cultural values, the low availability of supporting facilities such as lodging, transportation, and information facilities is a major challenge. The study recommends cooperation among local governments, local communities, and investors to jointly develop sustainable tourism infrastructure. (Triana et al., 2021) examined the potential of Hatta Forest Park as a green ecotourism destination. Despite its focus on terrestrial forests, the green ecotourism concepts developed—such as the construction of eco-friendly trekking trails, nature interpretation, and educational programs—are also highly relevant in the management of mangrove ecotourism. This concept can be adapted to improve the quality of tourist visits while maintaining the sustainability of the ecosystem.

(Setyaningrum et al., 2025) discuss mangrove ecotourism development strategies and programs holistically. This research suggests a sustainable approach that involves strengthening community institutions, developing tourism products based on local culture, and digital promotion. In Perancak Village, mangrove ecotourism not only aims to preserve the environment, but also create new jobs for village youth and increase

household income. (KURNIAWATI et al., 2022) integrate mangrove conservation endeavors with the development of ecotourism facilities. In Cengkong, a participatory approach has succeeded in increasing public awareness of the importance of mangrove forest conservation. Programs such as reforestation, the creation of tourist trails, and the training of local guides are integral to successful ecotourism management.

Private sector involvement and social investment can also be part of the ecotourism development strategy in Tahura. Companies that have environmental social responsibility (CSR) can be invited to work together in building ecotourism facilities and infrastructure, community training, or promotion campaigns for Tahura destinations. In addition, digital platforms and social media can be used to market Tahura ecotourism widely, both domestically and internationally. Collaborations with travel agencies, online booking apps, and social media influencers can be an effective way to reach more tourists without having to sacrifice sustainable ecotourism principles. CSR is increasingly recognized as one of the important instruments in supporting the development of sustainable ecotourism. Recent studies show that CSR not only plays a role in building tourism infrastructure and facilities, but also serves as a bridge among the business sector, local communities, governments, and academia to create an inclusive, environmentally friendly, and empowering tourism model.

(Rahman et al., 2024) examine how CSR can interact with the concept of green financing to support the sustainability of the tourism industry in Bangladesh. The study found that companies active in CSR programs have great potential to encourage green investment through participatory approaches involving local communities and financial institutions. By combining the principles of CSR and sustainable finance, the tourism sector—especially ecotourism—can be developed without sacrificing environmental and social aspects. The results of the study show that the active involvement of all parties increases the capacity of villages in managing ecotourism professionally, as well as strengthening transparency and accountability in the management of CSR funds.

(Yasir et al., 2022) highlighted Pertamina's CSR role in community-based ecotourism development as an effort to mitigate environmental problems such as forest fires and coastal scrape. In several regions, Pertamina has succeeded in developing mangrove ecotourism as an alternative livelihood for the surrounding community, as well as helping to

rehabilitate damaged ecosystems. This study emphasizes the importance of effective corporate communication in conveying CSR values to the public and building public trust in the corporation. (Seva et al., 2022) analyze how collaboration among CSR, government, and NGOs can be a strong foundation in the conservation of mangrove ecosystems. At MEC, CSR is used to build a mangrove education center that not only functions as a nature laboratory but also becomes an educational tourist attraction. The active participation of NGOs in the counseling and training process is a key factor in the success of this project.

(Tlali & Musi, 2021) highlight CSR initiatives that focus on gender empowerment in the ecotourism sector. In Malealea, CSR programs not only aim to improve tourism infrastructure, but also provide greater economic access to females through homestay management training, local product processing, and leadership development. This study shows that CSR can be a strategic tool to create more inclusive and gender-equitable tourism. (Darumurti et al., 2022) explain how cooperation among stakeholders—including CSR—can strengthen the development of community-based ecotourism in Pakem Sub-district. The participatory governance model built through the tourism village forum has succeeded in increasing the capacity of citizens in destination management, including digital promotion, tourism service management, and natural resource protection.

However, (Bayu Utomo & Rusmawati, 2023) not all CSR initiatives in ecotourism development terminate successfully. This is reflected in the research of examining the failure several CSR projects due to a lack of community empowerment. The study found that many tourism village projects fail due to a top-down CSR approach, without involving the community in the planning and implementation process. As a result, the community does not have a sense of ownership of the project, so there is no motivation to maintain and develop tourist destinations. (Pebrianto et al., 2024) analyzed the dynamics of stakeholder influence in the transformation of Samar into a tourist village. This includes the role of CSR as a source of initial funding, local governments as regulators, and communities as main implementers. This research shows that good coordination among stakeholders is essential to ensure the sustainability of ecotourism projects.

In the context of policy, the government needs to develop regulations that support the development of community-based ecotourism. One illustration is by granting special tourism business licenses to community groups around Tahura, as well as establishing operational standards for ecotourism management that are environment-based and inclusive. In addition, local governments can provide fiscal or non-fiscal incentives to ecotourism business actors who are committed to sustainability principles. This regulation needs to be accompanied by periodic monitoring and evaluation so that its implementation is by the initial goal, which is to maintain the Tahura ecosystem while improving the welfare of the community.

C. Environmental Education Initiative

Environmental education has a strategic role in building public awareness and concern for the importance of protecting natural ecosystems, including in the Great Forest Park (Tahura) area. As a conservation area that not only serves to protect forest resources, but also as a public education space, Tahura is an ideal location to develop environmental education initiatives that touch various levels of society. With high biodiversity potential, a diversity of flora and fauna habitats, and beautiful natural landscapes, Tahura can be used as a natural laboratory for hands-on learning about ecology, biodiversity, and sustainability principles.

One form of environmental education initiative that can be developed is an experiential learning-based educational program or direct learning in nature. This program can be intended for students from elementary school to college, with materials that are adapted to the formal and non-formal education curriculum. For illustration, field visits to Tahura can be designed as animal and plant observation activities, introduction to the hydrological cycle, tree planting, and simulation of natural disaster mitigation such as floods and landslides. Through this direct approach, students not only get theoretical information, but also real experiences that are easier to understand and remember.

In addition, Tahura can also be an environmental training center for teachers, environmental education facilitators, and environmental volunteer communities. With the existence of an environmental education center equipped with a digital library, discussion room, mini laboratory, and

interactive visual media, Tahura will become a reference center in providing information and training related to environmental issues. This facility can also be used to hold seminars, workshops, short training, and internship programs for students majoring in biology, environment, forestry, and tourism. Collaboration with universities, environmental NGOs, and international institutions such as UNESCO or UNDP will be very helpful in providing quality educational content that is relevant to current scientific developments.

Empowering local communities as environmental education agents is also an important aspect of this initiative. The communities around Tahura that have lived side by side with the forest for generations often have traditional knowledge about how to maintain the balance of nature, including in organic farming, herbal medicine, clean water management, and wildlife protection. This local knowledge can be packaged in the form of participatory learning programs involving tourists, students, and environmental activists. In addition, the community can be trained to become environmental education guides who are able to convey conservation values in an interesting and contextual manner by local socio-cultural conditions.

Environmental education initiatives should also include endeavors to raise public awareness through effective campaigns and communication media. Many urban communities are far from nature and lack knowledge about the importance of protecting the environment. Therefore, an educational strategy is needed that reaches this group, one of which is through digital platforms. Tahura's official website, mobile application, social media, and documentary video channels can be used to disseminate information about the benefits of forests, how to preserve nature, and the impact of environmental damage on human life. This content can be packaged in the form of infographics, educational animations, environmental podcasts, and interactive virtual tours to attract more interest from the younger generation.

In addition, collaboration with formal educational institutions such as schools and universities is key in expanding the reach of environmental education. The "green school" or "sustainable university" program can be developed by involving Tahura as a partner in the implementation of an environmentally friendly curriculum. Schools can create annual programs in the form of regular visits to Tahura, while universities can make Tahura a

location for research, community service, and environment-based internship programs. This initiative can also be supported by the local government through mandatory regulations for environmental education visits for students every year.

In the context of policy, the government needs to design a legal and budgetary framework that supports the development of environmental education in Tahura. These regulations can include minimum standards for the implementation of environmental education, guidelines for the preparation of nature-based curriculum, to funding mechanisms involving the State Budget/Regional Budget, corporate CSR, and international donor funds. In addition, there needs to be coordination among the Ministry of Environment and Forestry, the Ministry of Education and Culture, and regional agencies so that all parties have a harmonious vision and direction in the development of environmental education in Tahura.

As part of an inclusive and participatory management of Tahura, environmental education initiatives should also involve the active participation of civil society groups, youth organizations, and nature loving communities. Environmental forums at the local and national levels can be invited to participate in the preparation of environmental education programs, so that the results are more representative and by the needs of the community. In addition, the environmental volunteer community can also be invited to help the implementation process, both in the form of mutual cooperation activities to clean the Tahura area, community training, and environmental counseling to children.

D. Green Economy Opportunities and Sustainable Livelihoods

The development of a green economy and sustainable livelihood in the Taman Hutan Raya (Tahura) area has great potential to become an innovative solution in overcoming environmental challenges while improving the welfare of the surrounding community. As a protected forest area that has a high biodiversity richness, Tahura not only functions as an ecosystem buffer, but can also be a locomotive for the local economy that is environmentally friendly. With a green economy approach — an economic system that emphasizes energy efficiency, carbon emission reduction, and protection of natural resources — the communities around Tahura can be shifted from exploitative activities such as unlawful logging or unlawful plantations to sustainable productive business sectors, such as

agroforestry, non-timber forest product management (NTFP), ecotourism, and organic agriculture.

One of the main opportunities for the green economy in the context of Tahura is the sustainable use of non-timber forest products (NTFPs). Many types of medicinal plants, spices, forest honey, rattan, mushrooms, and other cultivated plants can be developed as high-value economic commodities. However, so far its use is still traditional and has not been managed optimally. Through technical help, post-harvest processing training, and wider market access, people can produce value-added products such as essential oils, herbal powders, organic honey, or rattan crafts that have high marketability in both domestic and international markets. In addition, the apply circular economy principles such as recycling organic waste into compost or biogas can also provide ecological and economic benefits for the community.

Agroforestry is one of the land management models that is very relevant to the geographical and ecological conditions of Tahura. This model combines agriculture, plantations, and forest conservation in one mutually supportive system. People can cultivate food crops, vegetables, or plantation crops such as coffee, chocolate, or vanilla under the stands of forest trees, thus maintaining green land cover without damaging the ecosystem. In addition, agroforestry also helps increase community food security while absorbing carbon from the atmosphere, contributing to climate change mitigation endeavors. Local governments, environmental NGOs, and research institutions can play a role in providing superior seeds, cultivation technical training, and counseling on environmentally friendly agricultural practices.

Community-based ecotourism is also the backbone of the green economy in the management of Tahura. With its beautiful natural potential and local cultural richness, many Tahura in Indonesia have tourist attractions that can be packaged in the form of educational packages, adventures, and natural relaxation. Tourists can be involved in reforestation programs, birdwatching, trekking, camping, as well as cultural visits to traditional villages around Tahura. Locals can be encouraged to become tour guides, homestay accommodation providers, cooks, as well as local souvenir manufacturers. The profits from this ecotourism can be allocated in part for the maintenance of the Tahura area, thereby creating a sustainable economic cycle that does not damage the environment.

In addition, the development of renewable energy around Tahura also opens up great opportunities to create sustainable livelihoods. The potential of solar, microhydro, and biogas is very large to be utilized to meet the electricity needs of households and community businesses. With this access to clean energy, people can reduce their dependence on fossil fuels and start switching to low-carbon technology. For illustration, biogas from livestock manure can be used to cook or drive NTFP processing machines, while solar panels can be used to light homestays or tourist information centers. Government programs such as the New Renewable Energy Village (NRE) can be an entrance to build green energy infrastructure in the areas around Tahura.

Community empowerment through a green economy must be supported by capacity building and market access. Many people around Tahura already have traditional skills, but have not been able to market their products widely due to the lack of connections and modern marketing strategies. For this reason, business training, product packaging, digital branding, and the use of ecommerce platforms are needed so that local products can reach the national and global markets. Cooperation with cooperatives, MSME centers, and microfinance institutions is also important to provide access to business capital to the community in a friendly and inclusive scheme.

In the context of policy, the government needs to develop regulations that support the development of a green economy and sustainable livelihoods in Tahura. One of them is by granting environmentally-based business licenses to local community groups, as well as setting operational standards for the production and marketing of eco-friendly products. This regulation must also be accompanied by fiscal incentives such as renewable energy subsidies, tax exemptions for environmentally friendly local products, and priority purchases of green products by government agencies. In addition, the community empowerment budget in the State Budget/Regional Budget needs to be increased to support the sustainable implementation of green economy programs.

Collaboration among stakeholders is the key to success in realizing a green economy in Tahura. Local governments, village officials, community leaders, traditional institutions, universities, and environmental organizations must work together in designing a common vision for inclusive and participatory Tahura management. Multi-stakeholder forums

such as the Tahura Management Board involving community elements can be a productive and transparent dialogue platform. With this forum, conflicts that often occur among the community and the government can be minimized through constructive and solutional mediation.

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BEST PRACTICES IN CONSERVATION POLICY TRANSFORMATION

Ari Sasmoko Adi and Yudiyanto Tri Kurniawan

In the face of global challenges such as climate change and biodiversity loss, the transformation of conservation policies is critical. Best practices in this transformation include an innovative, evidence-based approach that engages a wide range of stakeholders, including local and indigenous peoples. Effective policies require cross-sectoral collaboration, good governance, and sustainable funding mechanisms. By prioritizing participation, adaptation, and transparency, conservation policy transformation can support nature protection as well as sustainable development to achieve global goals such as the SDGs and the Paris Contract.

A. Overview of R Soerjo Forest Park

Raden Soerjo Forest Park (Tahura) is one of the nature conservations areas (KPA) that has an important role in maintaining the sustainability of forest ecosystems and natural resources in East Java Province. This area is located in the Arjuno-Welirang–Anjasmoro Mountains complex, which is known as one of the strategic mountainous areas on the island of Java. Its geographical location, which is at an average altitude of 800 to 3,339 meters above sea level, provides mild climatic conditions with fairly high rainfall, thus creating a forest ecosystem that is very rich in biodiversity. Tahura Raden Soerjo administratively covers the area of four districts, namely Mojokerto Regency, Pasuruan Regency, Malang Regency, and Jombang Regency. The total area of this area reaches 27,868.30 hectares, making it one of the largest protected forest areas in East Java.

The determine Tahura Raden Soerjo was carried out through the Decree of the Minister of Forestry No. 80/Kpts-II/2001 on March 15, 2001 concerning the Determine the Arjuno Lalijiwo Forest Group. The determine is the legal basis for the management of this forest area as part of the national conservation system. Furthermore, the status of this area is further

strengthened through the revision or amendment of the decision contained in Decree No.1190/Kpts-II/2002. Through these two decisions, the government affirms its commitment to protect forest areas that are not only of high ecological value, but also have great potential as natural tourism attractions, research, environmental education, and centers for the development of local culture for the surrounding community. The name "Raden Soerjo" itself is taken from the name of an East Java figure who once served as the Governor of East Java for the period 1967-1975, namely Raden Soerjo, as a form of appreciation for his services in the development of the region.

As a nature conservation area, Tahura Raden Soerjo has various main functions, including as a shelter for water systems, biodiversity preservation, and erosion and natural disaster control. In it, there are various types of rare flora and fauna that are protected, such as large old trees, endemic birds of Java, as well as land animals such as antelopes, long-tailed monkeys, and various species of reptiles. The existence of springs and small rivers in the area also makes Tahura Raden Soerjo one of the important water sources for the surrounding area. Some popular natural tourist destinations, such as Mount Welirang, Banjararum Hot Springs, and Tirta Mayang in Wonosalam Village, are included in this area. However, tourism activities are always balanced with the principle of sustainability so as not to damage the existing natural ecosystem.

In addition, Tahura Raden Soerjo also has a fairly high historical and spiritual value. At some points in the area, there are past heritage sites, such as heritage site and sacred tombs that are still visited by the community to make pilgrimages or perform certain traditional ceremonies. This shows that this area is not only of ecological value, but also part of the cultural heritage of the Javanese people, especially in the East Java region. Area management must also consider the socio-cultural aspects of the surrounding community so that there are no conflicts among land use and natural resources.

The management of Tahura Raden Soerjo is carried out by the local Watershed and Protected Forest Management Center (BPDAHL), in collaboration with related agencies, non-governmental organizations, academics, and the active participation of the surrounding community. Forest rehabilitation, reforestation, and environmental education endeavors are routinely carried out to maintain the sustainability of this

area. These programs also aim to increase public awareness of the importance of protecting the environment, considering that the pressure on forests is increasing due to human activities such as unlawful logging, forest encroachment, and land conversion. Therefore, cross-sector coordination is very important in maintaining the existence of Tahura Raden Soerjo as a green lung in East Java.

With an area of more than 27 thousand hectares and its strategic position in an active volcanic area, Tahura Raden Soerjo has great potential to be developed as a center for volcanology research, animal and plant conservation, and natural laboratories for the world of education. The potential of natural tourism can also be further developed, of course, while maintaining the principle of sustainability and not damaging the ecosystem. The local government, in this case the East Java Provincial Environment and Forestry Service together with BPDAHL, continues to strive to improve supporting infrastructure, educational facilities, and visitor facilities so that a visit to Tahura Raden Soerjo can provide economic benefits to the surrounding community without sacrificing environmental sustainability.

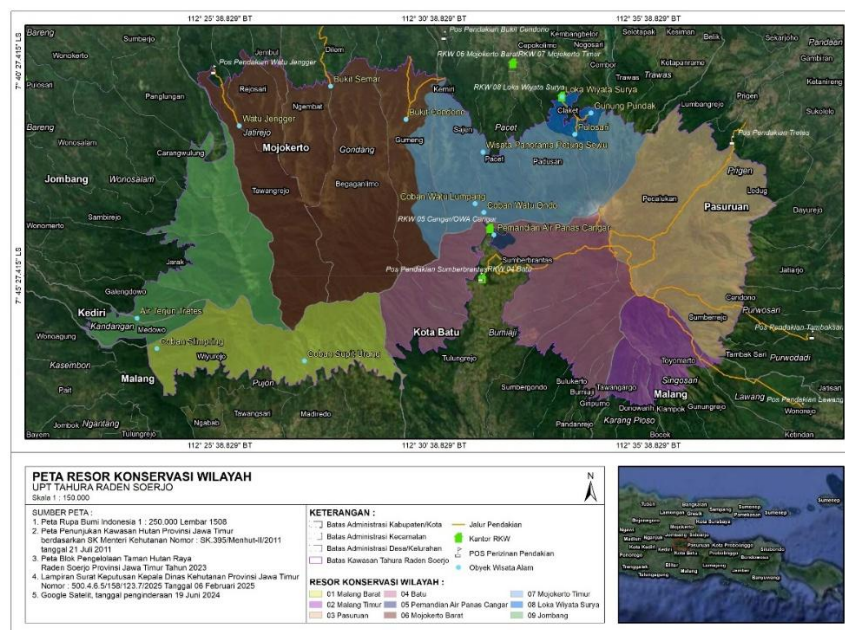


Figure 9.1. Map of the Conservation Resort of UPT Tahura Raden Soerjo

Tahura Raden Soerjo is not just an ordinary forest area, but is one of the important assets of the state in an effort to preserve biological natural

resources and their ecosystems. It acts as a life buffer for humans and other living things, a provider of clean air, a guardian of the water system, and a barrier to natural disasters such as landslides and floods. With good, participatory, and sustainable management, Tahura Raden Soerjo will continue to be a symbol of harmony among humans and nature, as well as a valuable heritage that deserves to be preserved for future generations. The Raden Soerjo Forest Park Conservation Resort Map (Tahura) is a map compiled on a scale of 1:150,000 and provides a comprehensive overview of the division of conservation management areas within the Raden Soerjo Tahura area, which is located in East Java Province, Indonesia. This area covers part of several districts and cities such as Mojokerto, Pasuruan, Malang, Batu City, and surrounding areas. This map is designed as a tool for planning and managing protected forest and mountain areas that are an integral part of Tahura Raden Soerjo. The preparation of this map is based on various reliable sources, including the 1:250,000 scale Indonesian Terrain (RBI) map, the 2011 East Java Province Forest Area Designation Map, as well as official documents related to forestry and conservation. In addition, Google Satellite satellite data for June 2024 is also used to ensure the accuracy and relevance of the geospatial information contained in the map.

This map shows nine (9) conservation resort areas, each of which has its own geographical and ecological characteristics. The regions are coded and different colors for easy identification and management. The first region is West Malang which is characterized by light green, followed by Batu City (dark green), Pasuruan (yellowish brown), Cangar (dark brown), Panderman & Cangar Hot Springs (light purple), West Mojokerto (dark brown), East Mojokerto (light blue), Suryo Tourism Workshop (dark blue), and Jombang (dark purple). Each conservation resort area has an important role in maintaining the sustainability of forest ecosystems, protecting endemic flora and fauna, and managing natural tourism potential in a sustainable manner. This division allows for more specific management according to environmental conditions and local socio-economic challenges in each region.

In addition to the division of conservation resort areas, this map also displays administrative boundaries ranging from the district/city level, sub-district, to village. This is very important in coordination among local government agencies and Tahura managers to maintain harmonious

spatial governance. In addition, the boundaries of the Tahura Raden Soerjo area are also clearly defined, making it easier to identify areas that are included in the conservation area category. Another important feature that is no less significant is the mountain climbing trail, such as the Arjuno-Welirang Trail which is popular with hikers and nature lovers. There are also markers for the location of the RKW (Regional Conservation Resort) office, climbing monitoring posts, and various natural attractions such as waterfalls and hot springs. Some of the tourist spots listed on the map include Coban Watu Ondo, Coban Watu Lumpang, and Cangar Hot Springs, which are major attractions for domestic and foreign tourists.

As an instrument for area management, this map also presents important information about the use of space within conservation areas. This information includes the distribution of land functions, core zones, use zones, and rehabilitation zones that are the basis for the preparation of long-term management plans. The map also helps identify potential land use conflicts among human activities and the protection of natural ecosystems. Thus, maps can be used as a basis for the implementation of various strategic activities such as area surveillance, ecotourism management, forest protection patrols, and community empowerment around conservation areas. Good management will have a positive impact not only on environmental sustainability, but also on improving the welfare of local communities through active participation in conservation and ecotourism programs.

As a complement, this map is equipped with an Indonesian map inset located in the lower right corner, which shows the geographical position of Tahura Raden Soerjo on the island of Java. This provides an important spatial context, especially for those who want to understand the strategic location of the region within a national framework. In addition, the attachment to the 2023 East Java Governor's Regulation is also a formal reference in the preparation of this map, thus ensuring legal validity and conformity with applicable regulations. With a combination of information technical, regulatory, and visualization data, this map is one of the important documents in endeavors to preserve natural resources and develop sustainable ecotourism at Tahura Raden Soerjo. The Map of the UPT Tahura Raden Soerjo Regional Conservation Resort is a comprehensive representation of integration endeavors among conservation area management, biodiversity protection, and environment-based local

economic development. This map is not only a medium of geographical information, but also a strategic planning tool that can support decision-making by managers, stakeholders, and local governments. Through this map, it is hoped that synergy can be achieved among nature conservation and the sustainable use of resources, so that Tahura Raden Soerjo remains a high-value natural heritage for future generations.

B. Tahura R Soerjo Governance

Conservation areas are one of the important assets that not only play a role in maintaining the sustainability of natural ecosystems, but also have great potential as a source of regional income through the tourism sector. The Conservation Area Entry Permit (SIMAKSI) is an important instrument in regulating tourist access to the area. In addition to aiming to ensure environmental sustainability, SIMAKSI also functions as a source of Regional Original Revenue (PAD), which makes a real contribution to the development and management of the local area. The entrance fee applied is adjusted to the type of destination, the status of the tourist (local or foreign), as well as more facilities such as vehicles and professional photography equipment. With the data on tourist visits and PAD from 2019 to 2024, it is possible to analyze how this tariff policy has an impact both economically and environmentally. The following is a detailed description related to the tariff structure, dynamics of the number of visitors, and the contribution of PAD from the implementation of SIMAKSI in conservation areas.

The implementation of the Conservation Area Entry Permit (SIMAKSI) is a strategic effort in maintaining a balance among nature conservation and sustainable economic use. SIMAKSI fees that apply in various conservation destinations show cost variations according to the characteristics of the location and the type of services provided. For illustration, the Cangar Hot Springs destination is charged a rate of IDR 20,000 on weekdays and increases to IDR 25,000 on weekends or national holidays. This time-based cost adjustment is intended to regulate the number of visits and avoid environmental damage due to tourist overcrowding. Waterfall destinations such as Tretes, Watu Lumpang, and Watu Ondo have lower rates, which is IDR 10,000 per person, reflecting relatively simpler operational costs and tourist attractions compared to other destinations. Meanwhile, Mount Arjuno-Welirang Climbing has a rate

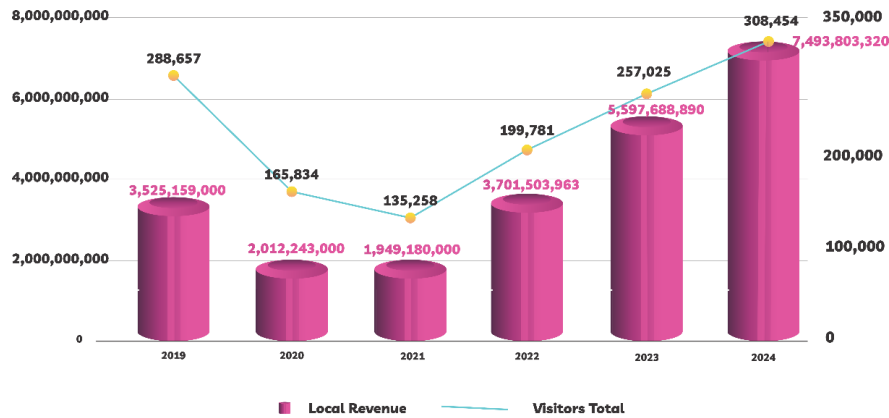
of Rp 20,000 per local tourist, while foreign tourists are charged much higher, namely Rp 200,000 for climbing and Rp 50,000 for ordinary nature tourism activities. This fare difference is based on the principle of equity and affordability, while also taking into account currency exchange rates and international tourists' interest in Indonesia's leading destinations.

In addition to the basic entrance fee to the area, tourists are also charged an more fee for certain facilities used during the visit. For illustration, two-wheeled vehicles are charged a parking fee of IDR 5,000 per unit per day, while the use of drones for commercial photography purposes is charged rates ranging from IDR 250,000 to IDR 500,000, depending on the category of tourists and the purpose of use. These more costs are not only aimed at increasing PAD, but also as a mechanism to control the use of technology that has the potential to disrupt wildlife or damage ecosystems. The imposition of these diverse tariffs reflects the endeavors of the area managers in optimizing revenue without reducing the comfort of visitors, while maintaining the integrity of the environment.

From a statistical perspective, graphs and tables of tariffs and the number of visitors from 2019 to 2024 provide a fairly information picture of the dynamics of tourist visits and their contribution to Regional Original Revenue (PAD). In 2019, the number of visitors reached 288,657 with a total PAD of IDR 3,525,159,000. This figure shows that even though there is no global pandemic yet, the pattern of tourist visits is still predictable and well managed. However, in 2020, the number of visitors dropped dramatically to 165,834 due to mobility restrictions and the temporary closure of natural tourism areas in response to the COVID-19 pandemic. The decrease in direct visits had an impact on PAD which shrank to IDR 2,012,243,000. However, the manager still strives to maintain income stability through service digitization innovations and the implementation of strict health protocols so that tourists feel safe when visiting.

The following years showed a positive recovery trend. The number of visitors increased to 257,025 in 2023, and is projected to reach 308,454 by 2024 (Figure 9.2.). Along with the increase in the number of visits, PAD has also experienced significant growth, with a projection of reaching IDR 7,493,803,320 in 2024. This surge in PAD is not only due to the increase in the number of visitors, but also to the effectiveness of a more transparent and modern levy withdrawal system. The digitization of SIMAKSI's services, including online ordering and non-cash payments, also supports

administrative efficiency and increases public confidence in the management of conservation areas. In addition, active promotion through social media and collaboration with tourism Industry players are also the main factors in attracting tourist interest post-pandemic.



Source: Tahura R Soerjo, 2025, modify by Andjar, 2025

Figure 9.2. Regional Original Revenue and Total Visitors 2019-2025

This data proves that the SIMAKSI tariff policy, which is implemented proportionally and flexibly, has succeeded in increasing PAD even though it had experienced serious disruptions due to the pandemic. This success shows that the management of conservation areas does not have to be contrary to economic interests, as long as it is carried out with the principles of sustainability and participation. Good area management, supported by proper regulations and public awareness of the importance of conservation, is a strong foundation for the development of environment-based tourism. With a projection of positive growth in visits and PAD, conservation areas have the potential to become one of the main pillars of environmentally friendly regional economic development. Through the synergy among fiscal policy, public education, and technological innovation, SIMAKSI management can be an illustration of a balanced natural resource management model among conservation and the regional economy.

C. Tahura R Soerjo Digitization Service

The Mountain Climbing Registration and Levy Information System or known as SiPenerang is a digital innovation developed by the Technical Implementation Unit (UPT) of the Raden Soerjo Forest Park (Tahura), East

Java Provincial Forestry Service. This site can be accessed through the address <https://tahurarloerjo.dishut.jatimprov.go.id/sipenerang/index.php>, and is designed to public service to regulate climbing activities in conservation areas in a more orderly, transparent, and sustainable manner. Before this system, the climbing registration process was still carried out manually, so it was vulnerable to long queues, data duplication, and difficulties in managing levies and the number of visitors. Therefore, SiPenerang is here as a solution to improve the efficiency of services to the community while maintaining the sustainability of the forest ecosystem.

1. Page 1: Background, Purpose, and Key Features of the Sipenerang Site

SiPenerang was created as an effort to bring order to mountain climbing activities in the Tahura Raden Soerjo area which is one of the important conservations areas in East Java. The main purpose of this system is to make it easier for the public to register for climbing online, as well as to support the management of levy data and accurate reporting of climbing activities. Through this system, UPT Tahura Raden Soerjo wants to create better governance of natural tourism visits while maintaining environmental conservation aspects.

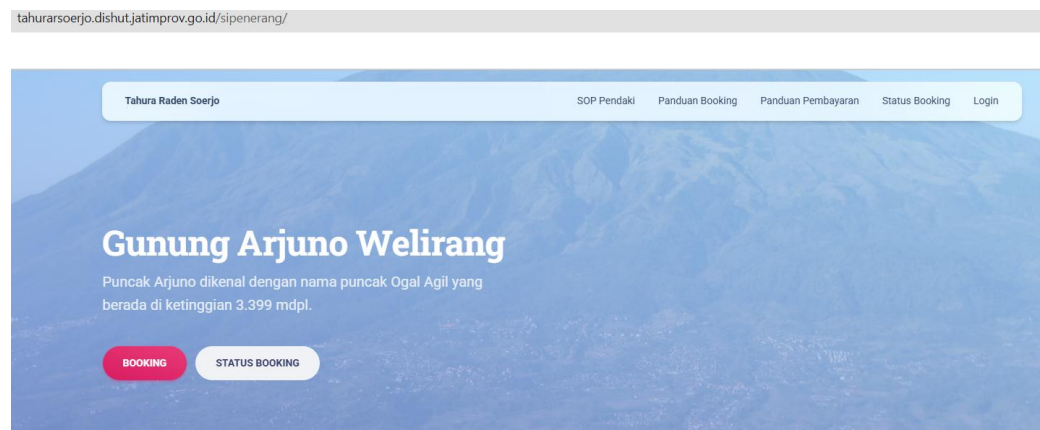


Figure 9.3. The front page of the SiPeNerang Site

The development of SiPenerang aims at several main things. First, realizing the digitalization of public services by replacing the manual system with an online system to make it more efficient and transparent. Second, enforce climbing quota control so that the number of visitors does not exceed the carrying capacity of the area, thereby avoiding

environmental damage. Third, strengthening the supervision and security of the area by providing real-time visitor data that makes it easier for field officers to monitor climber activities. Fourth, improving services to the community by providing administrative convenience from registration to levy payments.

To support this goal, SiPenerang provides some key features that are integrated with each other. The first feature is the online climbing registration system or booking system, where users can choose climbing routes such as Lawang, Tretes, Sumber Brantas, and others. Each registrant is vital to fill in individual and group of climber data. The booking process must be done at least one day before the date of the climb. Once successful, the system will send you a levy bill via email. Furthermore, the climber made the compensation via bank transfer to Tahura's official account and uploaded proof of transfer to be verified by the officer.

In addition, this site also provides climbing Standard Operating Procedures (SOP) documents that can be accessed by climbers. It contains information about verification service hours, technical booking conditions, compensation deadlines, mandatory equipment, and prohibitions during the climb. To help climbers choose a path according to their ability, the site also presents complete information on each climbing route, including terrain conditions, difficulty level, duration of the trip, as well as the location of rest posts and water sources. The Lawang Trial, for illustration, is known to have the longest climb and is suitable for experienced climbers.

Internally, SiPenerang is equipped with an admin dashboard that is used by officers to monitor the number of daily registrants, verify payments, validate bookings, and produce monthly and annual reports related to the number of climbers and incoming levies. This feature is very helpful in the process of monitoring and evaluating climbing activities in the Tahura Raden Soerjo area.

2. Page 2: Benefits and Impacts of Using the Sipenerang Site

The existence of SiPenerang has provided significant benefits both for the general public, area managers, and environmental conservation. For the public and climbers, this system makes it easier to register and pay the levy without having to come directly to the location. Transparency of the levy fee is also achieved because all tariffs are clearly listed in the system, thus avoiding climbers from the practice of pungli. In addition, the

availability of complete information about SOPs, weather, and climbing trial conditions helps climbers prepare well before embarking on an expedition.

For the area manager, namely UPT Tahura Raden Soerjo, SiPenerang facilitates the management of climbing quotas in real-time, so that the number of visitors can be controlled so that it does not exceed the carrying capacity of the environment. This also helps increase Regional Original Revenue (PAD) through more optimal and accountable levy management. Administrative processes such as data logging, reporting, and visitor monitoring have become faster and more structured thanks to the integration of online systems. Officers can also monitor the distribution of climbers on various trials directly from the control center, thus speeding up the handling of incidents if an emergency.

From an environmental aspect, SiPenerang also contributes to maintaining the sustainability of the forest ecosystem in Tahura Raden Soerjo. With quota restrictions and clear climbing paths, the risk of vegetation damage, erosion, and waste pollution can be minimized. In addition, this site is also an educational medium for the community about the importance of preserving forests and acting environmentally friendly during nature tourism. Awareness of sustainable tourism is increasing with the rules conveyed through SOPs and climbing guides.

As an integrated digital platform, SiPenerang is a real illustration of the implementation of e-government in the field of forestry and natural tourism. In addition to improving the quality of service to the community, this system also plays an important role in preserving the nature of Tahura Raden Soerjo for future generations. By continuing to be developed and optimized, SiPenerang is expected to become a model of a natural tourism visit management system that can be replicated in other conservation areas in Indonesia.

D. Alternative Climbing Information

1. Cangar Line

The map shown is a map of the climbing route of Mount Arjuno-Welirang via Sumberbrantas, a popular route in the Raden Soerjo Forest Park (Tahura) area, East Java. This map is compiled in detail with a scale of 1:25,000 to provide accurate information about terrain, distance, elevation, and important facilities throughout the hike.

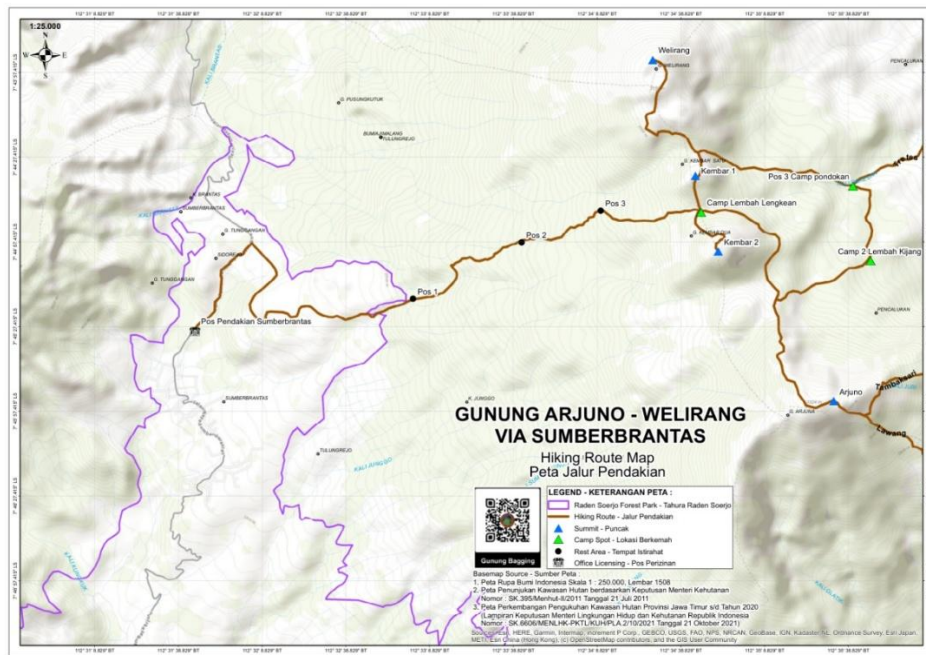


Figure 9.4. Map of Mount Arjuno-Welirang via Sumberbrantas

The main purpose of providing this map is to help climbers in planning expeditions well, minimizing the risk of getting lost, and increasing awareness of the importance of preserving the natural environment during activities in conservation areas. In addition, this map is also part of the area's management's endeavors to regulate hiking routes and regulate the flow of natural tourism visits in a more structured manner. This map is titled "Mount Arjuno-Welirang Via Sumberbrantas" and uses a scale of 1:25,000, meaning that every 1 centimeter on the map represents 25,000 centimeters or 250 meters in the field. This scale is ideal enough to support accurate land navigation, especially for climbers who want to know the distance, contours of the terrain, as well as strategic locations such as guard posts, rest areas, and camping points. At the bottom of the map there is a legend that explains the symbols used, such as the brown line for the hiking trail, the blue triangle for the mountain top, the black circle for the rest area, and the office icon for the permit Post. By understanding the legend, climbers can more easily read the conditions of the field visually before starting the journey.

The climbing route starts from the Sumberbrantas Climbing Post, which is the official entrance to the climbing routes of Mount Arjuno and Welirang. From here, the trial passes through several guard posts such as

Post 1, Post 2, and Post 3, which also function as a place to rest and monitor by field officers. After Post 3, hikers will arrive at Lengkean Valley Camp, one of the recommended camping locations to rest overnight before continuing the trek to the summit. The trail then continues to Camp Lembah Kijang, a second camping location closer to the mountain peaks. From this valley, climbers will choose whether to go to the peak of Mount Arjuno which is 3,324 meters above sea level or the peak of Mount Welirang which has an altitude of 3,156 meters above sea level.

In addition to the main route, this map also lists the rivers and water sources scattered around the hiking trail, such as the Brantas River, the Junggo River, the Rekesan River, and the Glatik River, which are very important as a reference source of drinking water during the climb. The boundaries of the administrative area among Malang, Lumajang, and Pasuruan Regencies are also included so that climbers can understand the geographical context of the area they are passing. The forest area managed by Tahura Raden Soerjo is marked with a white transparent area, so climbers can distinguish which areas are allowed to pass and which are not included in the official trail.

The map also includes information on the basic data used in the preparation, such as the Indonesian Terrain Map from BIG (Geospatial Information Agency), the Forest Area Designation Map based on the Decree of the Minister of Forestry, as well as more data from global GIS sources such as Esri, HERE, Garmin, and OpenStreetMap. This shows that this map was created with an accurate and reliable database, making it worthy of being used as an official guide for climbers. With this map, climbers can prepare themselves more maturely, both in physicality, equipment, and knowledge of the terrain, and contribute to maintaining the sustainability of the natural ecosystem around the climbing trail.

2. Lane Lane

The map shown is a map of the climbing route of Mount Arjuno-Welirang via Lawang, a popular route in the Raden Soerjo Forest Park (Tahura) area, East Java. This map is compiled in detail with a scale of 1:35,000 to provide accurate information about the terrain, mileage, elevation, and important facilities along the hiking trip.

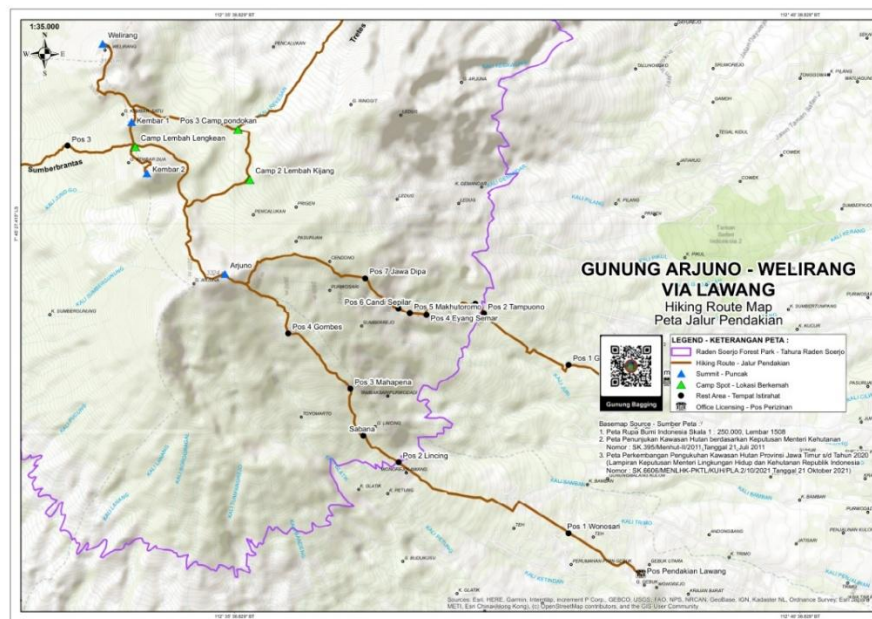


Figure 9.5. Map of Mount Arjuno-Welirang via Lawang

The main purpose of providing this map is to help climbers in planning expeditions well, minimizing the risk of getting lost, and increasing awareness of the importance of preserving the natural environment during activities in conservation areas. In addition, this map is also part of the area's management's endeavors to regulate hiking routes and regulate the flow of natural tourism visits in a more structured manner. This map is titled Mount Arjuno-Welirang via Lawang and uses a scale of 1:35,000, meaning that every 1 centimeter on the map represents 35,000 centimeters or 350 meters in the field. This scale is ideal enough to support accurate land navigation, especially for climbers who want to know the distance, contours of the terrain, as well as strategic locations such as guard posts, rest areas, and camping points. At the bottom of the map there is a legend that explains the symbols used, such as the brown line for the hiking trail, the blue triangle for the mountain top, the black circle for the rest area, and the office icon for the permit Post. By understanding the legend, climbers can more easily read the conditions of the field visually before starting the journey.

The climbing route starts from the Lawang Climbing Post, which is the official entrance to the climbing paths of Mount Arjuno and Welirang. From here, the path passes through several guard posts such as Post 1 Wonosari, Post 2 Lincing, Post 3 Mahapena, Post 4 Gombes, Post 5 Makhutoromo,

Post 6 Sepilar Temple, until it reaches Post 7 Jawa Dipa. After that, the trail continues to Camp Lembah Kijang and Camp Lembah Lengkean, two camping locations that are recommended to rest overnight before reaching the top. From this valley, climbers will choose whether to go to the peak of Mount Arjuno which is 3,324 meters above sea level or the peak of Mount Welirang which has an altitude of 3,156 meters above sea level.

In addition to the main route, this map also lists rivers and water sources scattered around the hiking trail, such as the Sumbergunung River, the Jurig River, the Petung River, and the Glatak River, which are very important as a reference for drinking water sources during the climb. The boundaries of the administrative area among Malang, Lumajang, and Pasuruan Regencies are also included so that climbers can understand the geographical context of the area they are passing. The forest area managed by Tahura Raden Soerjo is marked with a white transparent area, so climbers can distinguish which areas are allowed to pass and which are not included in the official trail.

The map also includes information on the basic data used in the preparation, such as the Indonesian Terrain Map from BIG (Geospatial Information Agency), the Forest Area Designation Map based on the Decree of the Minister of Forestry, as well as more data from global GIS sources such as Esri, HERE, Garmin, and OpenStreetMap. This shows that this map was created with an accurate and reliable database, making it worthy of being used as an official guide for climbers. With this map, climbers can prepare themselves more maturely, both in physicality, equipment, and knowledge of the terrain, and contribute to maintaining the sustainability of the natural ecosystem around the climbing trail.

3. Tambaksari Line

The map shown is a map of the climbing route of Mount Arjuno-Welirang Via Tambaksari, one of the popular climbing routes in the Raden Soerjo Forest Park (Tahura) area, East Java. This map is compiled in detail on a scale of 1:25,000 to provide accurate information about terrain conditions, mileage, elevation, and important locations such as guard posts, rest areas, and camping areas.

The main purpose of providing this map is to help climbers plan their journeys well, minimize the risk of getting lost, and support the endeavors of area managers in maintaining the sustainability of the natural

environment through orderly and sustainable climbing route arrangements. This map is titled Mount Arjuno-Welirang Via Tambaksari and uses a scale of 1:25,000, meaning that every 1 centimeter on the map represents 25,000 centimeters or 250 meters in the field. At the bottom of the map there is a legend that explains the symbols used, such as the brown line for the hiking trail, the blue triangle for the mountain top, the black circle for the rest spot, the green triangle for the camping site, and the office icon for the permit Post. By understanding the legend, climbers can more easily read maps and know strategic locations along the way. The climbing path starts from the Tambaksari Climbing Post, which is the official entrance to this route, and then passes through several guard posts such as Post 1 Guo onto Boego, Post 2 Tampuono, Post 3 Eyang Sakri, Post 4 Gombes, Post 5 Makhutoromo, Post 6 Sepilar Temple, until reaching Post 7 Jawa Dipa. After that, the trail continues to Camp Lembah Kijang and Camp Lembah Lengkan, two camping locations that are recommended to rest overnight before reaching the summit.

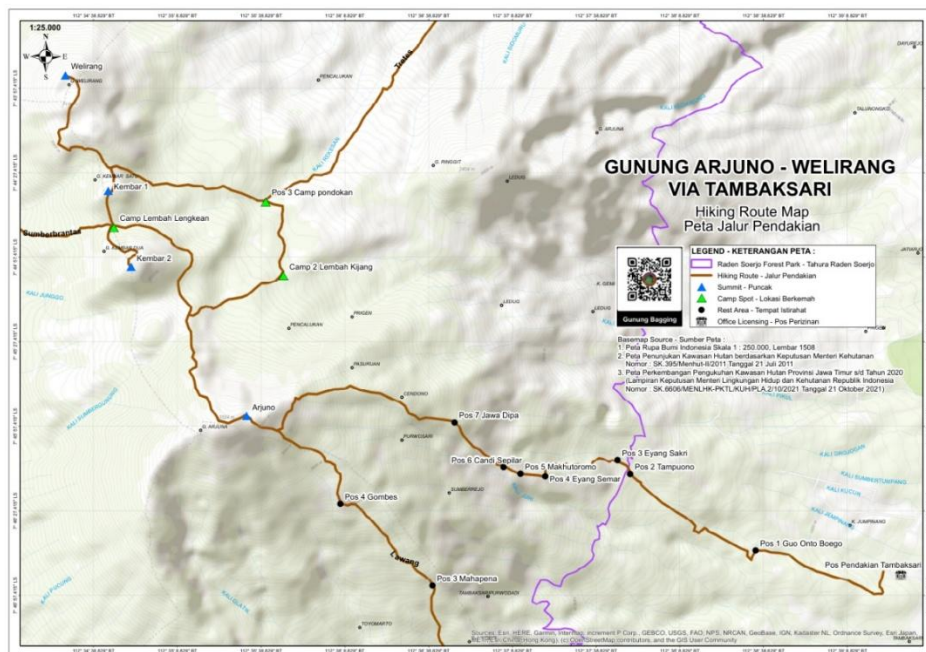


Figure 9.6. Map of Mount Arjuno-Welirang Via Tambaksari

From this valley, climbers can choose a route to reach the peak of Mount Arjuno which has an altitude of 3,324 meters above sea level or the peak of Mount Welirang as high as 3,156 meters above sea level. In addition

to the main route, this map also lists rivers and water sources scattered around the hiking trail, such as the Sumbrungunung River, the Jurig River, the Petung River, and the Glatak River, which are very important as a reference source of drinking water during the climb. The boundaries of the administrative area among Malang, Lumajang, and Pasuruan Regencies are also included so that climbers can understand the geographical context of the area they are passing. The forest area managed by Tahura Raden Soerjo is marked with a white transparent area, so climbers can distinguish which areas are allowed to pass and which are not included in the official trail. The map also includes information on the basic data used in the preparation, such as the Indonesian Terrain Map from BIG (Geospatial Information Agency), the Forest Area Designation Map based on the Decree of the Minister of Forestry, as well as more data from global GIS sources such as Esri, HERE, Garmin, and OpenStreetMap. This shows that this map was created with an accurate and reliable database, making it worthy of being used as an official guide for climbers. With this map, climbers can prepare themselves more maturely, both in physicality, equipment, and knowledge of the terrain, and contribute to maintaining the sustainability of the natural ecosystem around the climbing trail.

4. Jalur Tretes

The map analyzed is a visual representation of the hiking trails to Mount Arjuno and Welirang through the Tretes route, a popular hiking trail in Pasuruan and Malang Regencies, East Java. The title of the map reads "Gunung Arjuno–Welirang Via Tretes Hiking Route Map", indicating that this map was created as a guide for mountain climbers. The scale of the map is 1:30,000, meaning that each unit on the map represents 30,000 units in the real world; In this scale, every centimeter on the map is equivalent to 300 meters in the actual terrain. The map also comes with a compass symbol in the upper left that indicates the direction of the north, helping the user in the orientation of the terrain during the trip.

The area depicted on the map includes the Arjuno-Welirang mountainous area which is located in the Tahura Raden Soerjo protected forest area. The region is located on the border among Malang Regency and Pasuruan Regency, making it one of the favorite hiking destinations in East Java. Administrative boundaries are marked with dotted lines, while forest areas dominate the map in dark green. Inside there is a highland

forest ecosystem with dense vegetation, as well as the flow of small rivers such as the Temuran River, the Reban River, and the Welirang River, which are depicted in the form of a thin but clear blue line. These rivers are often a source of water for hikers along the way.

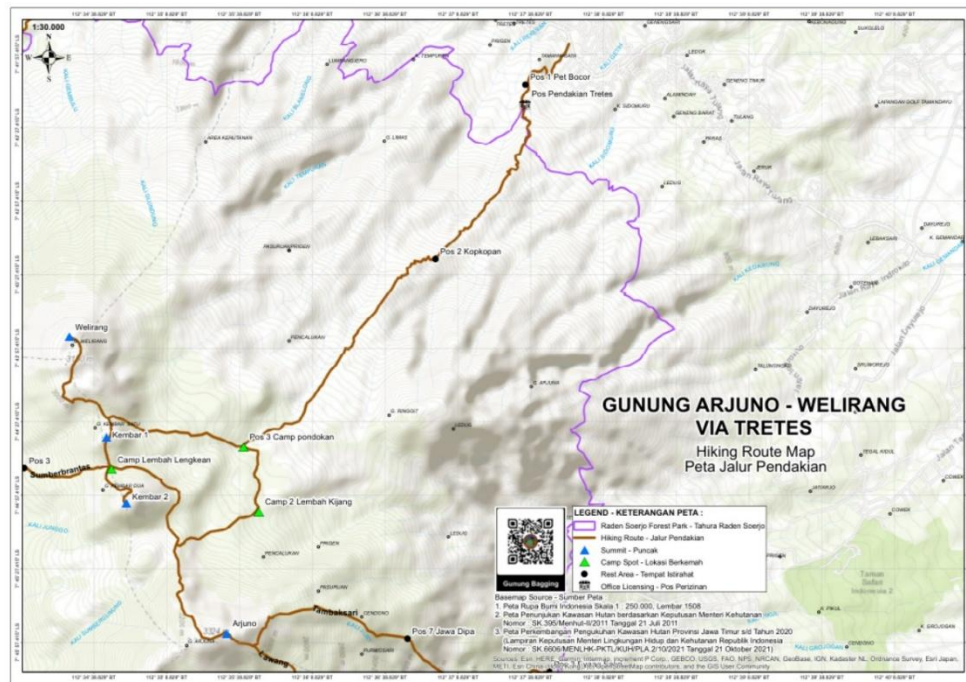


Figure 9.7. Map of Mount Arjuno-Welirang via Tretes

The main hiking trial is marked with a thick yellow line, which depicts the trekking route from the starting Post to the summit of Mount Arjuno. This trial starts from Pos one Pet Bocor, which is the registration point and the initial base of the climb. From here, the route passes through several important posts, namely Post 2 Kopkopian, Post 3 Camp Pondokan, then passes through two transit points named Kembar one and Kembar 2, which are suspected to be strategic locations or the confluence of other routes. After that, the trial leads to Camp Lembah Lingsaan, a camping location in the valley that is usually used by groups of hikers on a multi-day trip. Next, the climb path is steeper to Camp two of the Kijang Valley, the second campsite before approaching the top. The terminate point before reaching the summit is Post 7 Jawa Dipa, which is the place for the final preparation before the summit attack to the top of Mount Arjuno. The peak of Mount Arjuno itself is marked by a large green triangle symbol with a height of

3,324 meters above sea level, making it one of the highest mountains on the island of Java.

In addition to the main route, the map also lists rest points marked with black circles, usually in the form of shelter or strategic spots for a short break. These locations are very important because of the conditions of the hiking trails that are quite tiring and winding, with the elevation constantly increasing. The blue triangle symbol is used to indicate the official campsite location, providing hikers with information about where tents are allowed. The map also mentions the existence of a permit post-marked with a small box symbol, which is a mandatory point for climbers to obtain an entry permit into the forest area.

The map legend explains the meaning of all the symbols used, including: Thick yellow line = hiking trail, green triangle = mountain peak; Blue triangle = campsite location; Black circles = resting place; Small box = licensing Post; Blue line = river flow; Dark green color = forest area with this legend, climbers can easily read and understand the information available on the map. The basic data sources of the map come from several official institutions, including the 1:250,000 scale Indonesian Terrain Map, the Forest Area Designation Map based on SK.395/Menhut-II/2011, and the Map of the Development of the Inauguration of Forest Areas of East Java Province until 2020. More information is obtained from well-known geospatial service providers such as Esri, HERE, Garmin, OpenStreetMap, and the GIS community, so this map has a high level of accuracy and can be trusted for navigation in the field.

In addition to the technical elements, the map also lists the names of villages, small mountains, and rivers around the hiking trail, which provides a broader geographical context. Names such as Mount Werirang, Kali Werirang, and several villages around the basecamp are also included to help climbers in understanding their relative position during the journey. The existence of alternative paths or branches is also visible, although it is not the main focus of this map.

Overall, this map is an information and complete guide for hikers who want to take the Tretes route to the top of Mount Arjuno. The details presented ranging from topography, hiking trails, rest and camping locations, to administrative references and data sources, make this map a very useful document for both beginners and experienced climbers. By understanding the contents of this map in depth, climbers can plan their

trip more carefully, predict travel times, know vulnerable or difficult points, and ensure safety and smoothness during the climb.

E. Practice in Conservation Policy Transformation in R. Soerjo Forest Park

R. Soerjo Forest Park (Tahura) is one of the conservation areas that has an important role in the preservation of biological natural resources and their ecosystems. Located in East Java, Tahura R. Soerjo stretches in the administrative areas of Batu City, Malang Regency, and Mojokerto City. This area is managed as a protected forest as well as a green open space that functions to maintain environmental stability, manage natural tourism potential, and become a center for environmental education and research. In the context of conservation policy transformation, the management of Tahura R. Soerjo is increasingly dynamic with innovations in governance, digitization of services, and the development of alternative recreational activities such as mountain climbing.

In recent years, the concept of conservation no longer only focuses on nature conservation, but also includes the development of sustainable ecotourism, the digitization of services, and the integration of technology in area management. One illustration is policy transformation in ecopark areas such as Kyai Langgeng Park which was analyzed (Pangerando & Novitaningtyas, 2022) using the SWOT approach. This study shows that changes in marketing strategies, business models, brand image, and financial governance are important factors in increasing the attractiveness and sustainability of Eco parks. The approach provides an overview of how conservation policies can be combined with modern business principles without compromising environmental values. In addition, (Sutarmi, 2021) highlights the importance of regulatory aspects in land acquisition for conservation areas, especially in maintaining a balance among the public interest and the rights of local communities. This research is relevant in the context of Tahura or National Park management involving the surrounding community. Conservation policy transformation must pay attention to social and legal aspects so as not to cause horizontal or vertical conflicts among communities and government institutions.

In the realm of geoparks and geotourism, the (Prosiding Geodiversity, 2021) has presented the results of a national seminar that discussed the potential of geodiversity as the basis for the development of national

geoparks. Geological education and geotourism promotion are an integral part of an educational and environmentally friendly nature recreation strategy. Geoparks are not only tourist destinations, but also learning centers about landscapes, earth history, and biodiversity, thus expanding the scope of conservation area functions. The digitalization of services is also a major trend in the transformation of conservation policies. (Proceedings BIS-HSS 2022, 2024) highlights innovations during the pandemic that focus on empowering communities and industries through technology. This concept is very relevant to be applied in conservation areas, both in the form of online reservation systems, trekking trail information applications, and environmental education platforms. In addition, (Proceedings ICEI 2024, 2025) underscores the importance of green education in supporting sustainable environmental management. Digital integration in the education process can increase public participation and the effectiveness of conservation campaigns.

In digital management and Industry 4.0, (Proceedings iCAST-SS 2022, 2022) reviews digital transformation that contributes to sustainable economic growth. In the context of conservation, the apply technologies such as IoT, big data, and AI can be used for real-time monitoring of ecosystems, predicting natural disaster risks, and managing tourist visits so as not to exceed the carrying capacity of the environment. This shows that the current conservation policy cannot be separated from the development of Industry 4.0 technology. Furthermore, (Proceedings ICEI 2024, 2025) emphasizes the need for a cross-disciplinary approach in designing conservation policies. Arts, humanities, and social science perspectives provide new insights into how people's culture and behavior can be part of conservation strategies. For illustration, indigenous values and local traditions that support nature conservation can be integrated into regional management policies. Finally, (Proceedings GCBME 2022, 2024) emphasizes the importance of sustainable digital business in supporting the transformation of public services. In the context of conservation areas, this can be realized in the form of ecotourism-based ecommerce, application-based visitor management systems, to the use of digital platforms for crowdfunding nature restoration projects. This approach not only improves operational efficiency, but also opens up opportunities for public participation in conservation endeavors. The transformation of conservation policy today is increasingly complex and multidimensional.

By combining the principles of ecotourism, digitization of services, data-driven approaches, and social and cultural inclusion, conservation areas such as Tahura R. Soerjo can become a model of nature management that is sustainable, adaptive, and responsive to the challenges of the times.

In governance, Tahura R. Soerjo has undergone significant changes on one or more occasions. Originally managed conventionally, a participatory approach involving various stakeholders such as local governments, communities around forests, educational institutions, and environmental organizations have begun to be implemented. This approach aims to increase the effectiveness of regional management through cross-sectoral synergy. In addition, the principles of sustainability and transparency are the main focus in policy formulation, so that every activity in it can provide benefits both for the environment and the surrounding community.

In the management of conservation areas, a multi-stakeholder collaborative approach is increasingly important in designing and implementing policies that are inclusive, effective, and sustainable. (Hendro Pratikno & Anwar Kurniadi, 2021) show that in the context of Mount Merapi disaster mitigation in the Borobudur Temple area, interaction among stakeholders such as local governments, non-governmental institutions, academics, local communities, and tourism actors greatly determines the success of disaster management endeavors. This research emphasizes that intensive dialogue and trust building are the main foundations of participatory and responsive governance to environmental risks. A similar approach was found in the analysis of (Wulandari, 2024) on collaborative governance in the management of the Cidanau watershed using Ansell & Gash theory. This study concludes that the success of multi-stakeholder cooperation is greatly influenced by the starting conditions, institutional design, and the role of facilitative leadership. In other words, to create productive synergy in natural resource management, collective awareness, a supportive organizational structure, and the existence of figures or institutions that are able to help the process of communication and negotiation among parties are needed.

A broader collaboration model is applied in the concept of pentahelix, which is the synergy among government, academia, communities, businesses, and the media. (Kumala et al., 2024) review how this model can be a solution in the development of tourist villages, including in the context of conservation areas. The integration of the five main actors allows for

more effective knowledge transfer, technological innovation, policy support, community empowerment, and public campaigns. The apply the pentahelix principle in the management of Tahura R. Soerjo or national geoparks can improve the quality of ecotourism services while strengthening the local economic base based on conservation. From an institutional perspective, (Aini et al., 2021) conducted a study on marine ecotourism management in Raja Ampat and found that mapping the interests and influence of stakeholders is key in designing the right management strategy. They also highlighted the need for a strong coordination mechanism to address institutional constraints such as overlapping authority and lack of managerial capacity. These findings are relevant to be applied to terrestrial conservation areas such as protected forests and national parks, where multi-stakeholder involvement is a determining factor for the success of conservation programs.

In addition, aspects of transparency and accountability in budget management are crucial issues in the implementation of conservation policies. (Thamrin et al., 2023) criticized the case of forest fires in Riau and found that there was an alienation of budget policies that resulted in low public trust in related agencies. To avoid this, the budget planning and reporting system must be designed in a transparent and participatory manner, so that all parties can monitor the allocation and realization of conservation funds. As a support for data-driven policy planning, the (OECD, 2021) has developed the Regional Sustainable Development Index (RSDI) as a measure of sustainable development performance. This index not only measures economic growth, but also environmental and governance dimensions. The implementation of RSDI in conservation areas can help local governments in designing a management strategy that balances nature conservation, improving community welfare, and managing resources efficiently.

At the macro policy level, the OECD (2021) provides recommendations on green investment and clean energy financing in Indonesia. The policy framework offers guidance for governments and investors in directing funds to sustainable projects, including in the conservation sector. Green investment can be used to fund ecosystem restoration, environmentally friendly infrastructure development, and strengthen community capacity in maintaining regional sustainability. (Nur Aini et al., 2021) provides an overview of the challenges of tropical forest

management, including in the context of protected areas and conservation policies. The articles in this journal address issues such as deforestation, climate change, and land access conflicts that are often major obstacles to the implementation of conservation policies. With a strong scientific approach, this journal is an important reference in the development of adaptive and evidence-based forest management strategies.

In line with the development of information technology, the digitization of services is also an integral part of the transformation of conservation policies in Tahura R. Soerjo. Online ticket booking services, climbing route information applications, GIS-based ecosystem monitoring systems, and digital-based environmental education have begun to be introduced to the public. This step not only makes it easier for visitors to access, but also helps managers in monitoring and evaluating the impact of visits on the environment more accurately and in real-time. Digitalization also supports broader conservation campaigns through social media and online platforms, so that public awareness of the importance of preserving nature is increasing.

In addition, to increase the value of education and recreation while maintaining the balance of the ecosystem, Tahura R. Soerjo offers alternative climbing information. The hiking trails available are designed with sustainability and visitor safety in mind. Each trail is equipped with information about endemic flora and fauna, eco-friendly rest points, and an appeal to maintain cleanliness and not damage natural habitats. The manager also provides a digital guide that climbers can download, so they can make careful preparations and minimize the risk of environmental damage during the climb.

Through a combination of inclusive governance, digitization of services, and the provide alternative activities that are environmentally friendly, Tahura R. Soerjo is an illustration of real practice in the transformation of conservation policies in Indonesia. This effort not only maintains the survival of forest ecosystems, but also creates a sustainable conservation area management model, participatory, and adaptive to changing times.

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CONCEPTUAL MODEL OF POLICY TRANSFORMATION

Suharyon and Hasim Ashari

Effective policy change requires a strong foundation to be able to produce sustainable and relevant impacts on social, economic, and environmental problems. These foundations are known as the pillars of policy change, which are the basic principles that are the foundation in the process of formulation, implementation, and evaluation of public policies. There are several key pillars that support effective policy change, namely transformational leadership, stakeholder participation, accurate data and information, institutional capacity, and strong political commitment.

A. Transformational leadership

Transformational leadership is essential in driving policy change. Leaders who have a far-sighted vision, consensus-building skills, and managerial competence will help create policy directions that are not only reactive but also proactive to future challenges. This type of leadership advises innovation, inspires other policy actors, and creates a collaborative work culture. (ly, 2025) shows that in Cambodia's public sector, transformational leadership has a significant influence on accelerating digital transformation and sustainable development. This type of leadership not only advises technological innovation but also creates a work culture that is adaptive and responsive to the needs of society. In addition, (Cole, 2023) explains the importance of leadership in supporting education reform in African countries through African Union programs. In this context, leaders play the role of agents of change who bring new visions and implementation strategies that are in line with regional and national agendas. Furthermore, (Pillay & Kikasu, 2024) emphasize that servant leadership styles, which focus on service and stakeholder empowerment, are key to improving governance and the quality of public services in Africa. This leadership style puts the interests of the people as

the top priority, so as to be able to create a more inclusive and participatory system of government.

Transformational leadership has proven to be a key factor in driving policy change, especially in the context of public sector reforms. According (ly, 2025), transformational leadership plays an important role in driving digital transformation and sustainable development in Cambodia's public sector. This study shows that leaders with a transformational style not only provide a new vision, but also help inclusive adoption of technology, thus creating an adaptive and innovative work environment. Digital transformation is the main mediator among leadership and policy outcomes, proving that leadership style has an indirect but significant influence on the effectiveness of development program implementation. In South Africa, (Ngogi Emmanuel Mahaye, 2025) found that transformational leadership was very effective in supporting the implementation of the Basic Education Laws Amendment (BELA) Act, an education law reform that aims to improve access and quality of educational services. Despite the complex challenges of decentralization, leaders who apply transformational leadership principles—such as inspiration, empowerment, and individualization—are able to bridge different levels of government and ensure more harmonious coordination. This shows that although bureaucratic structures can be an obstacle, leadership competencies can be a solution to improve the efficiency of policy implementation.

(Gal-Arieli et al., 2020) added a local perspective to their study in Israel, where they found that transformational leadership at the local government level has a positive impact on active involvement in the formulation and implementation of education policies. This study emphasizes the importance of good governance structures as a foundation for transformational leadership to function optimally. In areas with strong institutional capacity, leaders are able to build synergy among national policies and local needs, resulting in more relevant and sustainable policies. (P. Poudel, 2020) presents a case from Nepal, where principals who use transformational leadership have successfully brought significant progress to community schools. Through a humanist and participatory approach, these school leaders are able to motivate teachers, involve students' parents, and build an organizational culture that supports innovation and improvement of the quality of education. These results suggest that

transformational leadership is not only effective at the macro or central government level, but also at the micro level such as primary education institutions.

Furthermore, (Jumakir et al., 2022) in their research in Sumatra, Indonesia, underlined how the transformational leadership of school principals directly affects school culture and teacher performance. A positive school culture, supported by visionary and empathetic leadership, creates a productive and collaborative work environment. The impact is to improve the quality of learning and achieve more inclusive educational goals. This proves that transformational leadership is not just about operational management, but also about building shared values that underpin policy sustainability. (Enang et al., 2022) in their systematic review affirm that transformational leadership is one of the essential elements in the sustainable transformation of public services. They stated that this type of leadership can drive structural change, increase employee motivation, and create space for policy innovation. Without strong, change-oriented leadership, public sector reform will be difficult to realize effectively.

Stakeholder participation is an important pillar in building transparent, accountable, and responsive public governance. (Zia ud din et al., 2023) found that collaborative governance in Pakistan, involving a wide range of stakeholders such as local governments, civil society, and non-governmental institutions, has succeeded in improving institutional capacity and the quality of public services. This approach helps to create a two-way feedback mechanism among state organizers and their citizens, so that the policies designed are more in line with the realities on the ground. (Cole, 2023) present a global illustration through the RIGHT Program in the UK, which leverages the participation of international actors in the health policy transformation process. This program prioritizes joint evaluation and collaborative learning as a strategy to improve the quality of health services. By engaging global experts and international institutions, the UK government can identify best practices and adapt more holistic solutions to domestic health challenges. (Pillay & Kikasu, 2024) highlight the importance of servant leadership in increasing community participation in African governance. This leadership style places the community as a key partner in the decision-making process, with a focus on accountability, transparency, and empowerment. The active

participation of the community is considered a core principle in creating an inclusive and democratic government. (Gaegane, 2024) added that in urban development planning in Africa, stakeholder participation is an important element in integrating sustainability and climate change mitigation issues. By involving local communities, environmental organizations, and climate experts, city governments are able to design policies that are more adaptive to disaster risk and environmental change. This approach not only increases policy legitimacy, but also strengthens the resilience of urban communities to global threats.

(Ashok et al., 2021) emphasize the need for active support from stakeholders in the knowledge management adoption process in the UAE public sector. They identified that without the active participation of stakeholders—from senior officials to field staff—data-driven reforms would fail. Therefore, training, cross-level dialogue, and open information systems are the keys to the successful implementation of knowledge-based policies. (Nwafor, 2024) highlights the flailsome artificial intelligence (AI) policies in Africa due to the lack of involvement of females' groups in the policy formulation process. Gender inequality in political and policy participation causes many technology initiatives to fail to meet females' needs and rights. This shows that stakeholder participation must be inclusive, not only in numbers but also in fair representation.

(Cole, 2023) states that in education reform under the auspices of the African Union, the involvement of youth and education stakeholders is key to success. Youth groups are given space to voice their aspirations, while teachers, principals, and parents are involved in the process of evaluating and refining policies. As a result, education policies have become more relevant to the needs of the younger generation. (Ngogi Emmanuel Mahaye, 2025; P. Poudel, 2020) agree that community participation in the form of School Governing Bodies is the main indicator in assessing the effectiveness of education policy implementation. The direct involvement of parents, teachers, and community leaders in the school's decision-making process helps ensure that education policies are not only top-down, but also bottom-up, making them easier to accept and implement.

(Enang et al., 2022) added that in addition to public participation, risk management is also a critical factor in the transformation of public services. Good leadership must be able to anticipate risks and design policies that are resilient to external disturbances. This further emphasizes

that transformational leadership must be accompanied by a systematic and sustainable approach. (Gal-Arieli et al., 2020) propose a "new localism" approach as an alternative model in policy reform. This approach puts local governments as a key actor working closely with the private sector, civil society, and non-profit organizations to create innovative local solutions. This model is particularly relevant in the context of increasingly widespread regional autonomy and complex decentralization. (Pillay & Kikasu, 2024) again emphasized that ethics, transparency, and stakeholder participation are prerequisites for sustainable public policy. They suggest that every public policy should go through a participatory validation process to ensure that it is not only efficient, but also fair and socially just.

(Zia ud din et al., 2023) concluded that focusing on multi-sectoral and cross-institutional sectors is an important strategy in improving public policy outcomes. Collaboration among departments, institutions, and stakeholders is a way to overcome policy fragmentation and create constructive synergy. Ly (2025) refines this argument by stating that the success of sustainable development policies is highly dependent on simultaneous digital and stakeholder engagement. Digital technology, if used correctly, can be a means to increase public participation in policy processes, including through e-governance platforms, mobile applications, and online complaint systems.

The effectiveness of stakeholder participation is a critical aspect of good governance, because the success of a policy is not only determined by its design, but also by the extent to which stakeholders are actively and meaningfully involved. (Wisnujati et al., 2025) offer a structured quantitative approach through Structural Equation Modeling based on Partial Least Square (SEM-PLS) to measure the influence of stakeholder participation in national food security projects in Indonesia. In this study, the effectiveness of participation was assessed from three main indicators: the level of trust among actors, the decrease in implementation resistance, and the fulfillment of stakeholder needs. This approach allows for the analysis of the complex relationships among participation, institutional support, communication, and program outcomes, thus providing an empirical picture of the contribution of participation in the achievement of policy objectives.

(Zahri et al., 2023) used the SERVQUAL model and Spearman correlation analysis to evaluate how stakeholder participation contributes

to the quality of public services in Aceh. They found that the active involvement of the community, apparatus, and non-governmental organizations has a direct influence on the perception of service quality. The SERVQUAL model helps identify gaps among expectations and service realities, while correlation analysis shows a significant relationship among participation, leadership, and bureaucratic performance. These results confirm the importance of participation as a determining factor in increasing the government's responsiveness to public needs. (Koeswayo et al., 2024) present an organizational perspective with a focus on measuring stakeholder participation through corporate governance and organizational reputation. Their study shows that an inclusive and transparent leadership style increases employee engagement as well as external participation, which ultimately improves the organization's image and social legitimacy. Measurement is carried out through surveys and company reputation indexes, making participation an intervention variable that strengthens the relationship among leadership and organizational performance.

In the context of local development, (Suryani et al., 2021) used a participatory approach to identify community needs in community-based tourism development. They emphasized that effective participation is not just about being present in forums, but rather about involvement in the planning, implementation, and evaluation processes. Through the method of targeted group discussions and field observations, they succeeded in measuring the contribution of local stakeholders in creating an inclusive and sustainable tourism model. (Hidayat et al., 2024) in a literature review, concluded that the active involvement of stakeholders—especially students and parents—is the main indicator in improving the quality of education. They recommend a participatory approach as a strategy to build a more democratic and responsive education system.

Transformational leadership has been a broad topic of research in the fields of public management and education. One of the popular approaches used to measure it is the European Foundation for Quality Management (EFQM) and Total Quality Management (TQM) models, as applied (Anastasiou & Ntokas, 2024). They use a scale that includes indicators of cooperation, communication, and participatory decision-making to evaluate the effectiveness of leadership in an educational setting. This approach helps identify how leadership styles can improve the

quality of the teaching and learning process and increase the motivation of education staff. (Zhang & Huang, 2024) developed a new instrument called the Low-Carbon Transformational Leadership Scale (LCTL) to measure the role of leadership in sustainable innovation, especially in the context of climate change and carbon emission reduction. This instrument is validated through confirmatory factor analysis, thus providing a valid and reliable measure to assess whether leaders truly support the environmental agenda in a transformational manner. This study opens up new avenues in measuring leadership in the context of global issues such as climate change.

(Conte, 2024) used the Theory of Change approach in the RIGHT Program in the global health sector to map the contribution of leadership to policy transformation. This method helps visualize the relationship among inputs, activities, outputs, and policy impacts, with leadership as one of the key variables. This approach is particularly useful in evaluating the role of leaders in facilitating structural and cultural change in health systems. (Gal-Arieli et al., 2020) used quantitative data from local authorities in Israel to link transformational leadership styles with active involvement in education policy. They found that transformational leadership has a positive influence on coordination among levels of government and community involvement in policymaking. Ly (2025) also uses PLS-SEM to measure the effects of transformational leadership on digital transformation and sustainable development in Cambodia. Their findings suggest that this type of leadership not only accelerates technology adoption, but also creates an adaptive and collaborative organizational culture.

(Ngogi Emmanuel Mahaye, 2025) analyzes the implementation of education policies in South Africa using the Concerns-Based Adoption Model (CBAM) model, which helps identify the level of acceptance and community involvement in education reform. This model measures leadership based on the ability to manage concerns and turn them into active support. (Pillay & Kikasu, 2024) added that servant leadership is an important principle in fair public governance, with indicators such as transparency, accountability, and ethics. Enang et al. (2020) in their systematic review concluded that leadership, public participation, and risk management are interrelated in public service transformation endeavors. Ashok et al. (2021) highlight challenges in the adoption of knowledge

management in the UAE, including resistance to changes in leadership style. Cole (2023) suggests community-based leadership training as a strategy to increase the capacity of leaders in African countries. (Nwafor, 2024) emphasizes the need for inclusive leadership in the integration of gender equality principles in AI policy in Africa. (P. Poudel, 2020) and Jumakir et al. (2021) agree that transformational leadership at the school level has a direct impact on organizational culture, teacher performance, and educational quality. Koeswayo et al. (2024) conclude that democratic leadership styles strengthen the relationship among governance and organizational participation.

B. Stakeholder participation

Stakeholder participation is one of the pillars that ensures that the policies designed are truly inclusive and oriented to the needs of the people. By involving civil society, non-governmental organizations, the private sector, academics, and vulnerable groups, policies will be more representative and easier to implement because they have gained legitimacy from the various parties involved. Zia ud din et al. (2023) found that collaborative governance at the local level is highly effective in improving institutional capacity and public service outcomes in Pakistan. By involving various parties such as civil society, non-governmental organizations, and the private sector, local governments can design policies that are more targeted and relevant to the real needs of the community. The active participation of stakeholders not only increases the legitimacy of public decisions, but also creates a sense of shared ownership of development outcomes. This approach is particularly relevant in the context of developing countries where public trust in government institutions is still low, so participatory mechanisms are needed to build harmonious relationships among state administrators and their citizens.

In the context of public governance, participation and collaboration have become core principles that determine the success of various development programs at the local and national levels. Many recent academic studies have shown that the active involvement of stakeholders from all walks of life—from governments, non-governmental organizations (NGOs), the private sector, to the general public—can significantly improve institutional capacity and the quality of public services. One illustration is research by Zia ud din et al. (2023) in Pakistan, which proves that

collaborative governance models involving various stakeholders have succeeded in improving bureaucratic efficiency and responsiveness to community needs. This study emphasizes the importance of coordination among actors as a foundation for institutional reform. In Africa, (Ogbekene, 2025) describes how freedom of expression and community participation strengthen collaborative governance in water resource management. He underlined that transparent access to information and a safe space for participation can create trust among the community and government agencies, thereby enabling shared solutions to water management challenges. This is in line with the findings of (Silumbwe et al., 2023) in Zambia, who stated that the failure or success of tobacco control policies is strongly influenced by the existence of "principled engagement"—that is, engagement based on the values of equality, transparency, and responsibility. Thus, participation is not just a formality, but must be built from strong moral and political principles. The study of (Abdulai et al., 2024) in Ghana provides another perspective on the importance of collective motivation in the collaborative management of municipal waste infrastructure. His research shows that when citizens feel they have a real role in the decision-making process, they are more likely to support and sustain long term environmental initiatives. Similar findings were also found in the study of (Esposito De Vita et al., 2023) in Mongolia, which evaluated the "3R4UB" initiative in sustainable waste management planning. They found that a participatory approach not only increases the legitimacy of policies, but also broadens the knowledge base used in the formulation of waste reduction strategies.

A paradigm shifts in governance is also happening in Japan, as described (Ishiwatari et al., 2025). They noted the evolution of water management systems from a centralized top-down model to an inclusive model involving local actors, including fishermen, farmers, and environmental groups. This model is designed to improve climate resilience through community-based adaptation. A similar approach is also applied in South Africa, where (Ngogi Emmanuel Mahaye, 2025) found that School Boards involving parents and community leaders are able to improve the quality of education because policies are more in line with the real needs of students and the local environment. Cross-sector collaboration is also the focus of the study (Alfiandri et al., 2024) on Bintan Island, Indonesia. They implement the VUCA (Volatility, Uncertainty, Complexity, Ambiguity)

method to manage mangrove ecotourism through a collaborative approach. The results show that flexibility and inter-agency coordination are key in dealing with complex environmental dynamics. On the other hand, (Gaegane, 2024) highlights the importance of stakeholder involvement in climate-resilient urban development planning in Africa, emphasizing that without the active participation of communities, disaster mitigation plans will be difficult to realize effectively.

In addition, some more literature provides broader insights into how participation can strengthen leadership and policy transformation. (Conte, 2024) in the evaluation of the RIGHT global health program found that the involvement of local and international actors from the early stages is a key factor in the success of health policy transformation. (Pillay & Kikasu, 2024) add that community-involved ministry leadership advises more ethical and responsive governance. Meanwhile, Ashok et al. (2021) in the UAE emphasized the need for participatory structures in knowledge management in public institutions so that organizational innovation and learning can continue to flourish. Poudel (2020) in his study in Nepal showed that successful principals transform their schools by directly engaging teachers and communities, proving that local participation can generate positive change even at the micro level. Gal-Arieli et al. (2020) also agree that local authorities are more effective in implementing education policies if they are supported by inclusive transformational leadership. However, (Nwafor, 2024) provides a sharp critique of the lack of inclusivity in AI policies in Africa, particularly the lack of participation of females as key stakeholders. It serves as a reminder that participation must be inclusive and non-discriminatory to create fair and representative policies. Zhang & Huang (2024) close this analysis with a concept of LCTL that engages stakeholders in driving sustainable innovation. They emphasized that participation is not only about the distribution of power, but also about creating space for new ideas that can answer global challenges such as climate change. Enang et al. (2020) also stated that meaningful public participation is a key leverage factor in the transformation of public services, as it empowers the community to be part of the solution, not just the beneficiaries.

The legitimacy of stakeholder participation is a crucial element in determining the success of collaborative governance, especially in the context of developing countries where power structures are often

unbalanced and institutional capacity is still weak. (Borlinghaus & Nestl, 2018) explain that social legitimacy can serve as a moderator variable that strengthens the relationship among entrepreneurial collaboration and social innovation in Vietnam. In their research, legitimacy was measured through public and institutional perceptions of the legitimacy of an inclusive and transparent decision-making process. The results show that when a collaborative initiative is socially accepted, its effectiveness in generating innovation increases significantly. This proves that legitimacy is not just a formality, but a foundation for sustainability and acceptance of the program by stakeholders. However, (Higham et al., 2024) noted that there is a legitimacy deficit in many multistakeholder partnerships (MSPs), especially in endeavors to achieve the Sustainable Development Goals (SDGs). They concluded that the main causes of low legitimacy were weak institutional design as well as a lack of clear accountability mechanisms. Without a transparent system to evaluate the roles and contributions of each actor, participation can turn purely symbolic, reducing the democratic value of the process. This is a major challenge in developing countries, where governance infrastructure is often not ready to accommodate inclusive and representative participation.

In the context of deliberative participation, (Cho et al., 2025) measured legitimacy through three main indicators: equality of access, inclusivity of participation, and density of collaborative networks. Their study of 12 food policy councils shows that the highest legitimacy is achieved when all stakeholder groups—including smallholders, local producers, and marginalized groups—have equal access to speak and provide input. In addition, a dense and interconnected collaboration network also strengthens legitimacy because it shows coordination and synergy among actors. These findings are relevant to conditions in many developing countries, where elite dominance often hinders the participation of non-traditional actors such as the urban poor or indigenous communities. Rigo et al. (2025) added a new dimension to the measurement of legitimacy by attributing it to the integration of Green Care Initiatives into the health system. They identified legitimacy as one of the four essential governance dimensions, along with transparency, participation, and accountability. Legitimacy is measured through two main aspects: institutional acceptance of health authorities and social acceptance of the general public. Their results show that without support

from these two levels, environmental initiatives aimed at improving mental and physical well-being will be difficult to implement widely. Brown et al. (2024) used a realistic interview approach to evaluate the legitimacy of stakeholder involvement in the impact assessment of extractive industries in Canada. Although the study was conducted in developed countries, the method used—i.e. to dig into the perceptions and direct experiences of people—can be applied in developing countries to assess whether participation is truly meaningful or just formalistic.

Emerson (2020) further highlights how power inequality among stakeholders affects the legitimacy of participation. In her study of global education programs in Africa and Asia, she found that groups with more resources and influence tend to dominate the decision-making process, thus reducing space for weaker groups. He recommends a case-based evaluative approach to assess whether participation is truly inclusive or merely gives the illusion of participation to marginalized groups. Radtke & Renn (2024) also emphasize the importance of compatibility among participatory formats and democratic policy styles in the context of the energy transition. They found that the legitimacy of public participation increased when the methods used were aligned with political culture and societal expectations.

In line with endeavors to increase the legitimacy of participation, it is important to know the most effective collaborative methods in the context of developing countries. Pugel et al. (2020) conducted a Delphi panel to sift through 58 factors of collaboration success and identify eight essential factors in low-income countries, including trust, local ownership, process flexibility, and cultural appropriateness. These factors form the basis for the establishment of a strong and sustainable collaboration mechanism. Silumbwe et al. (2023) show that principled engagement—that is, participation based on the principles of equality, transparency, and responsibility—is an effective method in tobacco control policy formulation in Zambia. This approach successfully integrates various views and interests without sacrificing public health principles. Abdulai et al. (2024) emphasize the importance of collective motivation and mutual action Contract in waste management in Ghana. They found that this method was particularly effective in informal settings, where formal structures were often inadequate. Ogbekene (2025) also states that community participation in water management in Africa is strengthened by freedom

of expression and transparency of information. Meanwhile, Esposito De Vita et al. (2023) demonstrated the success of the 3R4UB project in Mongolia, which uses a design-based participatory approach to manage waste in a circular manner. Alfandri et al. (2024) adapted the VUCA method in managing mangrove ecotourism on Bintan Island, Indonesia. They emphasized that adaptability and mapping of cross-sector actors are key in designing collaborative strategies that are responsive to environmental dynamics.

Cole-Hamilton et al. (2024) evaluated the RIGHT Program and found that cross-country and cross-sectoral collaboration is highly effective in improving the impact of global health policies. Gaegane (2024) concludes that the multi-sector approach is superior to the top-down bureaucratic model in planning climate-resilient urban development in Africa. Ashok et al. (2021) suggest that public sector organizations in the UAE and other countries make internal adaptations to collaborative structures to address institutional inertia. Enang et al. (2020) in their systematic review stated that leadership, participation, and risk management are the main collaborative methods in public service transformation. Cole (2023) emphasizes the importance of engaging youth and educational institutions as part of a community-based collaborative strategy in Africa. Nwafor (2024) criticizes AI strategies in Africa that fail to include vulnerable groups, especially females, as key stakeholders. He called for the need for collaborative methods based on social justice that ensure inclusivity and representation. Zhang & Huang (2024) promote LCTL based on collective vision and strategic cooperation as an innovative approach to addressing climate challenges through cross-sector collaboration.

C. Data and information

Accurate data and information are the basis for making the right decisions. Without valid and up-to-date data, policies tend to be speculative and fail to achieve their targets. Therefore, investment in public information systems, policy research, and policy impact analysis is absolutely necessary to improve the quality of policy planning. Ashok et al. (2021) underscore the structural challenges that often hinder the adoption of knowledge management practices in the public sector of the United Arab Emirates. According to them, the modern bureaucracy must be based on

valid, reliable, and easily accessible data so that the policies formulated can be effective and have a real impact on society. Without quality data, development plans often fail because they are not based on in-depth analysis or realities on the ground. Therefore, investment in data infrastructure, human resource training, and the development of integrated information systems are essential in endeavors to build evidence-based governance

The implementation of e-governance has proven to be one of the key keys in driving economic growth in various countries, especially in the context of developing countries. Research conducted (Noah, 2024) shows that the implementation of the e-government system in ECOWAS countries has a positive impact on both short- and long-term economic growth. This is supported by administrative efficiency, increased transparency, and reduced corruption which directly improves the investment climate and public trust in the government. On the other hand, Evidence-Informed Policy Making (EIPM) is becoming increasingly relevant in designing sustainable and responsive public policies. The (OECD, 2020a) underlines the importance of analytical skills and a culture of data use in decision-making processes, including the need for ongoing training and incentives for policymakers to use evidence in program planning and evaluation. The (OECD, 2022) complements this view by proposing a portfolio approach in the management of public sector innovation, as a strategy to address complex and multidimensional policy challenges. This approach allows for more flexible and adaptive resource allocation, and supports experimentation and risk-based learning.

In the urban context, the concept of smart cities is increasingly closely related to evidence-based decision-making. (Mills et al., 2022) explore how smart city theory can be applied to achieve urban sustainability goals through the integration of data and technology in spatial planning, transportation, and environmental management. (Semyachkov, 2022) added that digitalization and environmental pressures are the two main factors driving the transformation of modern cities toward a smart governance model. He emphasized the importance of collaboration among stakeholders in integrating technological innovation with the principles of sustainability and inclusivity. Big data also plays a crucial role in realizing smart and responsive governance. (Hossin et al., 2023) explained that big data has great potential to be used in four stages

of public policy: agenda setting, policy formulation, implementation, and evaluation. By utilizing big data, the government can make more accurate predictions, design targeted policies, and conduct real-time monitoring and evaluation. This allows for a rapid response to changing social, economic, and environmental conditions. Performance evaluation is an important element in policy reform, especially in the health sector. (Quigley et al., 2023) assessed that evaluative capacity building and community involvement are needed so that research and policy results can be more relevant to the real needs of the community. They recommend strengthening the public participation mechanism at every stage of policy, so that it is not only technically effective but also has a real impact on the quality of life of the community. Overall, technology integration, empirical evidence, and public participation provide a strong foundation for future policy reform and better governance.

Data-driven policy implementation faces some key challenges that are multidimensional, ranging from infrastructure to human resource (HR) capacity. One of the crucial issues is the lack of readiness of information technology infrastructure and the low competence of HRs in managing algorithmic systems. In addition, (Neely et al., 2021) noted that in the Kenyan context, inter-sectoral coordination is still weak, accompanied by a lack of availability of accurate local data, thus hampering evidence-based decision-making processes. (Arman & Patasaka, 2024) added that low public digital literacy and information system fragmentation are significant obstacles to the digital transformation of public services. Structural problems such as unequal access to infrastructure and the limitation of professional personnel were also discovered (Ticona Machaca et al., 2025), who concluded that these conditions exacerbate inequalities in the provide basic services. In Somalia, (Mothupi et al., 2025) highlighted dependence on international donors and weak national policy structures as factors that hinder the prioritization of sustainable health policies.

To overcome these challenges, investment in HR development is a critical element in strengthening the public information system. Ticona Machaca et al. (2025) emphasized the importance of human resource development policies in the health and education sectors as a foundation for equitable access to public services. Neely et al. (2021) show that through cross-actor collaboration and repeated training, institutional change can be achieved, including increased information management

capacity at the local level. (Skubis et al., 2024) offer a human-centric approach in the implementation of AI technology in smart cities, which aims to improve HR competencies to be more adaptive and participatory in using data for decision-making. Thus, strengthening human capacity should be seen as a long-term investment that not only improves administrative efficiency, but also builds an innovative and inclusive work culture.

To effectively integrate data into policy processes, a holistic and adaptive strategy is needed to the local context. Neely et al. (2021) developed a SHARED (Strengthening Human Resources through Analytical and Evidence-Based Decision-making) model designed to support collaborative decision-making in a decentralized environment. This model helps align regional needs with national policy directions through strengthening data analysis and stakeholder participation.

D. Institutional capacity

Institutional capacity must be increased so that policy implementation can be carried out effectively. This capacity includes human resources, budget, technology, and coordination mechanisms among agencies. Without adequate capacity, even if the policy is good in theory, its implementation will be problematic. Gaegane (2024) assesses that many cities in Africa are beginning to integrate sustainability principles in their development planning, but this requires strong institutional capacity support. Institutional capacity includes the organization's ability to formulate policies, manage resources efficiently, and evaluate the impact of each program implemented. The same thing is conveyed by Zia ud din et al. (2023), who emphasize that institutional capacity serves as a key mediator among multistakeholder collaboration and optimal public service outcomes. Without adequate capacity, even the most innovative policies will be difficult to implement effectively.

In the era of globalization and climate change, institutional capacity is one of the crucial factors in the success of environmental policy reform. (Rahman et al., 2024) found that in Bangladesh, weak institutional capacity has led to environmental policy reform endeavors not being able to support the achievement of the SDGs. The low capacity of institutions is reflected in the lack of quality human resources, inadequate administrative infrastructure, and weak inter-agency coordination mechanisms. This

hinders the effective and efficient implementation of environmental policies. Without a strong institutional system, the post-conflict recovery process will be vulnerable to uncertainty and implementation gaps. Therefore, strengthening institutional capacity is a top priority in environmental policy reform to achieve the SDGs targets. The effectiveness of environmental policies is greatly influenced by the quality of strategic planning and coordination among levels of government. (Hensengerth et al., 2024) show that spatial planning in the Mekong Delta region requires legal innovation as well as harmonious cooperation among central and local governments. Legal uncertainty and overlapping authority are often the main obstacles to the implementation of environmental policies in these disaster-prone areas. In addition, (Ansong et al., 2022) highlight challenges in cross-border Marine Spatial Planning in Ireland, where institutional barriers are the main cause of disunity in interstate policy integration. This problem shows that without solid coordination and a shared vision among government actors, environmental policies tend to be out of sync with the realities on the ground and the needs of ecosystems. Thus, capacity building for strategic planning and inter-agency synergy must be the main focus in the formulation of sustainability policies.

Stakeholder participation and perception have an important role in shaping the effectiveness of environmental policies. (Kunwar et al., 2024) researched campus autonomy in Nepal and found that capacity building, governance transparency, and strong coordination are prerequisites for successful institutional management. Although the study focuses on the education sector, the findings are relevant in the context of environmental policy, where the active participation of communities and local stakeholders can increase legitimacy and support for policies. Inclusive participation also ensures that policies are not only designed from the ground up but also by local socio-ecological conditions. Therefore, in the formulation and implementation of environmental policies, it is important to involve all stakeholders, including local governments, civil society organizations, academics, and local communities to create more responsive and inclusive governance.

To respond to the challenges of urbanization and climate change, nature-based solutions (NbS) are increasingly being adopted as an alternative approach to urban development. However, (Yuanita et al., 2025) examined the policy constraints in the implementation of NbS in the

archipelago's capital city and emphasized the need for a strong institutional framework to ensure its sustainability. Without adequate institutional support, NbS often fail in the implementation stage due to lack of coordination, unclear technical standards, and a lack of evaluation mechanisms. (A. Poudel & Adhikari, 2024) also highlight the importance of post-construction institutional management in rural clean water projects in Nepal, where the sustainability of projects is highly dependent on local capacity to manage and maintain the infrastructure that has been built. These findings show that physical infrastructure alone is not enough; A strong institutional infrastructure is also needed to maintain the function and benefits of the project in the long term.

In addition to institutional and infrastructure aspects, community resilience is an important foundation in adapting to climate change. (Lai et al., 2021) found that risk perception and community capacity greatly influence the effectiveness of climate adaptation policies in Taiwan. Communities that have a good understanding of climate threats and are supported by adequate local capacity are better able to respond to the impacts of climate change quickly and appropriately. Conversely, when communities do not have access to information or are not involved in the decision-making process, adaptation policies tend to be ineffective. Therefore, mainstreaming community capacity in climate policy planning must be a priority in the sustainable development agenda. These endeavors include educating the public, strengthening social networks, and providing resources to build local resilience to climate risks.

The use of technology in government and public policy is increasingly becoming the main focus in endeavors to increase institutional capacity. (Casiano Flores et al., 2020) showed that the use of unmanned aerial vehicles (UAVs) in Rwanda can accelerate land administration, providing accurate and efficient spatial data. However, this study also reminds the importance of governance evaluation so that the implementation of technology does not lead to failure or abuse. (Christmann, 2021) added that digital transformation in mineral resource management in Europe requires policy support and strong institutional capacity to bridge the gap among technological innovation and the reality of the field. (Haddad et al., 2022) mentioned that although technology-based transformational innovation has great potential, weaknesses in policy making capacity development are often a major obstacle. This

emphasizes that technology is not an instant solution, but must be supported by an institutional structure that can manage it effectively.

In addition, (Kok et al., 2025) emphasize the need for proto-institutional institutions in Chile's food sector as a bridge among technological developments and policy implementation. The institution serves as a vehicle for policy experimentation and dynamic capacity building that supports the adoption of innovation. (Radošević & Zoretić, 2024) from Croatia noted that the clash among technological experimentation and the need for accountability often limits the space for policy innovation. (Bleda & Krupnik, 2024) complement these findings by arguing that although research and development (R&D) is supported by high technology, the risk of policy failure remains high if there is no institutional capacity for risk mitigation. Thus, the integration of technology in public policy must be accompanied by strengthening institutional capacity, including in the aspects of regulation, risk management, and accountability.

Some empirical cases show that policy implementation failures are often more caused by weak institutional capacity than by the absence of technology or resources. (Woźniak, 2024) notes that innovative public procurement in Poland failed due to a lack of risk analysis, institutional coordination, as well as market support. Although innovative ideas are available, the inability of government agencies to design proper implementation strategies makes the project unsustainable. (Kovacic et al., 2021) found a similar pattern in the energy transition in the informal region of Africa, where weaknesses in local capacity and governance understanding led to programs failing to achieve targets. Hensengerth et al. (2023) also highlight governance challenges in the Mekong Delta spatial plan. Despite being supported by advanced technology and modern infrastructure, institutional fragmentation and low coordination among levels of government hinder policy effectiveness. (Ansong et al., 2022) reported on a similar issue in Marine Spatial Planning in Ireland, where although legal and technological frameworks have been in place, institutional fragmentation remains a barrier to policy integration. These findings prove that without good coordination and adequate institutional capacity, even policies with cutting-edge technological approaches can fail.

In the context of social change and innovation, institutional capacity is a key element that determines the success of policy reform. (Kunwar et

al., 2024) show that campus autonomy in Nepal will only succeed if it is accompanied by increased institutional capacity, including in the aspects of governance and coordination. Without it, reform has the potential to be distorted or not have a significant impact. (A. Poudel & Adhikari, 2024) note that clean water projects in Nepal often fail to function after the construction stage due to weak post-construction capacity, even though basic technologies are already available. This shows that the sustainability of infrastructure projects is highly dependent on the ability of local institutions to manage and maintain the facilities being built. (Lai et al., 2021), add an important perspective on the role of communities in climate adaptation. Their study in Taiwan shows that policy effectiveness is heavily influenced by understanding local risks and capacity. When communities are not engaged or do not have the capacity to respond to climate threats, policies tend to be ineffective. This confirms that institutional capacity is not only related to formal government institutions, but also to the capacity of civil society and non-state actors in supporting policy implementation.

Innovative policy transformation requires a cross-sectoral approach and strong institutional support. (Kok et al., 2025) emphasized the need for liaison institutions in the success of policy innovation in Chile, especially in the context of cross-sectoral collaboration. Kok et al. (2025) also highlight the importance of policy experiments as a means to build dynamic capacity in the agricultural sector. They suggested that the government should focus not only on technology transfer, but also on developing policy experimentation mechanisms that allow institutions to learn from mistakes and adapt approaches according to field conditions. Rahman et al. (2023) reiterate that many policy reforms in Bangladesh have failed to achieve the expected results due to weaknesses in coordination and institutional capacity. Yuanita et al. (2025) report similar challenges in the implementation of NbS in the archipelago's capital city, where the lack of a policy framework and cross-agency coordination are the main causes of implementation barriers.

From the series of studies that have been reviewed, it can be concluded that the success of innovative policies depends heavily on the synergy among technology, institutional capacity, and stakeholder participation. Technology does have great potential in improving the efficiency and effectiveness of policies, but it cannot work alone without strong institutional support. Institutional capacity—whether in the form of

HRs, coordination systems, and transparent governance—is the key foundation in ensuring that policy innovations can be implemented effectively and sustainably. In addition, the active participation of communities and local stakeholders is also needed to ensure that policies are not only designed from the top, but also relevant to the social and environmental realities on the ground.

E. Political commitment

Strong political commitment is a decisive factor in the success of policy transformation. This commitment is reflected in budget allocation, legislative support, and consistency in carrying out the reform agenda. Without political commitment, policies often become unfocused and easily replaced by short-term agendas. Nwafor (2024) underlines that although many African countries have made political statements on the use of AI technology to support gender equality, its implementation is still far from expectations. This shows that there is a gap among policy rhetoric and real action on the ground, which is generally due to weak political commitment. Strong political commitment includes adequate budget allocation, supportive legal and regulatory support, and regular monitoring and evaluation. Without this commitment, an inclusive and sustainable development agenda will be difficult to realize. Therefore, it is important for political leaders to not only voice progressive values but also turn them into concrete actions that have a direct impact on the wider community.

Political commitment is one of the determining factors in the success of public policy reform. (Farsaci, 2024) affirms the same in the context of universal health insurance reform, which requires not only political commitment but also cross-sector coordination to achieve sustainability and effectiveness. Preljevic (2024) provides an empirical illustration from Bosnia and Herzegovina, where despite political rhetoric about integration into the European Union, real action is minimal, proving that political declarations without implementable commitments are not enough. (Steve Thomas, 2024) in the EUPHA scientific session emphasized the importance of political consistency in carrying out health system reforms in various countries, especially in the context of the pandemic and rapid social change.

Several studies show a significant gap among political promises and policy realization on the ground. (Zulu et al., 2025) found that in Zambia,

multiactor participation in climate policy is often hampered by internal political conflicts and a lack of active support from public sector leaders. This causes the expected collaboration to not run optimally. (Esien, 2020) complements these findings by highlighting the weak relations among countries and societies in several Central European countries during the COVID-19 pandemic, which reflects a lack of transparency and accountability in decision-making—a direct result of unsound political commitments. This phenomenon shows that without real political commitment, public policies tend to fail to achieve strategic goals, even in emergency situations.

In the context of governance and institutional capacity, political commitment has a central role in determining the direction and outcome of reform. (Dzulkifli et al., 2023) criticized that many digital transformation policies in developing countries have failed because they are not accompanied by capacity building and long-term political support. This proves that technology alone is not enough if it is not supported by a clear political vision and commitment to execution. (Hasyem et al., 2022) added that bureaucratic reform in Indonesia is often hampered by weak political leadership and internal resistance of the bureaucracy itself, suggesting that political commitment must be accompanied by a good change management strategy. Kovacic et al. (2020) also found that energy transitions in informal regions of Africa are not successful due to a lack of consistent political support and adequate local help.

In the realm of social justice, political commitment is the foundation for the implementation of the principles of inclusivity and equality. Nwafor (2024), although not yet available DOI or full link, said that despite political declarations on AI and gender equality in Africa, the lack of concrete action shows that political commitments are still superficial and more symbolic. The study confirms that without deep and sustained political commitment, social justice issues such as gender equality, minority rights, and resource distribution will not be realized to the fullest.

Within the framework of cross-border reforms, political commitment is needed not only at the national level, but also in regional and global contexts. Kok et al. (2025) show that the advancement of innovative policies in Chile requires proto-institutions and strong political support to function across sectors and regions. Bleda & Krupnik (2024) state that the fail R&D programs is often caused by political indecisiveness

in policy risk management, especially in international collaborative projects. Radošević & Zoretić (2024) discuss the conflict among innovative policy experimentation and the demands of political accountability in Croatia, demonstrating the need for synergy among innovation and political stability. Christmann (2021) emphasizes that mineral resource governance in Europe is only effective if it is supported by strong policy commitments and regional coordination. Rahman et al. (2023) also found that environmental reforms in Bangladesh failed due to a lack of political support in planning and implementation. Preljević (2024) again underlines that the rhetoric of EU integration in Bosnia is not balanced with a real commitment to the implementation of reforms. Thomas & Hansen (2024) close this series of arguments by emphasizing the importance of policy integrity and political continuity in ensuring the sustainability of health system reforms in European countries.

The use of technology in government is increasingly recognized as an effective tool to increase accountability, transparency, and public participation—factors that can ultimately strengthen political commitment to reform. (Shahrose Alam & Dr Anna Nath Ganguly, 2024) show that digital transformation in Bihar, India, through the Bihar Vikas Mission project, has succeeded in increasing citizen engagement and strengthening government accountability, which has an impact on increasing political commitment to government reform. This study proves that when people have easier access to information and services, they become more active in the process of policy oversight, thus putting positive pressure on political elites to act. The (OECD, 2020b), in a study on Lebanon, suggested the importance of an integrated digital strategy to strengthen governance and ensure consistent policy implementation. (Gherghin, 2025) also noted that the digitalization of public services in the European Union has contributed to building public trust, encouraging transparency, and strengthening political support for digital policies. However, (Clarke & Dubois, 2020) emphasize that although initiatives such as open government in Canada use technology to increase transparency, their effectiveness remains dependent on changes in internal political culture. (Marie, 2024) added that political stability and a technology-based legal framework are essential to bridge the development gap in developing countries.

To ensure that political commitment is not only symbolic but also leads to concrete implementation, a systematic and sustainable approach is needed. (Amin et al., 2024) show that administrative reform in Nigeria requires a combination of digital governance, HR training, and strong political leadership to ensure policy stability and consistency. (Khatiri et al., 2025) convey the same in the context of the health system, where strong political leadership, supported by systemic governance and digitalization, is an important prerequisite for achieving universal health coverage. (Kamaruddin & Ikhsan, 2025) highlight the importance of consistent political support and human resource training in maintaining the sustainability of bureaucratic reform in Indonesia. Without a deep commitment from the political elite and investment in the capacity of the civil apparatus, reforms will be prone to stagnation or even regression. Therefore, strategies to strengthen political commitment must include institutional aspects, change management, and periodic evaluation of policy achievements.

Multiactor participation in policy processes is an important mechanism to strengthen political legitimacy and reduce resistance in implementation. Zulu et al. (2025) emphasize that the active participation of stakeholders in Zambia's climate policy has increased political support and accelerated the adoption of mitigation measures. Thomas & Hansen (2024) added that in the context of health reform, cross-border learning and clear alignment of political vision are key to maintaining the momentum of reform. The active participation of civil society, the private sector, and international institutions can create synergies that support political commitments in the long term. In addition, Haddad et al. (2022) suggest the need for broad stakeholder engagement and evidence-based evaluation to maintain political commitment in innovative policies. By involving various parties in the planning, implementation, and evaluation stages, policies will be more responsive to real needs and have a stronger political support base.

Despite many high-profile political declarations and promises of reform, the main challenge remains in the gap among rhetoric and implementation. Preljevic (2024) points out that in Bosnia and Herzegovina, despite strong rhetoric about integration into the European Union, the implementation of reforms is still lagging behind due to the weak real commitment of the political elite. Esien (2020) emphasized that during the

COVID-19 pandemic, a transparent-based collaborative approach can strengthen state-people relations, but this requires a serious political commitment to reform governance structures. Rahman et al. (2023) highlight the importance of policy consistency and budget support as indicators of political commitment in the implementation of environmental reform. Woźniak (2024) criticizes the failinnovative procurement policies in Poland caused by the absence of political support and a lack of understanding of market dynamics. Without political sensitivity to the realities on the ground, innovative policies will find it difficult to survive even if they are supported by cutting-edge technology.

In the context of cross-sectoral reforms, institutional coordination and high-level policy support are crucial elements in ensuring successful implementation. Kok et al. (2025) show that the success of innovation policies in Chile is highly dependent on institutional coordination and a strong high-level political commitment. Radosevic & Zoretic (2024) discuss the tension among the need for policy experimentation and the demands of political accountability in Croatia, suggesting that without a balance among innovation and transparency, policy will be vulnerable to rejection or distortion. Hensengerth et al. (2023) concluded that strong central and local government collaboration strengthens consistency in sustainability policy planning, especially in disaster-prone regions such as the Mekong Delta. Ansong et al. (2022) emphasized that institutional strengthening in marine governance requires cross-border coordination and political support so that policy fragmentation does not occur. Lai et al. (2021) show that community perception and local involvement can be supporting factors in maintaining commitments to climate adaptation, proving that social participation is an important foundation in strengthening political commitments in a sustainable manner.

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POLICY INNOVATION STRATEGIES TO INCREASE CONSERVATION AWARENESS

Mohammad Sofyan Budiarto and Fitriyatus Sholihah

Awareness of the importance of environmental conservation is increasingly a key focus on various global agendas, given the negative impacts of climate change, biodiversity loss, and overexploitation of natural resources. Policy innovation strategies play an important role in driving public awareness and participation. This approach involves a combination of technology, education, and cross-sector collaboration to create sustainable impact. The scientific literature shows that policies involving information technology, economic incentives, and community-based campaigns can significantly increase public awareness of conservation issues.

Technology integration and digitalization play a crucial role in strengthening conservation policies. The use of blockchain in water-intensive industries has been shown to increase the effectiveness of government interventions as well as supply chain awareness toward water conservation, according to (Leng & Hao, 2025). In addition, the use of digital twins in the management of water-energy-food resources shows great potential in increasing urban people's understanding of the relationship among these resources, as revealed (Shehadeh et al., 2025). Digitalization also contributes to the development of green cities by promoting environmentally friendly innovations and increasing public awareness of environmental issues (Li et al., 2024). In addition to technological approaches, citizenship-based educational and social strategies are also important in conservation endeavors. (Maheshwari et al., 2025) propose mandatory conservation training that adopts the principle of defending the country as a form of patriotic approach to create long-term awareness and involve various sectors in the protection of wildlife and its ecosystems.

Active community participation and increased local awareness are also key to the success of conservation programs. Studies in Ghana show that public awareness of the SDGs, especially SDG fourteen on marine

conservation, is still low, so an inclusive and community-based communication strategy is needed (Odoom et al., 2024). The management of conflict use and conservation in the UNESCO Geopark area is a good illustration of a community participatory approach through tourism-aware groups (Sulistyo et al., 2023). In agriculture, innovations such as precision agriculture and the use of sensors for water efficiency are becoming an integral part of sustainable conservation strategies. This approach not only increases productivity, but also maintains the sustainability of natural resources to support food security (Rastogi et al., 2024; Saad Sultan, 2021).

A. Education and Communication Strategy

Education and communication strategies play a crucial role in increasing public awareness of the importance of environmental conservation, especially in the midst of the increasingly urgent threat of ecosystem degradation. Based on more than ten recent international studies (2021–2025), a variety of innovative and contextual approaches have proven effective in educating the public and shaping pro-environmental behaviors. (Loury et al., 2021) show that in Cambodia, the combination of direct education, print media, and social media with an emphasis on local narratives can significantly expand the reach of water conservation messages as well as increase community engagement. A similar approach is also applied in the "One Health" strategy that integrates human, animal, and environmental health issues through digital media, although (Oliveira et al., 2025a) note the need for a more inclusive strategy to reach non-academic audiences.

In Europe, hands-on experience-based approaches in urban biodiversity education have proven effective, such as those carried out by Oliveira et al. (2025) in Portugal, where students are actively involved in biodiversity documentation and the results are published and exhibited to the public. (Lucrezi, 2022) added that understanding local perceptions is very important in designing targeted marine environmental communication strategies, especially for coastal users in Italy. Meanwhile, in Kenya, (Nzau et al., 2022) emphasized the importance of integrating formal, informal, and indigenous knowledge education in shaping positive attitudes toward conservation through participatory forest management.

In the context of higher education, the Project-Based Learning model has succeeded in integrating conservation values into the curriculum, as

implemented (Oliveira et al., 2025b). In the tourism sector, (Pásková et al., 2024) recommend the use of education and communication based on dynamic systems supported by information technology to reduce the impact of water pollution due to tourist activities. More broadly, the concept of cross-generational community planning based on disaster resilient conservation education is an important strategy in encouraging social participation, as identified (Wang & Tsai, 2022).

Cross-country and institutional collaboration is also an effective means of conservation education, as in the case of bilateral cooperation among Austria and Hungary to improve the resilience of native forests to climate change through scientific data-driven campaigns (Szamosvári et al., 2023). Lucrezi (2021) suggested that coastal recreation activities be used as an environmental education platform by conveying messages through visual narratives and inclusive communication strategies. Requena-Mullor et al. (2024) added that for environmental communication to be more socially relevant, an approach that involves non-academic actors and the delivery of messages that are easily understood by the general public is needed. Education and communication aim not only to disseminate information, but also to build emotional connections and collective responsibility toward environmental preservation with the ten processes visualized in figure 11.1.

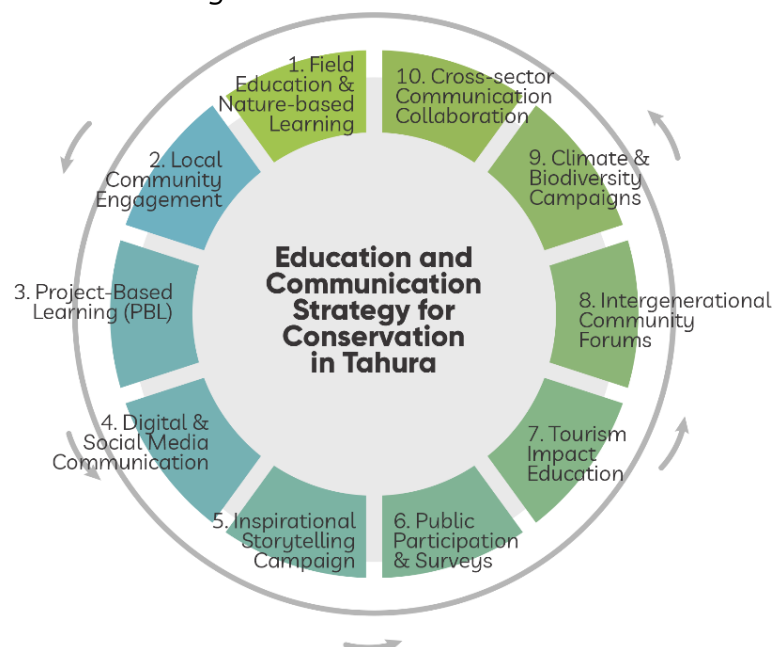


Figure 11.1. Education and Communication Strategy for Conservation in Tahura

Table 11.1. summarize education and communication strategies to increase conservation awareness that can be implemented in the Great Forest Park (Tahura).

Table 11.1. Education and communication strategy for Tahura

No	Strategy	Application Description in Tahura	Reference
1	Field Education and Educational Nature Tourism	Conduct educational tours, observation of flora-fauna and forest school programs.	Loury et al., 2021
2	Local Community Engagement and Indigenous Knowledge	Involve local residents in the role of guides, area guards, or local resource persons.	Nzau et al., 2022
3	Project-Based Learning (PBL)	Collaboration with schools and universities for the Tahura biodiversity documentation project.	Oliveira et al., 2025
4	Digital Communication and social media	Use Instagram, YouTube, or apps to deliver conservation information based on local narratives.	Requena-Mullor et al., 2024
5	Visual Campaigns and Inspirational Stories	Showcasing the stories of forest rangers, volunteers, or community leaders through educational exhibits and posters.	Loury et al., 2021
6	Participatory Surveys and Research	Involve visitors or communities in species monitoring and reporting on ecosystem conditions.	Lucrezi, 2022
7	Education on the Impact of Tourism	Socialization through infographics and open discussions about the impact of visitors on the ecosystem.	Pásová et al., 2023
8	Intergenerational and Climate Resilient Community Forum	Build cross-age learning spaces on conservation, disaster risk mitigation, and sustainability.	Wang & Tsai, 2022
9	Forest Climate Change Adaptation Education	Educational campaign based on data monitoring climate change and its effects on the Tahura ecosystem.	Szamosvári et al., 2023
10	Social Media Integration for Health-Environment Education	Cross-sector collaboration to expand the reach of ecosystem health-based conservation campaigns.	Requena-Mullor et al., 2024

Source: author search, 2025

To support the development of Tahura as an environmental education center based on conservation and community involvement, a well-planned education and communication strategy is needed that can be implemented technically. This strategy must be relevant to local characteristics,

incorporate participatory approaches and information technology, and be able to build awareness across generations. The following table presents the technical implementation steps of various strategies that can be implemented in Tahura based on global good practices.

Table 11.2. Education and Communication Strategy and Technical Implementation in Tahura

Strategy	Technical Implementation Steps in Tahura
Field Education and Educational Nature Tourism	- Create an interpretive trail with information boards.- Train local educational guides.- Organize a "Nature School" program for students and students.
Local Community Engagement	- Form a Tahura Care Community Group (KMPT).- Recruit residents as conservation guides or extension workers.- Involve traditional leaders to explain local wisdom on conservation.
Project-Based Learning (PBL)	- Collaborate with universities for KKN programs or biodiversity research.- Invite students to document flora and fauna and make reports or e-books.
Digital Communication and social media	- Create an official Instagram, YouTube, and TikTok Tahura account.- post-weekly educational content: "Species Facts", "Forest Ranger Stories", etc.- Develop QR codes at tourist sites that are linked to educational videos.
Inspirational Story Campaign	- Record and broadcast the inspiring stories of forest rangers and locals through local TV and social media.- Put up murals or infographics at the main post and entrance to Tahura.
Surveys and Public Participation	- Create a "Citizen Science" program where visitors can report species findings or habitat destruction through the app.- Provide feedback forms for visitors at conservation posts.
Education on the Impact of Tourism	- Put educational infographics in camping, tracking, and tourist post-areas.- Give an "ecotourism briefing" to groups of visitors before entering the forest.
Intergenerational Community Forum	- Hold a monthly "Citizens' Forum" on conservation and climate change issues.- Form cross-age classes, such as the Elderly and Children's Conservation Club.
Climate and Biodiversity Campaign	- Display daily temperature, humidity, and species data boards.- Publish monitoring research results through wall and web newsletters.
Collaboration Communication Among Sectors	- Collaborate with health, education, and tourism agencies to create integrated content (e.g. "Healthy with Forests").- Engage local influencers for public campaigns.

Each strategy in the table above is prepared to be immediately adopted by Tahura managers and their strategic partners (table 11.2.). This

approach emphasizes active community involvement, digital media integration, and local capacity building. This technical implementation also opens up space for collaboration among the government, academia, the private sector, and the community, so that Tahura can double function as a conservation area and a sustainable environmental education center.

To support effective community involvement and education in Tahura, a Standard Operating Procedure (SOP) for Community Involvement and Education was prepared with the aim of ensuring active, structured, and sustainable involvement of the community in conservation activities and ensuring the integration among field activities and environmental conservation values. This SOP includes several main components, namely stakeholder identification through mapping of surrounding community groups such as customary villages, youth, females, and schools; determining the role of the community as local guides, education facilitators, forest supervisors, or research volunteers; as well as recruitment and training standards that consider age, residence, and willingness to engage. In addition, the activity protocol includes a list of participatory activities such as open classes, tree planting, and animal monitoring, with written guidelines to ensure consistent implementation. Ethics and permits are important principles in the Free, Prior and Informed Consent cooperation process, while coordination is carried out through synergy among Tahura management institutions and community representatives in each stage of planning. Each activity must also be fully documented and evaluated through an integrated information system.

In line with the SOPs, the Monitoring and Evaluation Guide (Monev) for the Impact of Education and Community Engagement Programs is designed to assess the effectiveness of the program in increasing awareness, engagement, and change in community behavior toward conservation. The Monev process consists of five stages: planning, implementation, analysis, reporting, and feedback and revision. At the planning stage, success indicators such as the number of participants, increased knowledge, and real community action are determined, and initial data (baseline) is compiled to be a reference. The implementation of Monev is carried out through direct observation, surveys, interviews, and pre- and post-education questionnaires. The results were then analyzed using simple qualitative and quantitative approaches such as scoring and graphs to compare developments over time. Monev results reports are

made periodically (monthly/quarterly) with easy-to-understand data visualizations. The findings are then used to provide feedback to the community and stakeholders and become the basis for program revisions or adjustments if necessary. With these two concepts—the SOP for Community Involvement and Education and the Monitoring and Evaluation Guidelines—it is hoped that Tahura managers and implementing partners will have comprehensive and practical operational documents to carry out education and community involvement programs in a systematic, transparent, and sustainable manner.

B. Strengthening Multi-Party Collaboration

Strengthening multi-stakeholder collaboration is a crucial strategy in environmental conservation, especially in the context of socio-ecological complexity and resource limitations. Based on ten indexed international publications from 2020 onwards, a collaborative approach involving various factors such as governments, local communities, NGOs, academics, and the private sector has been proven to strengthen the effectiveness and legitimacy of conservation programs. An effective collaboration model requires recognition of the equality of actors as well as adaptive social learning approaches, as shown by Hovardas (2021) in the context of collaborative natural resource management (Hovardas, 2021). In marine conservation in Europe, the MarCons network of scientists emphasizes the importance of cross-country and sectoral cooperation to close the gap among science and public policy (Katsanevakis et al., 2020). Similar is also emphasized in the management of Australian islands which requires a collaborative platform across jurisdictions and stakeholders (Kark et al., 2022).

In area-based conservation practices, collaborative communication among actors is often hampered by tensions of meaning and importance. Rice (2022) developed a framework for managing these "dialectical tensions" in African coastal conservation programs (Rice, 2022). In Germany, urban conservation programs involving vulnerable communities prove that the success of collaboration depends on the flexibility of approaches and strengthening local capacity (Kowarik et al., 2025). Collaboration has also been proven to strengthen the preservation of historic buildings in Europe through the integration of digital data and joint decision-making among technocrats, communities, and regional managers

(Resta et al., 2024). Meanwhile, in the context of sustainable fisheries in eastern Indonesia, cross-sectoral collaboration, including international partners and local governments, is seen as essential in addressing marine resource governance challenges (Kobayashi, 2023). A collaborative approach in the field of conservation not only drives efficiency, but also enhances the social legitimacy, environmental justice, and long-term sustainability of the conservation policies or programs implemented.

In strengthening multi-stakeholder collaboration for environmental conservation, there are some challenges and obstacles that often hinder the effectiveness and sustainability of these initiatives. One of the main challenges is power and access inequality (power asymmetry), where dominant actors such as governments or international donors often ignore the voices of local communities or indigenous communities, thus hindering inclusive and equitable social learning in the management of conservation areas (Hovardas, 2021). In addition, differences in goals and values among actors are also significant obstacles; for illustration, the conflict among ecological conservation interests and local economic needs creates dialectical tensions that require a collaborative communication approach that is sensitive to differences in motivation and meaning (Rice, 2022).

The lack of coordination mechanisms and a shared platform further complicates the situation, as the absence of a permanent forum or structure that facilitates the exchange of information and experiences among sectors causes the synchronization of programs to be ineffective, as found in island conservation projects in Australia that failed without a strong cross-jurisdictional coordination system (Kark et al., 2022). On the other hand, the low capacity of local communities—both in access to information, technical skills, and legitimacy—creates inequalities in participation in the decision-making process, especially in collaborative projects such as fisheries management in Maluku (Kobayashi, 2023).

Policy fragmentation and institutional interests are also an important issue, where many conservation policies run sectorally without integration among institutions such as the environment, fisheries, tourism, and forestry, thus triggering overlapping authority and lack of synergy (Katsanevakis et al., 2020). Communication barriers and language differences, both literally and figuratively—such as communication styles or technical terms—also affect understanding and common vision in multinational or cross-community collaborations (Rice, 2022). Finally, the reliance on short-term

funding from specific donors or projects makes it difficult for many collaborative initiatives to sustain after the funding period ends, especially when local institutional capacity is not strong enough to run activities independently (Kowarik et al., 2025).

To ensure the success of conservation and sustainable management in the Great Forest Park (Tahura), a collaborative approach is needed that involves various stakeholders in a structured manner. The implementation of multi-stakeholder collaboration in Tahura must be tailored to the local context, taking into account social values, institutional capacity, and fair participation mechanisms. The following table presents the forms of technical implementation of multi-stakeholder collaboration that can be applied in Tahura based on practices and recommendations from the international literature (table 11.3.).

Table 11.3. Implementation of Multi-Stakeholder Collaboration in Tahura Management

Collaboration Aspects	Implementation Steps in Tahura	Reference
Coordination Structure	- Form a <i>Tahura Collaboration Forum</i> (managers, communities, NGOs, academics, private sector).- Establish a structure and regular meetings.	Kark et al., 2022
Setting Goals and Zones	- Cross-stakeholder deliberations to agree on priority zones and targets for education, tourism, and restoration programs.	Hovardas, 2021
Integrated Collaborative Program	- Implement programs such as <i>Forest School</i> , <i>Participatory Ecotourism</i> , and <i>Species Monitoring</i> with residents and partners.	Kowarik et al., 2025
Communication and Resolution Mechanisms	- Hold a <i>Quarterly Tahura Forum</i> for coordination and discuss conflicts.- Implement protocols of collaboration and participation ethics.	Rice, 2022
Joint Monitoring and Evaluation	- Involve all parties in annual evaluations and measurement of conservation indicators.- Publish results through local and digital media.	Katsanevakis et al., 2020
Local Capacity Support	- Hold technical training for residents and partners related to conservation, facilitation, and ecotourism.- Help access to basic conservation information and equipment.	Kobayashi, 2023

Source: researcher search, 2025

The success of collaboration at Tahura is highly dependent on participatory institutional design, open communication among actors, and the sustainability of the program through joint evaluation. By emulating

successful practices at the global level and adapting them to local conditions, Tahura can become a model of collaborative conservation that is inclusive and has a real impact.

The Tahura Collaboration Forum serves as a strategic forum that brings together various stakeholders to unite visions and actions in effective and inclusive conservation management. Based on international practices and local needs, the forum has some key priorities, namely the preparation of a Joint Action Plan that includes educational programs, habitat restoration, and management of nature tourism in the short to medium term; coordination among actors as a permanent communication space to harmonize cross-sectoral activities such as related agencies, NGOs, local communities, academics, and tourism actors; and resolution of conservation conflicts through participatory dialogue to resolve issues of governance, territorial boundaries, or community access. In addition, strengthening local capacity is a priority by identifying the need for training, facility support, and facilitation for community groups or conservation volunteers. The forum is also tasked with monitoring activities and ensuring accountability for program implementation in a transparent manner to the public.

To maintain the effectiveness and sustainability of collaboration, evaluations must be conducted regularly and participatorily. The practical steps of evaluation at Tahura commence with the determine joint indicators by the forum, such as the number of active partners, the level of community participation, and the number of collaborative programs that have been implemented. Furthermore, surveys and field observations were conducted through interviews or simple questionnaires to program participants—such as residents, guides, and students—as well as collective visits to the activity sites. Evaluations are carried out on a quarterly or semi-monthly basis, where forums gather to discuss achievements, challenges, and adjust strategies if needed. The results of the evaluation are then visualized in the form of infographics or information boards on Tahura posts and social media so that they are easily accessible to the public. Finally, two-way feedback is given the widest possible opportunity for all parties, including local communities, so that evaluation is not only top-down but truly participatory.

As an operational reference, some concrete indicators that can be used to measure the success of the collaboration include: the number of

joint conservation activities per month, the number of local residents who have been trained and participated, an increase in the frequency of educational visits or biodiversity monitoring activities, and the level of satisfaction of collaborative partners with the performance of the forum. Thus, the Tahura Collaboration Forum can continue to develop into a responsive, transparent, and sustainable mechanism in supporting environmental conservation.

To ensure the effectiveness and sustainability of conservation collaboration in Tahura, evaluations must be carried out in a structured manner based on clear, measurable, and trackable indicators on a regular basis. Good evaluation indicators include both quantitative and qualitative aspects, such as the number of active partners in the forum, the level of attendance at regular meetings, and the number of collaborative activities—such as education, research, or restoration—carried out per month. In addition, community empowerment is also an important parameter, for illustration through the percentage of local residents involved as guides, facilitators, or conservation volunteers. The quality of communication among actors can be measured through annual surveys to determine the level of satisfaction of partners with transparency and decision-making processes. The sustainability of the program is marked by the existence of activities that continue to run without dependence on external funds. On the environmental side, the decrease in destructive activities such as encroachment or forest burning, as well as an increase in the area of the restored area, are indicators of the direct impact of these collaborative endeavors.

Community capacity building is the main foundation for the success of this collaboration. Practical steps that can be taken include conservation technical training such as species identification, ecosystem monitoring, early fire extinguishing, and habitat restoration techniques. Communication and education training is also no less important, including fostering residents to become ecotourism guides, nature school facilitators, or local conservation storytellers. Access to information and the provide equipment such as guidebooks, educational videos, GPS, and biodiversity documentation tools will strengthen the community's participatory capacity. In addition, strengthening local institutions such as the establishment and empowerment of the Tahura Care Community Group (KMPT) can increase community coordination and ownership of

conservation programs. Real project-based mentoring, where residents are directly involved in research and restoration activities with academics and NGOs, is an effective way to build capacity gradually and contextually.

Conflicts among stakeholders are a natural dynamic in the collaboration process. To overcome this, mitigation measures need to be carried out systematically and transparently. Identifying the root cause through open dialogue and stakeholder mapping helps to understand the conflict more deeply. Facilitation of dialogue by neutral parties such as academics or independent mediators is essential to create a safe and equal space for discussion. Pre-agreed rules of collaboration forums—such as participation protocols and cooperation ethics—can be used as guidelines in mediation. The outcome of mediation should be well documented and followed by a concrete action plan that clearly divides responsibilities among all parties. A win-win solution approach that accommodates ecological values as well as local economic needs, such as the division of management zones or the compromise area model, is a strategic solution in maintaining harmony among parties. Evaluation of collaboration based on real indicators, comprehensive community capacity building, and participatory and fair conflict resolution, will be the key to the success of the Tahura Collaboration Forum in realizing inclusive, effective, and sustainable conservation management.

Measuring the success of conflict resolution in collaborative forums such as Tahura is not enough to simply observe the loss of tension, but also involves assessing the quality of the mediation process, the implementation of agreements, and the satisfaction and sustainability of long-term outcomes. Based on the practice of conflict evaluation in the context of conservation (as conveyed by Rice, 2022), success indicators can be grouped into five main aspects: process, outcomes, implementation, stakeholder satisfaction, and sustainability. An inclusive process is characterized by the presence of all parties in the mediation meeting and the participation of neutral facilitators that are mutually agreed. The outcome of mediation can be judged from the existence of a written Contract or action document that is solutive and accepted by all parties. Implementation is important to ensure that concrete actions are taken post-Contract, such as the sharing of access to resources or changes to the zoning system. Stakeholder satisfaction can be measured through surveys or discussions that show that the majority of participants feel heard and

treated fairly. On the other hand, sustainability is manifested in the form of non-recurrence of conflicts in the 6–12-month period as well as forums that remain active to communication and coordination.

To apply these measurements practically in the field, several methods can be used. First, an anonymous partner satisfaction questionnaire can be shared with all parties after the mediation session to get impartial input on their perception of the process and outcomes. Second, structured meeting records help track the number of issues that have been successfully resolved and the follow-up that has been implemented. Third, field observations were conducted to identify whether conflicting behaviors—such as unlawful access, encroachment, or boycotts—had decreased post-release. Fourth, in-depth interviews by independent facilitators with key stakeholders provide a richer understanding of the barriers and perceptions of the success of resolutions. Fifth, periodic reporting such as quarterly reports from the forum can record the progress of conflict resolution and implementation in a transparent manner.

For illustration, the success of conflict resolution can be seen when the boundary conflict of the conservation zone is successfully resolved by an Contract among the residents and the officers to install boundary signs together. In the case of local tour guide disputes, the facilitation of the establishment of an official association that regulates the sharing of schedules is tangible evidence of a sustainable solution. Likewise, when the tension among conservation and tourism activities is overcome through a visitor quota system and educational programs that maintain ecological and economic balance. Thus, a holistic and participatory evaluation approach will strengthen the capacity of the Tahura Collaboration Forum in resolving conflicts effectively and sustainably.

Conflict management in community-based conservation collaboration, such as in Tahura, requires systematic and participatory evaluation. The best survey method for conflict evaluation is a combinatorial approach—combining quantitative and qualitative surveys—that can capture the dynamics of perception, satisfaction, and legitimacy of the resolution process. (Allen & Ross, 2024) demonstrated the success of a participatory approach based on community workshops and independent research in resolving conservation conflicts in Fraser Island, Australia. Meanwhile, (Ruano-Chamorro et al., 2022) developed a framework for evaluating procedural justice in conservation, with indicators

such as process transparency, access to decision-making, and equitable conflict facilitation. To ensure citizen participation in evaluations, various studies emphasize the importance of using local media and inclusive formats. For illustration, an interactive serious game in watershed management in Colombia to help citizens understand conflicts and their role in collective planning (Gonzalez et al., 2024). In addition, (Hausner et al., 2021) found that providing informal evaluation spaces through village discussions and citizen involvement in conservation planning strengthens the social legitimacy of national conservation policies in Norway. Preventive measures to prevent future conflicts include: establishing a permanent communication structure, developing a collaborative code of conduct, and strengthening the capacity of community facilitators. (Maldonado Ibarra et al., 2022) emphasized that low citizen understanding of conservation goals can create latent conflicts, which can be prevented by increasing transparency and community-based education. In the context of tourism on Dachen Island, emphasized the importance of identifying the interests of actors from the beginning and providing a sustainable compromise mechanism (Ali & Li, 2024). Long-term evaluations such as those conducted in Scotland show that initial success in conflict mediation can collapse if it is not supported by local leaders, liaison structures among actors, and equitable participation (Cox et al., 2020). The best survey method for evaluating conflict is a combination of quantitative and qualitative instruments developed in a participatory manner. Citizen participation in the evaluation will only be effective if the media, language, and facilitation are adapted to the local context. To prevent conflicts from re-emerging, the Tahura forum needs to have a fixed communication mechanism, strengthen the capacity of community facilitators, and carry out evaluations based on social justice indicators.

Participatory evaluation is an important approach in community-based conservation management because it places communities as active subjects, rather than passive objects. More than ten international scientific publications from 2020 onwards have shown that the success of long-term conservation programs is largely determined by community involvement in assessing, reflecting, and refining policies and programs. Ruano-Chamorro et al. (2021) offer a framework of procedural justice in conservation that emphasizes three main pillars of participatory evaluation: meaningful engagement, process transparency, and

recognition of socio-cultural diversity. Gonzalez et al. (2024) developed a serious game-based approach to watershed management in Colombia to encourage citizens to understand the policy structure and communicate their priorities collectively. Evaluations are carried out by integrating narrative data, interactive decisions, and direct feedback among actors. Similar methods can also be applied in Tahura through conflict mapping and collaborative simulation. (Gao et al., 2025) through a systematic review highlighted the weak involvement of stakeholders in the evaluation stage and suggested the integration of landscape approaches and participatory visual scenarios to bridge conflicts of interest in nature solutions-based conservation projects.

(Peterson St-Laurent et al., 2020) offer an analytic-deliberative framework for natural resource evaluation that combines quantitative analysis with deliberative discussion, allowing communities to deliver assessments that are experience-based, rather than just numbers. This approach has proven effective in assessing the effectiveness of collaborative management in forest and coastal areas. Cox et al. (2020) in a long-term study in Scotland used qualitative and quantitative indicators to assess the sustainability of adaptive co-management in wildlife conservation conflict areas. Evaluations were conducted through serial interviews, perception surveys, and analysis of the sustainability of the actors' networks. Similarly, (Siangulube et al., 2023) show how multi-stakeholder forums in Zambia use participatory evaluation tools to detect participation inequities and encourage gradual improvement of landscape governance structures.

Furthermore, (Smyth et al., 2021) describe how participatory assessment in water research networks in Latin America advises local adaptation through actor mapping, community discussions, and reflective surveys across social and cultural locations. In addition, in the context of the implementation of conservation based on cultural and ecological values, Maldonado Ibarra et al. (2022) found that participatory evaluation methods based on in-depth interviews and social observation can uncover hidden conflicts that are not visible in formal surveys. Hausner et al. (2021) show that community involvement in conservation evaluation through informal forums, customary meetings, and collective reflection can increase local support for conservation in the mountainous regions of Norway. Participatory evaluation methods in conservation have evolved

significantly and are globally recognized as a key approach to ensuring social and ecological sustainability. With the support of more than ten international scientific publications, this approach emphasizes equal dialogue, flexibility of tools, and social validation of program outcomes. At Tahura, this method can be the main foundation for measuring impact and improving conservation collaborative practices in a sustainable manner.

C. Incentive Approach to Conservation

The incentive approach in conservation has become an effective strategy globally to increase community participation in the conservation of protected areas, including community-based ones such as Tahura. More than ten international studies highlight that incentives—both financial and non-financial—can strengthen citizens' commitment to conservation and minimize land use conflicts. One form of incentive that is widely applied is the payment of environmental services (PES). A study by Nunez Godoy et al. (2022) in Argentina showed that the effectiveness of PES is highly dependent on the understanding of landowners and the suitability of compensation values to local needs. A similar thing was also found by Kim et al. (2023) in the context of wetland areas in Korea, which emphasized the need for PES Contract standards that are structured based on two-way preferences: giver and legatee.

Incentives can also be in the form of strengthening community-based ecotourism. Aseres & Sira (2020) prove that most visitors to Bale National Park, Ethiopia, are willing to pay conservation fees to support the sustainability of the area, which can also be diverted as income from local communities. Meanwhile, (Vijulie et al., 2024) exemplify that natural grasslands in Romania are successfully preserved through integration with nature-based tourism that provides economic benefits for villagers. In addition, an environmentally friendly livelihood-based incentive approach was also developed. (He & Jiao, 2023) propose a "conservation-compatible livelihoods" model that integrates conservation management with local economic activities such as organic farming or traditional handicrafts, so that there is a symbiosis among ecological sustainability and social well-being. In India, (Mariyam et al., 2021) found that landowners around national parks are willing to switch to animal-friendly land use if the incentives are relevant, simple, and short-term. For the context of Tahura, an incentive approach can be applied through conservation subsidies for

farmers around the forest. Profit sharing scheme from entrance tickets or nature tourism services. Training and support for ecotourism and agroecological agriculture businesses. In the context of education and youth, (Rana et al., 2024) emphasize the importance of incentives based on local agroecotourism and culinary training that involve the younger generation as future conservation agents. This is in line with the multi-scale approach as studied by Smyth et al. (2021), that social and institutional incentives strengthen integration among conservation and natural resource management in different regions.

Designing conservation incentives in areas such as Tahura faces some structural and social challenges. One of the main challenges is inequality in access and allocation of benefits among local actors, which often leads to distribution inequities and diminishes the legitimacy of incentive schemes. (Coolsaet et al., 2020) show that in various global contexts, conservation incentives often fail if they do not pay attention to the access rights of indigenous peoples or vulnerable groups to resources. (Saengavut & Somswasdi, 2022) also emphasized that people's preferences for the form and duration of incentives vary widely, so uniform designs are at risk of being ineffective. In addition, the complexity of the incentive system also creates institutional challenges. (Khuu et al., 2021) showed that weak inter-agency coordination in Con Dao National Park, Vietnam, led to program overlap and decreased efficiency of conservation incentives. Another problem is the value of incentives that are often not equal to the cost of land opportunities or community labor, as criticized (Tafoya et al., 2020) in the context of ecotourism and PES in Costa Rica.

To measure the effectiveness of ecotourism incentives, the evaluation needs to be carried out multidimensionally, involving ecological, social, and economic indicators. For illustration, Arias-Arévalo et al. (2025) developed an evaluation framework based on three values: instrumental (economic), relational (social bonds), and intrinsic (concern for nature), which have been shown to reinforce each other when evaluated participatively in Colombia. Quantitative evaluation can also be carried out through the analysis of land cover change, citizen participation rates, and local economic acceptance, as applied in the Theory of Change-based PES evaluation model (Cerveira et al., 2024). Another important question is whether financial and non-financial incentives can be integrated. The answer: yes. Some studies even suggest that the integration of the two improves conservation

sustainability. (Arias-Arévalo et al., 2025) state that citizens often remain conservationists even without pay, because their intrinsic value and social connection with nature are stronger than financial incentives. This approach is also supported (He & Jiao, 2023), who developed the concept of conservation-compatible livelihoods, which are livelihoods that are designed in harmony with local ecological and cultural values. Practically, the integration of incentives in Tahura can be in the form of: (1) payment or profit sharing from tourism; (2) social recognition such as local awards; (3) access to training and markets for environmentally friendly products; and (4) participation in governance as a form of non-material incentive.

The integration of incentives in field conservation practices has been shown to strengthen collaboration among area managers, local communities, and tourists. A successful integrative illustration is the scheme of sharing the proceeds of ecotourism with the communities around the protected area. As Guerrero-Moreno & Oliveira-Junior (2024) shows, many community-based ecotourism initiatives (CBETs) in the tropics combine financial incentives (from tickets and tour services) with non-financial incentives such as training, social recognition, and participation in local governance. This approach is also found in Katon-Karagay National Park in Kazakhstan, where the management of tourist visits based on conservation zones is complemented by social incentives in the form of ecotourism service business opportunities provided only to villagers around the park. Integration is also carried out through a small business-based environmental compensation mechanism. In some national parks in China, local tourism actors are provided with training for the development of eco-friendly cultural products and services, as a form of non-financial incentive that strengthens the economic and ecological sustainability of communities around the region (Wan et al., 2025). Meanwhile, (Guo et al., 2023) stated that forms of incentives that prioritize citizens' autonomy in determining conservation based economic activities are more acceptable than direct cash help.

To measure the effectiveness of ecotourism incentives, the most relevant metrics are a combination of ecological, social, and economic indicators. Ecologically, effectiveness can be measured through reduced pressure on the area, increased vegetation cover, or protection of key species. Socially, the metrics used include community participation in ecotourism programs, satisfaction of local actors, perception of benefits,

and sustainability of community relations with park managers (Guerrero-Moreno & Oliveira-Junior, 2024). From the economic side, the indicators that are often used are increasing household income from ecotourism, diversifying livelihoods, and distributing profits fairly (Tafoya et al., 2020). (Aktymbayeva et al., 2023) also emphasized the importance of calculating tourism carrying capacity as a spatial metric that determines the extent to which an area can receive visits without damaging its ecological function. In a large bibliometric study, (Das et al., 2025) showed that cross-sectoral indicators—such as the linkage of ecotourism to the SDGs, tourism carbon emissions, and local institutional capacity—are starting to be widely used as more metrics in assessing the success of incentivized ecotourism programs.

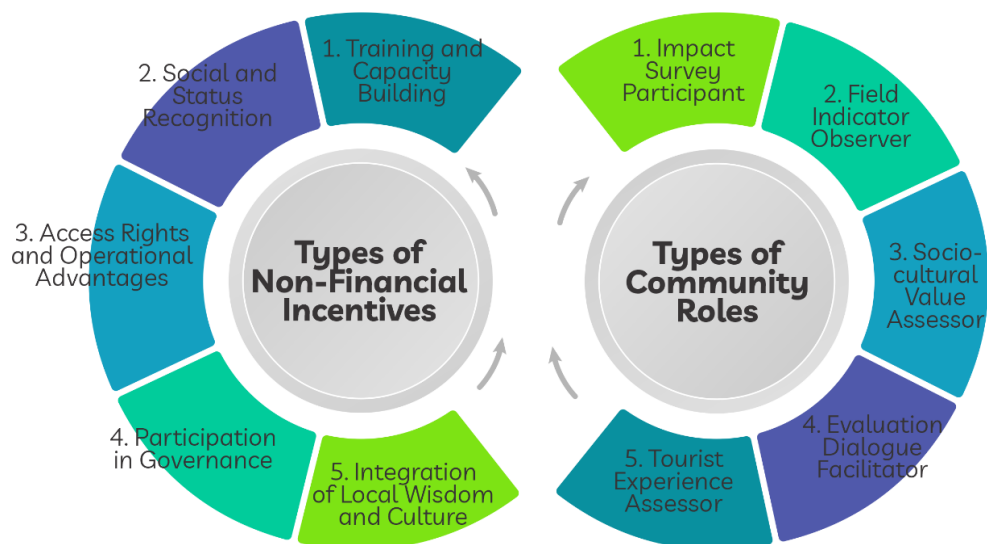


Figure 11.2. Types of Non-Financial Incentives and Types of Community Roles

To create a sustainable ecotourism-based conservation system in Tahura, incentives do not always have to be in the form of financial support. Various international studies confirm that non-financial incentives such as social recognition, training, or access to decision-making also have a significant impact on encouraging community engagement. In addition, local communities have a strategic role in evaluating the impact of ecotourism on social and environmental welfare. Non-financial incentives, the role of communities in evaluations, as well as methods for measuring community satisfaction are visualized in figure 11.2.

Table 11.4. describes non-financial incentives, the role of the community in evaluation, as well as methods to measure community satisfaction and is related to the Type of Community Role in Tahura which explains the form of involvement in evaluation. Non-financial incentives such as training, social recognition, and access to decision-making can increase citizens' sense of ownership of conservation ecotourism. The community also has an important role to play in assessing the impact and determining indicators of program success, especially if the evaluation method is adapted to the local culture. Citizen satisfaction measurement is not only carried out through quantitative surveys, but also through qualitative approaches such as discussions and social mapping. This integrated approach allows Tahura management to align conservation goals with community expectations in a fair and sustainable manner.

Community participation in Tahura can be manifested in tangible forms that not only increase conservation effectiveness, but also strengthen the social and economic involvement of local communities. One of the main forms of participation is the active involvement of communities in planning and decision-making related to zoning, ecotourism regulations, and conservation policies through annual deliberative or consultative forums—an approach that has been successfully implemented in protected forest areas in China (Wan et al., 2025). In addition, the community can participate in ecotourism management and environmental education by becoming tour guides, homestay managers, local culinary presenters, and facilitators of the "nature school" program. This practice has shown success in Kazakhstan and Colombia, where citizen involvement in the tourism sector increases a sense of ownership as well as local income (Aktymbayeva et al., 2023; Guerrero-Moreno & Oliveira-Junior, 2024). Another form of participation that is no less important is contribution to conservation monitoring and evaluation. With the right training, communities can be engaged in monitoring biodiversity, habitat conditions, or the impact of tourism activities using simple methods or participatory digital applications—as has been implemented in community forest monitoring systems in Latin America and Southeast Asia (Cerveira et al., 2024). On the economic side, strengthening environmentally friendly local products such as handicrafts, traditional foods, or tourism services promoted as part of Tahura's identity can provide added value for the community while supporting regional branding. This model has been

successfully applied in the agroecological regions of Eastern Europe (Das et al., 2025).

Table 11.4. Non-Financial Incentives, Community Evaluation, and Satisfaction Measurement in Conservation Ecotourism

Types of Non-Financial Incentives	Practical Illustrations	Reference
Training and Capacity Building	Ecotourism training for village youth and residents as local guides	Guerrero-Moreno & Oliveira-Junior, 2024
	Training in eco-friendly tourism products and local conservation knowledge	Smyth et al., 2021
Social Recognition and Status	Granting of a certificate or title of "conservation volunteer" from the area manager	Guo et al., 2023
	Invitation as a resource person or facilitator of ecotourism training	Cerveira et al., 2024
Access Rights and Operational Advantages	Priority as a local tour operator (guide, transportation, service provider)	Arias-Arévalo et al., 2025
	Community-exclusive access to specific zones in tourist areas	Aktymbayeva et al., 2023
Participation in Governance	Citizen involvement in the preparation of conservation zoning and tourism plans	Wan et al., 2025
	Voting rights in area management forums or conservation working groups	Wan et al., 2025
Integration of Local and Cultural Wisdom	Transfer of traditional knowledge into ecotourism interpretation programs	Wan et al., 2025
	Support for branding local products as part of the area's conservation identity	Das et al., 2025
Impact Survey Participants	Fill out surveys related to the social, economic, and ecological impact of ecotourism on daily life	Guo et al., 2023
Field Indicator Observer	Monitor local indicators such as the presence of animals, tourist waste, or visitor volume	Das et al., 2025
Socio-Cultural Value Assessor	Convey important local values (such as a sense of security, community, and social comfort) in the form of local indicators	Arias-Arévalo et al., 2025
Evaluation Dialogue Facilitator	Be part of a community team that facilitates public discussion and decision-making based on evaluation results	Smyth et al., 2021
Traveler Experience Assessor	- Provide an assessment of tourist behavior and its impact from the perspective of the host community	Guerrero-Moreno, 2024

Not to forget, the social and cultural role of indigenous leaders or elders in conservation education is an important means to integrate traditional knowledge with modern science. They can be resource persons in trainings, conservation festivals, or more meaningful educational programs locally, such as cultural value-based conservation models in China and Latin America (Wan et al., 2025). Overall, the active participation of the community in planning, ecotourism, environmental monitoring, creative economy development, and strengthening cultural identity is a strong foundation for inclusive, sustainable, and community-based management of Tahura.

Community participation in Tahura, although it is the key to the success of conservation management, cannot be separated from various structural and social challenges that can reduce its effectiveness. One of the main barriers is inequality of access and representation, where participation is often dominated by certain groups such as village leaders or active tourism actors, while females, youth, or indigenous groups tend to be marginalized—a dynamic that also occurs in many community-based protected areas globally (Guo et al., 2023). In addition, the low technical capacity and organization of citizens causes participation to be only symbolic without substantial contribution, especially if the community does not understand the concepts of conservation, biodiversity monitoring techniques, or ecotourism management (Smyth et al., 2021). Without adequate training and capacity building, community involvement is difficult to develop into meaningful participation.

Another challenge is the lack of real and sustainable incentives for communities to be actively engaged. As noted by Cerveira et al. (2024), community involvement will be stronger if it is accompanied by concrete benefits, both in the form of direct economy and social recognition of their role in environmental conservation. The lack of a two-way feedback mechanism is also an important issue, as participation is often one-way, with the community only as a recipient of information or an implementer of activities with no space to provide input or evaluate results (Wan et al., 2025). Unclear roles and authority in the decision-making process further complicates the situation, so participation risks becoming a mere administrative formality with no real impact (Wang & Xie, 2025). On the other hand, the tension among conservation values and the needs of the local economy is also a significant hindrance. Communities often view

conservation as a restriction on access to resources that have been their livelihood, such as the prohibition of forest encroachment or infrastructure development (Aktymbayeva et al., 2023). Therefore, a more inclusive, socially just, and capacity building approach is needed so that community participation in Tahura can be truly meaningful, sustainable, and support the goal of environmental conservation holistically.

The integration of economic value with conservation in Tahura is a strategic approach that not only strengthens environmental conservation endeavors, but also improves the welfare of the surrounding community. By making conservation a source of economic benefits, the community has a real incentive to participate in the protection of the area. One of the main strategies is the development of community-based ecotourism, where residents become the main actors in the provide guide services, homestays, local culinary, and handicraft sales. As Guerrero-Moreno & Oliveira-Junior (2024) demonstrate, the active participation of communities in the ecotourism chain creates a direct link among ecological success and economic well-being. In Kazakhstan, the exclusivity model is implemented by granting tourism management rights only to local residents, thus reinforcing a sense of ownership and responsibility for the region (Aktymbayeva et al., 2023).

In addition, the development of productive businesses that are in line with conservation principles such as agroecology, sustainable fisheries, and the use of non-timber forest products (NTFPs) are also important means of integrating the economy and conservation. This approach is referred to by He & Jiao (2023) as conservation-compatible livelihoods, which are lifestyles that not only support the community's economy, but also reduce pressure on protected ecosystems. Strengthening the local economy through institutional incentive schemes—such as the distribution of confession proceeds to the community, conservation scholarships for farmers' children, or marketing local products labeled "Tahura conservation products"—can also increase the relevance of conservation in people's daily lives. Furthermore, Arias-Arévalo et al. (2025) emphasize that in addition to market value, recognition of relational economic value—the meaningful relationship among humans and nature—is essential in building sustainable community engagement. With a combination of strengthening community ecotourism, developing environmentally friendly businesses, and inclusive incentive mechanisms, the integration of

economic and conservation values in Tahura can create synergy among ecological sustainability and social welfare in the long-term.

Studies have shown that the success of community-based ecotourism (CBET) in various countries not only has a positive impact on environmental conservation, but is also able to improve the socio-economic well-being of local communities. One illustration is the CBET program at Bhitarkanika Wildlife Sanctuary, India, which has succeeded in strengthening citizens' participation in mangrove conservation through their role as tour guides, boat managers, and environmental educators, while increasing community income (Patita Paban Mohanty et al., 2024). In the Aksu-Zhabagly Nature Reserve, Kazakhstan, the integration among biodiversity and local culture in village ecotourism was successfully implemented with the support of a SWOT analysis for institutional strengthening and active participation of the community in tourism management and education (Akbar et al., 2022).

Another prominent illustration is the Gornje Podunavlje Reserve in Serbia, where the participation of local communities and educators in nature education pathways helps to reduce pressure on ecosystems while increasing visitor awareness of the importance of conservation (Stojanović et al., 2021). Meanwhile, in Katun Karagay National Park, Kazakhstan, granting villagers exclusive rights to manage tourism services contributes to reducing encroachment activities and strengthening local social and economic relations (Aktymbayeva et al., 2023). In the context of agrarian reform, COPA Protected Areas in South Africa shows how community management models create a system of conservation governance based on justice and legal ownership by local communities (Mthimkhulu & Nel, 2024).

Other international experiences include national park management in China adapting global practices to build inclusive and social incentive-based national systems (Kong et al., 2025). In Indonesia itself, Kalibiru Village is a successful illustration of the transformation of production forests into community-managed forest-based tourist destinations with real economic benefits (Wiyono et al., 2020), while Bukit Tigapuluh National Park displays the active role of indigenous peoples in conservation, visitor education, and protection of endangered animals (Musadad et al., 2022). From these various cases, it can be concluded that the success of community ecotourism depends on the active involvement of the community in the entire process—from planning, operational, to

evaluation—as well as the recognition of local management rights and cultural values. These findings provide a solid basis for the development of a similar model in Tahura, with an adaptive, inclusive approach that focuses on the unique potential of local communities.

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Chapter 12

POLICY TRANSFORMATION MODEL AT TAHURA R. SOERJO

Amir HT and Andjar Prasetyo

Policy transformation in conservation areas such as Tahura R. Soerjo is a strategic urgency to answer the challenges of ecosystem sustainability and local community empowerment. Spatial analysis (Li et al., 2021), the study of participatory governance (Zhang et al., 2023), as well as the critique of symbolic conservation raised (Angelstam et al., 2021), policy transformation must be rooted in empirical data, local socio-ecological contexts, and strong institutional synergy. The implementation of this transformation should ideally be carried out through collaboration across actors, including central and regional governments, regional managers, local communities, academics, and environmental NGOs. The Triple Helix Twin model proposed (Gebhardt et al., 2022) demonstrates the effectiveness of the involvement of government, academic, and civil society actors in designing and evaluating inclusive and adaptive conservation policies.

The importance of this policy transformation is based on several key factors: first, to address the conflict among conservation goals and people's livelihood needs as identified by (B. Wang et al., 2023); second, increasing the effectiveness of conservation areas through participatory and adaptive governance approaches; third, overcoming structural inequality in access and control of natural resources so that the phenomenon of paper parks in areas that are administratively protected but without real ecosystem protection does not occur (Angelstam et al., 2021). As an operational guide, a policy transformation roadmap needs to include a map of actors and their level of influence (Magessa & Hockley, 2023), specific objectives such as increasing community participation or restoration of ecosystem function, implementation time frames, and measurable indicators of success. Global case studies such as the transformation of national parks in Germany (Gebhardt et al., 2022) and community-based conservation in

Costa Rica (Castro-Arce & Vanclay, 2020) provide important lessons regarding institutional models and dynamics of local participation. In addition, spatial studies and landscape changes such as those conducted (Li et al., 2021) and (Young et al., 2020) are needed as a basis for decision-making. The complex dynamics of local and global governance must also be considered as reviewed (Zhang et al., 2023), so that new policies are able to embrace local aspirations while being aligned with global conservation standards.

A. Short-, Medium-, and Long-Term Policy Actions

Policy transformation in conservation areas such as Tahura R. Soerjo requires a well-planned gradual approach, covering the short, medium, and long term, and supported by lessons learned from global studies (table 12.1.). In the short term (1–2 years), the top priority is the comprehensive identification of problems, the consolidation of key actors, and the initial improvement of regional governance. This effort can commence through updating spatial data to design evidence-based policies (Hernandez et al., 2021), followed by an audit of existing policies and an analysis of institutional gaps in ecosystem service management (Nepal et al., 2025). The active participation of local communities and stakeholders is crucial from the early stages, for illustration through the Deliberative-Delphi method (Alberts et al., 2025) to build consensus and social legitimacy. In addition, it is necessary to adjust the governance system based on the organization-user-manager model (Yirga Ayele et al., 2022), as well as an initial study of ecosystem connectivity among protected areas according to the Post-2020 Global Biodiversity Framework target (Lemieux et al., 2022). In the medium term (3–5 years), the focus shifts to the implementation of institutional reforms and strengthening the capacity of local managers. One important strategy is the integration of conservation policies with regional spatial planning through spatial evaluation and ecological-economic zoning (Daunt et al., 2021). The capacity of local institutions must be strengthened by the national roadmap for conservation (Alberts et al., 2025), to be able to manage ecosystems independently and sustainably. The development of conservation models based on local cultural rights and values, such as Indigenous Protected and Conserved Areas (IPCA), also needs to be encouraged as a form of recognition of traditional ownership of land and resources (Tran et al.,

2020). On the funding side, reform of incentive mechanisms and collaborative financing is needed to support the sustainability of conservation programs (Lemieux et al., 2022).

Table 12.1. Short-, Medium-, and Long-Term Policy Actions

Metric	Description	Source
<i>Focus: Initial assessment, stakeholder engagement, and basic governance reforms.</i>		
Stakeholder engagement index	The percentage of key actors (government, communities, NGOs) actively involved in planning	(Alberts et al., 2025)
Up-to-date ecosystem maps available	Complete spatial data on forest cover, biodiversity, and threats	(Hernandez et al., 2021)
Policy audit report completed	Number of outdated or conflicting regulations successfully identified	(Nepal et al., 2025)
Local community participation	Percentage of locals engaged in park dialogues or forums	(Yirga Ayele et al., 2022)
<i>Focus: Implementation of institutional structures, capacity building, and integration of spatial policies.</i>		
Institutional capacity score	Number of trained staff and speed of response of institutions on conservation issues	(Alberts et al., 2025)
Policy integration index	The level of integration of conservation objectives into regional spatial plans	(Daunt et al., 2021)
Conservation funding ratio	The amount of conservation funds successfully raised compared to the base year	(Lemieux et al., 2022)
Level of legal harmonization	Number of sectoral regulations successfully harmonized	(Nepal et al., 2025)
Inclusive governance index	The existence of a legal framework that recognizes the rights of communities or customs	(Tran et al., 2020)
<i>Focus: Measurable ecological impacts, community well-being, and institutional resilience.</i>		
Ecosystem health index	Forest cover quality, ecological connectivity, and water quality	(Cardona et al., 2022)
Biodiversity performance	Number of priority species or habitats that show increased populations	(Lemieux et al., 2022)
Livelihood benefit index	Percentage of household income from conservation-based activities	(Tran et al., 2020)
Institutional resilience index	Ability of the institution to deal with disasters, conflicts, or land pressures	(Lemieux et al., 2022)
Restoration success rate	Percentage of damaged land that has been ecologically restored	(Cardona et al., 2022)

Source: researcher analysis, 2025

In the long term (6–10 years), the main goal of transformation is the achievement of socio-ecological resilience through cross-border ecological

connectivity and large-scale landscape restoration (Cardona et al., 2022). In this phase, adaptive and community-based management systems need to become the new norm, with a gradual transition from a top-down to participatory model (Tran et al., 2020). Periodic evaluation of policy effectiveness is essential using the Aichi Target and Post-2020 Global Biodiversity Goals indicators (Cardona et al., 2022), so that policy responses remain relevant and responsive to environmental dynamics. Synergies among conservation and local economic development should also be strengthened, where participatory strategies are used to bridge ecological interests and community well-being (Nepal et al., 2025). Inclusive and innovative cross-sectoral collaboration, as exemplified (Lemieux et al., 2022), will be the foundation for sustainable and equitable institutional transformation.

The management of conservation areas requires a framework that can assess the effectiveness of the program as a whole—both from ecological, governance, and socio-economic aspects. The table above provides a comprehensive overview of the metrics that can be used to evaluate conservation area management in three main phases: (1) initial assessment, stakeholder engagement, and basic governance reform; (2) implementation of institutional structure, capacity building, and spatial policy integration; and (3) measurable ecological impacts, community welfare, and institutional resilience. Each of these metrics has an important role in providing impartial information for periodic planning and evaluation.

In the initial assessment and participation phase, indicators such as the stakeholder engagement index become particularly relevant. (Alberts et al., 2025) explain that the percentage of key actors—such as local governments, environmental NGOs, and local communities—involved in the planning process is an important parameter in assessing the level of inclusiveness of regional management. Without the active participation of all parties, conservation policies tend to fail due to a lack of legitimacy from below. In addition, the availability of up-to-date ecosystem maps is also an important requirement in identifying forest cover conditions, biodiversity, and potential threats such as deforestation or land conversion. (Hernandez et al., 2021) found that complete and accurate spatial data are helpful in designing restoration and environmental risk mitigation strategies.

Furthermore, the completed policy audit report is one of the important indicators in evaluating whether existing regulations are in line

with sustainability principles and do not contradict each other. Nepal et al. (2025) note that there are many cases where conservation policies fail due to overlapping sectoral regulations. Therefore, the number of outdated or inconsistent regulations can be a parameter for recommending governance reform. As a supporter of direct community participation, the percentage of local population involved in park forums or dialogues (Ayele et al., 2022) is also an important indicator to assess whether conservation areas are managed in a participatory manner or are still top-down.

In the phase of institutional structure implementation and policy integration, the institutional capacity score is one of the parameters that shows the ability of management institutions to respond quickly and appropriately to conservation issues. Alberts et al. (2024) found that the number of staff who have undergone technical and socio-ecological training has a positive relationship with the responsiveness of the institution to field dynamics. In addition, the policy integration index that measures the level of synchronization among conservation goals and regional spatial plans is key in preventing land use conflicts. Daunt et al. (2021) emphasized that without this integration, conservation areas are often victims of the pressure of infrastructure development and agricultural expansion.

In the context of funding, the conservation funding ratio that describes the amount of funds successfully raised compared to the base year is an important parameter in assessing an institution's commitment to natural resource conservation. Lemieux et al. (2022) found that stability and increased conservation budgets contribute greatly to the success of habitat restoration and protection programs. In addition, the level of legal harmonization —i.e. the number of sectoral regulations that have been successfully harmonized—is an important indicator in ensuring that the legal system does not become an obstacle to the implementation of conservation policies. Nepal et al. (2025) suggest that any regulatory revision be carried out collaboratively with stakeholders to increase legitimacy and compliance.

In the dimensions of rights and participation, the inclusive governance index is a parameter to evaluate whether the legal framework has recognized the rights of indigenous and local peoples in the management of natural resources. Tran et al. (2020) found that formal recognition of traditional rights is not only a matter of distributive justice, but also a

matter of management effectiveness. With legal recognition, the community is more motivated to participate in conservation endeavors.

In the impact evaluation phase, the ecosystem health index is the main parameter to assess the quality of forest cover, ecological connectivity, and water quality. Cano Cardona et al. (2022) found that periodic measurements of ecosystems are essential for detecting early changes that could disrupt environmental stability. In addition, biodiversity performance—which measures the number of priority species or habitats that show population increase—is an important indicator in assessing the effectiveness of *in situ* conservation programs. Lemieux et al. (2022) added that monitoring key species could be an early warning system for broader environmental changes.

From the socio-economic side, the livelihood benefit index, which describes the percentage of household income from conservation-based activities, is an important parameter in assessing whether conservation areas provide real economic benefits to the surrounding community. Tran et al. (2020) found that access to ecotourism markets, environmentally friendly products, or ecological incentive schemes is very helpful in improving people's welfare while maintaining ecosystem sustainability. On the institutional side, the institutional resilience index which measures the ability of institutions to deal with disasters, conflicts, or land pressures is an important indicator to assess the adaptability and sustainability of the managing organization. Beazley et al. (2022) emphasized that institutions that have quick response mechanisms and good crisis management systems tend to be more stable in the face of external challenges.

Finally, the restoration success rate, which measures the percentage of degraded land that has been ecologically restored, is an important parameter in assessing the direct impact of a rehabilitation program. Cano Cardona et al. (2022) found that a combination of technical approaches and community participation is a key factor in increasing the success rate of ecosystem restoration.

The metrics presented in this table provide a systematic and multidimensional framework in assessing the effectiveness of conservation area management. By using measurable, transparent, and participatory indicators, the monitoring and evaluation process is not only a tool to measure success, but also a means to improve the quality of policies, strengthen the legitimacy of management, and ensure that conservation

areas provide sustainable benefits to both the environment and the community. The implementation of this metric in Indonesia, especially in regional management such as Tahura R. Soerjo, will be very relevant in bridging local aspirations with global standards of environmental management.

B. Institutional Strengthening and Capacity Building

Sustainability transformation in conservation areas such as the R. Soerjo Forest Park (Tahura) requires a more holistic, adaptive, and participatory approach. In the midst of external pressures in the form of climate change, land use conflicts, and socio-economic dynamics of the surrounding community, the management of conservation areas can no longer depend solely on a technocratic approach. Instead, institutional strengthening and capacity building are the two key foundations to ensure that protected areas are not only legally protected, but also managed effectively and inclusively by various management actors.

First, institutional strengthening is an important element in improving the coherence and effectiveness of conservation area governance. One of the main challenges in the management of protected areas is policy fragmentation and overlapping authority among institutions. This leads to inefficiencies in program implementation, uncertainty about local communities' access rights, and low legitimacy of the directly affected parties. (Quiroz-Ibarra et al., 2020) found that strengthening the coordination function among institutions is key to overcoming these problems, as it can create synergy among various levels of government and stakeholders. Without strong coordination, management plans often conflict with the realities on the ground, especially in the context of areas where ecological values and human activities overlap.

In addition, local leadership and the level of trust among actors are the foundation for an effective collaborative model. (Orozco-Quintero et al., 2020) show that in developed countries such as Canada, the active involvement of local community leaders is helpful in building harmonious working relationships among the state and civil society. In the Indonesian context, this is especially relevant in the management of conservation areas that have administrative boundaries with customary territories or traditional communities. The coevolutionary governance model developed (Jones & Long, 2021) provides a new perspective on how protected area

governance should be flexible and responsive to ever-evolving socio-ecological dynamics. This type of governance combines the principles of multi-level and participatory governance, so that national policies are not simply "relegated" to the regions, but are also adapted according to local conditions.

Rights-based institutional reforms are also gaining momentum as a way to increase the formal legitimacy of the role of indigenous communities and groups in the natural resource management process. (Larsen & Chanthavisouk, 2024) emphasized that the recognition of the rights of local communities is not only a matter of distributive justice, but also of the effectiveness of environmental management. When people feel they have rights to land, water, and other resources, they are more likely to actively participate in conservation endeavors. This is also in line with the principle of FPIC (Free, Prior and Informed Consent) which has become a benchmark in participatory management practices in many developing countries. Second, increasing individual and institutional capacity is an inseparable aspect of sustainability transformation. The capacity of local communities can be strengthened through training and education based on local ecology and culture. Quiroz-Ibarra et al. (2020) show that this approach is effective in creating awareness and skills relevant to the context of area management, including in environmental monitoring, waste management, and human-wildlife conflict mitigation. In addition, increasing the capacity of local apparatus, such as field officers, sub-district heads, or village heads, has also been shown to improve the implementation of FPIC principles better (Larsen & Chanthavisouk, 2024). This capacity is not only technical, but also includes the ability to dialogue, negotiate, and manage conflicts peacefully.

Diversification of institutional incentives—both economically, legally, and socially—has been shown to be positively correlated with the effectiveness of protected area management, both land and sea (Jones et al., 2024). Economic incentives such as market access for ecotourism products, sharing of conservation products, or REDD+ schemes can be a powerful motivation for communities to be actively involved in conservation endeavors. Meanwhile, legal incentives such as the legalization of traditional land claims or natural resource management permits can provide a sense of security and certainty to the community. At the policy level, the integration of these incentives in the RPJMD or RKPD

document is very important so that it does not become a partial program that is easily lost with the change of leadership period.

Multi-actor and cross-sectoral capacity building is also very important to address the complexity of socio-ecological systems, especially in the context of coastal and marine areas that have more complex interaction dynamics among the environment, economy, and society (Khuu et al., 2023). (Ariando et al., 2023) found that successful participatory ocean management models in Southeast Asia have always involved broad coalitions among governments, NGOs, academics, and fishery groups. This opens up space for the development of strategic alliances that focus not only on environmental issues, but also on poverty alleviation, protection of indigenous rights, and strengthening the local economy.

Third, synergy among institutional strengthening and capacity building is key in answering the challenge of conservation policy transformation. In their study on the management of marine protected areas emphasized that a successful collaborative management model is always based on these two pillars: first, the existence of strong institutions that are able to coordinate across sectors; Second, there is a collective capacity of all parties involved. Without institutional strengthening, the capacity built will be difficult to implement systematically. On the other hand, without increased capacity, institutions will remain stuttering in response to rapid and complex changes. Jones et al. (2024), in a comparative study of 50 marine protected areas, found that management effectiveness is greatly influenced by a combination of strong institutions and continuously built capacity. They also suggested the need for periodic evaluation of the existing incentive system, so that there are no distortions or mal-incentives that actually undermine the principles of sustainability. Khuu et al. (2023) added that the current big challenge is to build stable alliances among state institutions, businesses, and civil society organizations, especially in developing countries with governance structures that are still transitional.

Sustainability transformation in conservation areas cannot be achieved only through top-down regulations or incidental projects. It requires serious institutional reform and planned capacity building. Proven effective approaches include strengthening local actors, diversifying institutional incentives, and multi-level coordination and governance that is

responsive to the social and ecological dynamics of the region. Thus, conservation areas such as Tahura R. Soerjo are not only a symbol of environmental protection, but also a productive, fair, and sustainable living space. Strengthening institutions and building capacity in the Tahura area such as Tahura R. Soerjo requires a systematic strategy based on global practices. These practices include institutional reform, human resource capacity building, as well as the integration of local knowledge.

Table 12.2. Practice of Institutional Strengthening and Capacity Building in the Tahura Area

Yes	Practice	Description	Illustrations of International Studies
1	Multi-level coordination forum	Build a cross-agency collaborative structure	Orozco-Quintero et al., 2020
2	Training of officers and managers	Technical and socio-ecological training for Tahura staff	Larsen & Chanthavisouk, 2024
3	Co-management	Collaboration among the manager and the community around Tahura	Quiroz-Ibarra et al., 2020
4	Institutional incentive scheme	Use of economic, legal, and social incentives	Jones et al., 2024
5	Local knowledge integration	Joint training modules among academics and the public	Tran et al., 2020
6	Institutional evaluation indicators	Annual monitoring based on participatory indicators	Khuu et al., 2023

The management of conservation areas such as the R. Soerjo Forest Park (Tahura) requires an approach that is not only technical, but also institutional and participatory. To realize effective, inclusive, and sustainable governance, several best practices have been developed in various countries. One of them is the establishment of a multi-level coordination forum as an effort to build a cross-institutional collaborative structure. This practice is very important to avoid policy fragmentation and increase synergy among management actors, both at the national, provincial, and district/city levels. As shown by Orozco-Quintero et al. (2020), this kind of forum succeeds in creating a productive dialogue space among the central government, local governments, and local stakeholders, so that management plans are more responsive to the dynamics of the field and the aspirations of the communities around the region.

In addition, training of officials and managers is an inseparable element of institutional capacity transformation. Field staff, management officers, and village officials often have a key role in the implementation of conservation programs, but there is still a lack of support in technical and socio-ecological knowledge. Larsen & Chanthavisouk (2024) found that intensive training targeting communication skills, conflict mediation, and understanding of FPIC principles is very helpful in increasing the legitimacy of the management process among indigenous and local communities. In Indonesia, this practice is relevant to be applied in the context of Tahura management, where interaction among management staff and the surrounding community is an integral part of conservation activities.

The joint management approach among the area management agency and the surrounding community is also becoming an increasingly popular strategy in the protected area management literature. Quiroz-Ibarra et al. (2020) emphasized that this model not only increases the effectiveness of ecosystem conservation, but also provides space for communities to participate in decision-making. With the active involvement of the community, the perception of conservation areas as "prohibited areas" can be transformed into productive and sustainable "living spaces". It also advises the emergence of a sense of collective ownership of natural resources, so that the potential for land use conflicts can be minimized naturally.

The provide institutional incentives is another strategy that has proven effective in supporting the transformation of regional governance. Jones et al. (2024) in their study of 50 marine protected areas found that economic, legal, and social incentives have a positive relationship with the level of community participation and conservation success. Illustrations of economic incentives can be in the form of market access for ecotourism products, environmentally friendly business capital help, or profit-sharing schemes from the use of non-exploitative biological resources. Meanwhile, legal incentives involve the recognition of traditional rights to land or certain management permits, which provide legal certainty to the community. Social incentives, such as community rewards or leadership training, also contribute greatly to building people's internal motivation to be actively involved.

The integration of local knowledge in the regional management system is one way to bridge the gap among formal science and traditional

practice. Tran et al. (2020) in their study in Vietnam showed that the preparation of joint training modules among academics, research institutions, and local communities can create management solutions that are more appropriate and relevant to local conditions. At Tahura R. Soerjo, this practice can be applied through the preparation of management guidelines based on cultural ecology, which not only refer to national or international standards, but also respect local wisdom in maintaining environmental balance.

As part of periodic evaluations, the use of participation-based institutional evaluation indicators is also important to ensure that governance reforms go as expected. Khuu et al. (2023) recommend the implementation of annual monitoring involving all management actors—ranging from local governments, communities, NGOs, to the business world—in designing and evaluating regional management achievements. By using indicators formulated in a participatory manner, the results of the evaluation will be more representative and can be used as a basis for future policy improvement. Institutional strengthening and capacity building must be seen as the two main pillars in the transformation of conservation area management. Practices such as multi-level coordination forums, apparatus training, joint management, institutional incentive schemes, local knowledge integration, and participatory evaluation, have proven effective in various international contexts. Its implementation at Tahura R. Soerjo will not only increase the effectiveness of conservation, but also strengthen community participation and policy legitimacy at the site level.

C. Monitoring and Evaluation Framework Design

Monitoring and evaluation (monev) are an important element in ensuring the effectiveness of conservation policies, especially in areas such as Tahura R. Soerjo. A good monev design assesses not only ecological outcomes, but also the quality of governance, community participation, and long-term sustainability. Monitoring and evaluation (monev) is an important element in the management of conservation areas to ensure that the goal of ecosystem conservation is achieved effectively and inclusively. One of the main components of monitoring is the purpose of monitoring, which is to assess the effectiveness of management, governance, and socio-ecological impact of conservation programs. According to Mahajan et al. (2024), monev must have clear indicator

targets and a valid data baseline so that the results can be used as a basis for future policy improvements. Without a clear framework, the monev process tends to be incidental and does not make a significant contribution to the transformation of regional management.

Table 12.3. Draft Monitoring and Evaluation Framework in the Tahura Area

Opponent	Description	Indicator	Reference
Purpose of monev	Assess the effectiveness of management, governance, and socio-ecological impacts	Clarity of impartial indicators and baseline	Mahajan et al., 2024
Ecological Dimension	Biodiversity monitoring, forest cover, habitat connectivity	Diversity index, canopy cover, key species indicators	(Awazi, 2025; Fischer et al., 2024)
Governance Dimension	Institutional effectiveness, participation, transparency, and coordination	Participation scores, role clarity, decision-making quality	(Mahajan et al., 2024; Siddique et al., 2024)
Social Dimension	Changes in livelihoods, public perceptions, conflicts or benefits	Community satisfaction, number of conflicts or complaints	Wijayanto et al., 2025
Monitoring Tools and Systems	Technologies and approaches to continuous monitoring	Monev applications such as <i>Elinor</i> , geographic information systems (GIS) system, citizen science	(Mahajan et al., 2024)
Evaluation and Feedback Cycle	Integration of evaluation results in policy and management revision	Policy revision based on periodic evaluation results	(Geng et al., 2025; J. Wang et al., 2025)
Multi-Party Collaboration	Involvement of various actors in the monev process	Number and type of actors involved, technical capacity	(Rogelja et al., 2025)

In the ecological dimension, monitoring is focused on monitoring biodiversity, forest cover, and habitat connectivity among regional zones. The indicators used include biodiversity indexes, canopy cover percentages, and key species conditions that are bioindicators of ecosystem health. Awazi (2025) found that periodic ecological monitoring with technological approaches such as satellite imagery and GIS is very helpful in detecting environmental changes early. Fischer et al. (2024) also added that habitat connectivity should be a major focus in protected area management, as habitat fragmentation is one of the biggest threats to the survival of endangered species and the stability of the ecosystem as a whole.

In addition, the governance dimension is an inseparable aspect in the evaluation of conservation area management. The effectiveness of the management institutions, the participation of local actors, transparency, and cross-sector coordination are the determining factors for the success of policy implementation. Siddique et al. (2024) suggest the use of participation scores, clarity of role sharing, and the quality of the decision-making process as the main parameters in measuring governance performance. The results of the monitoring in this dimension are very relevant to evaluate whether the management system is responsive to the aspirations of the surrounding community or is still top-down. Mahajan et al. (2024) emphasized that governance reforms based on evaluation results can increase the legitimacy and effectiveness of regional management.

The social dimension reflects the direct impact of conservation programs on communities around the area. Monitoring in this dimension involves assessing changes in livelihood patterns, community perception of the area, and the frequency of conflicts or benefits felt by residents. Wijayanto et al. (2025) recommend the use of indicators such as the level of community satisfaction, the number of conflicts or complaints received, and the distribution of economic benefits as the main benchmarks in social monitoring. The importance of this dimension is often overlooked in many cases, leading to unfair distribution of benefits and resistance from local communities to conservation policies.

In practice, monitoring tools and systems play a crucial role in ensuring that the monitoring process is carried out systematically and continuously. Digital technologies such as the Elinor application, GIS platform, and citizen science are becoming increasingly popular choices in international literature. Mahajan et al. (2024) show that citizen science integration—where communities participate in the data collection process—not only improves the accuracy and completeness of data, but also strengthens the capacity and collective ownership of communities over the region. In addition, spatial data-driven systems allow for real-time visualization of environmental dynamics, making the strategic decision-making process easier.

The cycle of evaluation and feedback is an important part of maintaining the continuity and adaptation of conservation policies. The evaluation process should not stop at the reporting stage, but should be integrated into the annual policy revision and management plan. Wang et

al. (2025) found that successful conservation areas typically have strong feedback mechanisms, so any findings from periodic evaluations can be immediately followed up in the form of new policies or improvements to existing programs. Geng et al. (2025) added that a transparent evaluation cycle also increases public trust in management institutions, as the public can see that there are real endeavors to correct weaknesses and improve the quality of conservation services.

Finally, multi-stakeholder collaboration is a core principle in building an inclusive and representative money system. The involvement of various actors—ranging from local governments, NGOs, universities, community groups, to the business world—can enrich perspectives and increase the legitimacy of evaluation results. Rogelja et al. (2025) found that the more diverse the types and number of actors involved in the monitoring process, the higher the potential to produce holistic and sustainable policy recommendations. In addition, the technical capacity of the parties involved also needs to be strengthened through training and facilitation so that all actors can contribute optimally to the monitoring and evaluation process. Money in the management of conservation areas must be built from a comprehensive and multidimensional framework. By combining ecological, governance, and social aspects, and supported by reliable monitoring tools and systems, the money process can be a strong foundation for designing more responsive, participatory, and sustainable policies. The integration of evaluation results in the policy cycle and multi-stakeholder engagement will ensure that the transformation of conservation area management has a positive impact not only on the environment, but also on the communities and institutions involved in it.

Monitoring and evaluation (money) are an important element in ensuring that the management of conservation areas runs effectively, inclusively, and sustainably. The table above provides a comprehensive overview of money best practices that have been implemented in various regions, from Asia, Africa, Europe, to the global level. From each practice presented, there is a common theme that money is not only an engineering tool to measure the achievement of ecological indicators, but also a strategic instrument to strengthen governance, increase the participation of local actors, and design policies that are responsive to environmental and social change.

Table 12.4. Best Practices for Monitoring and Evaluating the Management of Conservation Areas in Various Regions

No	Location/Country	Best Practices	Key Results	Source
1	Bangladesh (Sundarbans)	Use of community-based evaluative frameworks for co-management	Identify coordination barriers and provide locally-based solutions	Siddique et al., 2024
2	Global (Platform Elinor)	Use of <i>open-source digital tools</i> for governance-based Monev	Increasing transparency and stakeholder engagement across scales	Mahajan et al., 2024
3	China (Marine Protected Area)	Evaluation of the effectiveness of protected areas with a leverage points approach	Mapping intervention points for M.PA. governance improvement	Wang et al., 2025
4	EU Biodiversity Strategy 2030	Use of 26 biodiversity indicators to evaluate policy impacts	Identify the risk of <i>leakage</i> to countries with weak governance	Fischer et al., 2024
5	Canada (National Parks)	Evaluation based on state-community relations (co-governance)	Resulting in policy revisions that are more responsive to the social context	Orozco-Quintero et al., 2020
6	Africa (Cameroon)	Evaluation of <i>in situ</i> conservation success using species indicators	Linking ecological outcomes with governance quality	Awazi, 2025
7	Indonesia (Bukit Rimbang)	Collaborative monev based on interviews, field observations, and FGDs	Finding implementation gaps and improving collaborative strategies	Wijayanto et al., 2025
8	UE–Global	Monitoring the <i>policy spillover</i> of the European Conservation Strategy	Highlighting the importance of cross-border evaluation	Fischer et al., 2024
9	Southeast Asia (Vietnam)	Integration of monev into the <i>coevolutionary governance framework</i>	Assess the role of states, businesses, and NGOs in influencing conservation policies	Khuu et al., 2023
10	EU (Europe)	Participatory stakeholder mapping for forest genetic conservation	Strengthen accountability in conservation data collection and reporting	Rogelja et al., 2025

One notable illustration is the implementation of a community-based evaluative framework in the Sundarbans, Bangladesh (Siddique et al., 2024). This study shows that by actively involving the community in the monitoring process, many obstacles to inter-agency coordination can be identified, as well as providing local-based solutions that are more in line with the reality of the field. This approach is relevant to be applied in areas such as Tahura R. Soerjo, where interaction among the community and

area managers is a key factor in maintaining a balance among environmental conservation and meeting the living needs of the surrounding community. At the level of technology and information systems, the use of digital platforms such as Elinor—an open-source tool for governance-based monitoring—has proven its effectiveness in increasing transparency and engagement of actors across economies of scale (Mahajan et al., 2024). This platform allows stakeholders from various levels of government, civil society organizations, and local communities to exchange data, share findings, and conduct joint validation. The use of this kind of technology is especially important in the Indonesian context, where access to information and data distribution are often major challenges in the implementation of conservation programs.

In China, the evaluation of the effectiveness of marine protected areas is carried out using a leverage points approach, which is an effort to identify critical points that if intervened will have a significant impact on the governance system (Wang et al., 2025). This approach assists managers in designing policies that are more targeted and efficient, without having to make major structural changes. The results of this study show that money does not always have to be extensive and complex, but can focus on areas that have high transformation potential. In regional contexts such as the European Union, the use of 26 biodiversity indicators to evaluate policy impacts has become standard in the implementation of the EU Biodiversity Strategy 2030 (Fischer et al., 2024). However, the study also reveals the risk of policy leakage—where strict protection policies in Europe lead to deforestation or environmental degradation in developing countries with weak governance. These findings underscore the importance of cross-border evaluations and consider the global dimension in conservation policy formulation.

Canada is one of the countries that has successfully implemented evaluation based on state-community relations (co-governance), especially in national park management (Orozco-Quintero et al., 2020). This model provides space for indigenous groups and local communities to participate in the preparation of management plans, so that the results of the evaluation are directly used to revise policies to be more responsive to the socio-cultural context. The success of this model has inspired conservation area management in Indonesia, where the rights of indigenous peoples and their participation in decision-making are

increasingly being recognized. Studies from Africa, particularly Cameroon, show that evaluation of *in situ* conservation success using species indicators can be an effective method for linking ecological outcomes to governance quality (Awazi, 2025). By combining biological measurements such as the number of individuals of endangered species and habitat conditions, as well as institutional aspects such as community participation and capacity of officials, the evaluation can provide a more holistic picture of the success of an area.

In Indonesia itself, a case study in Bukit Rimbang shows that collaborative monitoring based on interviews, field observations, and group discussion forums (FGDs) is very effective in finding implementation gaps and improving collaborative strategies (Wijayanto et al., 2025). This approach opens up space for dialogue among managers, the community, and academics to jointly formulate more appropriate policy recommendations. This study is a good illustration of how *monev* can be a vehicle for collective participation and learning. In addition, international studies also highlight the importance of monitoring indirect impacts (policy spillover) of European conservation strategies that have the potential to spread environmental burdens to other countries (Fischer et al., 2024). It serves as a reminder that evaluation should not stop at a specific geographic scope, but should consider the domino effects that may occur outside the boundaries of the policy area. This perspective is important in an era of globalization where environmental issues can no longer be viewed partially.

In Southeast Asia, Vietnam is one of the countries that has successfully integrated *monev* into the coevolutionary governance framework (Khuu et al., 2023). This model considers the dynamics of governance change that occurs naturally among countries, businesses, and NGOs. Thus, evaluations are not only retrospective, but also prospective, helping managers predict impending changes and prepare appropriate responses. Finally, at the European level, the participation of actors in stakeholder mapping is an important part of the evaluation of forest genetic conservation (Rogelja et al., 2025). Through this approach, all parties involved—from researchers, field officers, to community representatives—have an equal opportunity to voice their views and concerns. The result is increased accountability in the collection and reporting of conservation data, as well as stronger public legitimacy of the

policies being taken. The monitoring practices presented in this table provide a broad and in-depth perspective on the importance of evaluation in ensuring the sustainability of conservation area management. Monev is not only about measuring success, but also about building constructive feedback mechanisms, increasing the participation of local actors, and designing adaptive and responsive policies. By adopting and modifying these practices, Indonesia—and especially the management of Tahura R. Soerjo—can develop a more inclusive, transparent, and sustainable monitoring system.

D. Implementation Roadmap

The Forest Park transformation implementation roadmap is designed as a systematic framework that guides fundamental changes in the governance and management of conservation areas. This phased approach recognizes the complexity of systemic change that requires time, resources, and long-term commitments from a wide range of stakeholders. Each phase is designed with clear milestones, measurable success indicators, and adaptive mechanisms that allow for adjustments based on learning and context changes. This roadmap serves not only as a technical guide, but also as a communication instrument that builds a common understanding and collective commitment to the vision of transformation.

The initiation phase that lasts for the first two years is a critical period that determines the foundation of long-term transformation success. Regulatory reform is a top priority with a focus on harmonizing overlapping regulations, simplifying licensing procedures, and strengthening the legal framework for collaborative management. This process involves a comprehensive review of all regulations related to Tahura, identification of gaps and inconsistencies, and the development of new regulatory packages that support management innovation. Intensive consultations with various ministries, local governments, and stakeholders ensure buy-ins and overcome potential resistance to change.

Capacity building in the initiation phase is designed as a strategic investment in human capital that will drive transformation. The capacity building program includes technical training in ecosystem management, modern managerial skills, and digital competencies for Tahura's management staff. Leadership development program for key officials to build a shared vision and change management skills. The establishment of

a community of practice that connects Tahura managers in various regions facilitates peer learning and collaborative innovation. Partnerships with universities and training institutions ensure continued access to up-to-date knowledge and skills.

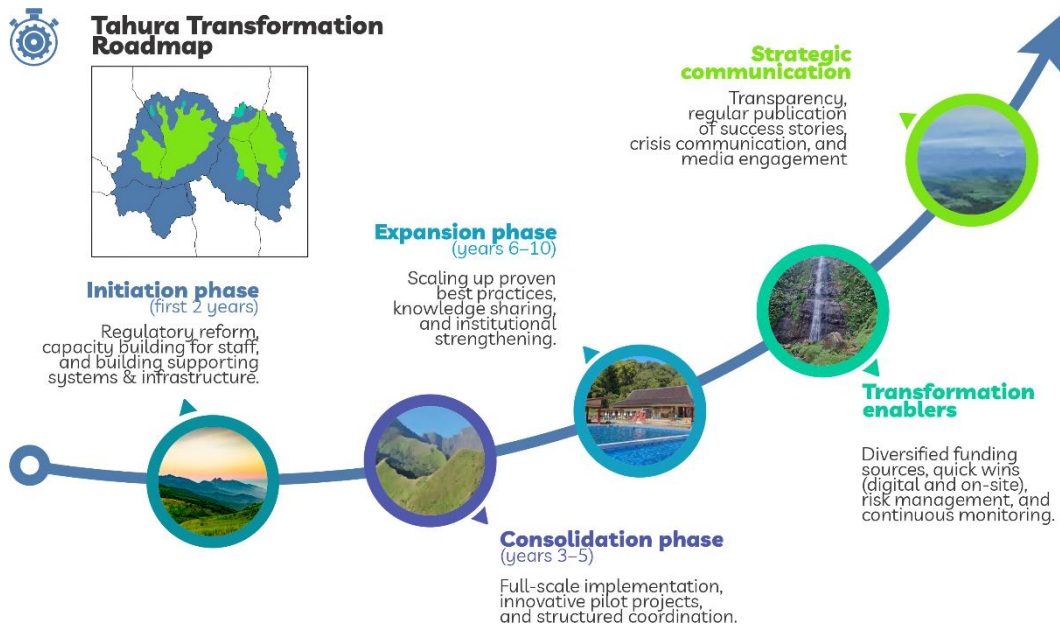


Figure 12.1. Tahura transformation roadmap

The development of supporting systems and infrastructure is a critical enabler in the initiation phase. Investments in information technology include the development of integrated digital platforms for data management, GIS for spatial monitoring, and mobile applications for community engagement. The construction or renovation of physical facilities such as interpretation centers, modern guard posts, and ecotourism infrastructure creates conditions that support the implementation of new management models. The establishment of clear and standardized standard operating procedures ensures consistency of implementation in various locations.

The consolidation phase during the third to fifth years marks the transition from planning to concrete implementation of new management models. Operationalization involves the full rollout of new systems and procedures that have been developed in the initiation phase. The Tahura management unit began to implement an adaptive management

approach with a structured planning-implementation-monitoring-evaluation cycle. The coordination mechanism among institutions is fully activated with regular meetings, joint planning, and shared accountability. The monitoring and evaluation system begins to produce data that can be used for continuous improvement.

Pilot projects in the consolidation phase serve as learning laboratories to test and refine innovative approaches. The selection of pilot locations takes into account the representation of various ecosystem typologies and socio-economic contexts to ensure comprehensive learning. Pilot projects include initiatives such as co-management with indigenous peoples, community-based ecotourism development, participatory ecosystem restoration, and payment for ecosystem services. Systematic documentation of the processes, challenges, and outcomes of pilot projects provides an evidence base for scaling up.

Institutional strengthening in the consolidation phase focuses on developing an inclusive and effective governance structure. The establishment of multi-stakeholder platforms at the site level ensures meaningful participation of communities, the private sector, and civil society in decision-making. Grievance and conflict resolution mechanisms are developed and socialized to resolve disputes constructively. Incentive and disincentive systems are designed to encourage behaviors that support conservation goals while rewarding the contributions of various parties.

The expansion phase that lasted from the sixth to the tenth year represented a period of scaling up and institutionalization of change. Best practices that have proven effective in pilot projects are systematically replicated to all Tahura management units. The replication process is not copy-pasted but involves contextual adaptations that take into account the unique characteristics of each location. A robust knowledge management system facilitates learning transfer and prevents reinventing the wheel. The network of excellence that connects Tahura-Tahura with the best performance becomes a motor of sustainable innovation.

Sustainability mechanisms in the expansion phase are designed to ensure the sustainability of transformation beyond the project cycle. Diversifying funding sources through the development of revenue streams from ecotourism, payment for ecosystem services, and green financing reduces dependence on the government budget. The institutionalization of

change through integration in the regular planning and budgeting system ensures program continuity. The development of local champions and successor planning ensures the regeneration of leadership that is committed to the vision of transformation.

Quick wins play a strategic role in building the momentum and credibility of the transformation from the start. The digitization of services such as online licensing, virtual tours, and citizen science apps provides direct benefits that can be felt by the public. Community engagement programs that produce quick economic benefits such as tour guide training or the development of natural resource-based handicraft products build community support. Visible improvements such as information signage, well-organized trails, and clean public facilities create a positive first impression that supports changes in public perception.

Risk management is integrated in each phase of implementation to anticipate and mitigate potential bottlenecks. Political risks such as leadership change are anticipated through strong institutionalization and broad-based support. Technical risks such as technology failures or design errors are mitigated through piloting and iterative improvement. Social risks such as community resistance or conflicts of interest are managed through proactive communication and genuine participation mechanisms. Contingency planning for various scenarios ensures the resilience of the implementation to shock and uncertainty.

Monitoring and evaluation of the roadmap is carried out in stages with an annual review for tactical adjustments and a comprehensive evaluation at the terminate of each phase for strategic adjustments. Key performance indicators include aspects of the process (such as the number of regulations reformed or staff trained) and outcomes (such as increased biodiversity or community satisfaction). Independent evaluation provides an impartial perspective on achievements and areas for improvement. Regular learning events help collective reflection and continuous improvement.

Strategic communication throughout the implementation of the roadmap ensures transparency, builds support, and manages expectations. Differentiated communication strategies for different audiences with appropriate messages and channels. Success stories are published regularly to maintain momentum and inspiration. Crisis communication protocols are prepared to address negative issues or

misconceptions. Engagement with mass media and social media influencers expand the reach and impact of communication.

E. Risk and Contingency Mitigation

Risk mitigation in policy transformation is a crucial aspect that determines the successful implementation of systemic change in governance (fig.12.2). Bureaucratic resistance often emerges as a major obstacle, rooted in the apparatus's reluctance to step out of their comfort zone, fear of losing power or privilege, as well as concerns about the more workload that may arise. This phenomenon is reinforced by a bureaucratic culture that tends to be risk-averse and avoids change, especially when the transformation threatens established power structures or changes the pattern of resource distribution that has been benefiting certain groups.

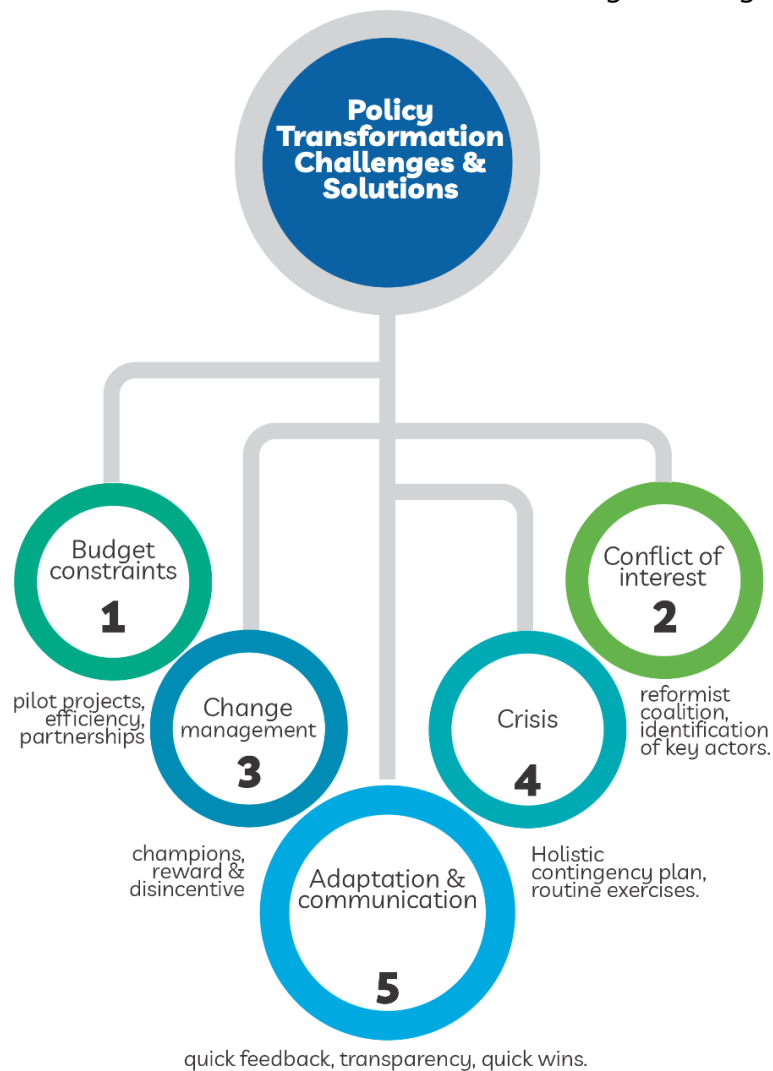


Figure 12.2. Policy transformation challenge and solutions

Budget constraints are structural obstacles that require a creative approach in resource management. Policy transformation often requires significant initial investment in systems development, personnel training, and organizational restructuring. In a limited fiscal context, careful prioritization is needed, finding alternative funding sources through partnerships with the private sector or donor institutions, and optimizing the use of existing budgets through reallocation and spending efficiency. An incremental approach in implementation can help manage budget constraints by starting from a pilot project which is then scaled up gradually according to the availability of resources.

Conflicts of interest represent complex political challenges, involving a variety of actors with different agendas. Local elites who have benefited from the status quo tend to oppose changes that threaten their position. Business groups that have a symbiotic relationship with the old bureaucracy may seek to thwart reforms that increase transparency and accountability. Even within the government itself, competition among institutions or work units can create dynamics that are counterproductive to transformation endeavors.

An effective change management strategy requires the identification and empowerment of champions or agents of change at various levels of government. Champions at the leadership level provide political legitimacy and strategic support, while mid-level champions act as a bridge among the leadership's vision and operational reality. At the grassroots level, champions ensure technical implementation goes as planned and provide real-time feedback on obstacles on the ground. The formation of a coalition of the willing involving reformers from various institutions can create a momentum of change that is difficult for the status quo group to stop.

The development of the right incentive system is key in mobilizing support for transformation. This includes rewards for work units or individuals who successfully implement change, career advancement for well-performing champions, and public recognition for innovation and best practices. Instead, a system of disincentives needs to be implemented to address active resistance, including rotation of positions for officials who impede reform or even administrative sanctions for serious violations.

Contingency planning for crisis scenarios requires a systematic approach that anticipates a wide range of possible disruptions. For large fires, a clear evacuation protocol, an integrated early warning system,

coordination among institutions that have been trained through routine simulations, and an emergency resource mobilization mechanism are needed. The pandemic requires different preparedness, including health surveillance systems, stockpiling of medical devices, proportionate social restriction protocols, and social help mechanisms that can be activated quickly.

Contingency planning must consider the cascading effects of a crisis, where one disaster can trigger a series of other problems. For illustration, the pandemic has not only created a health crisis but also an economic, social, and even political crisis. Therefore, contingency plans must be holistic and multi-sectoral, with a clear command structure, effective crisis communication, and coordination mechanisms that have been tested through table-top exercises and full-scale simulations.

Political economy analysis is a vital instrument in understanding and navigating the dynamics of local power. This analysis maps out who the key actors are, what their interests are, how they are interconnected, and what sources of power they have. A deep understanding of informal networks, patron-client relationships, and shadow governance structures enable reformists to design realistic and contextual strategies.

Adaptive management approaches need to be applied given the complexity and uncertainty in policy transformation. This means having a robust monitoring mechanism to detect deviations from the plan, quick feedback loops for adjustment, and the flexibility to change strategies when the initial approach is ineffective. Learning by doing is an important principle, where small failures are treated as learning opportunities, not disasters that must be avoided at all costs.

Strategic communication plays an important role in managing public perceptions and expectations. The narrative of change must be carefully constructed to demonstrate concrete benefits for various stakeholders, unconditionally acknowledge legitimate concerns, and build a sense of urgency without creating panic. Transparency in the process, meaningful public participation, and visible quick wins can help build momentum and public support for long term transformation.

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Chapter 13

POLICY RECOMMENDATIONS

Abdul Hamid and Linda Wige Ningrum

The Great Forest Park (Tahura) as a nature conservation area requires a holistic policy transformation to face modern conservation challenges. This transformation must integrate ecological, social, economic, and governance aspects that are adaptive to the changing times.

A. Situation Analysis and Transformation Framework

Forest Parks in Indonesia face the complexity of interrelated problems and require a holistic understanding to formulate effective solutions. Habitat degradation is becoming the most real threat, where the encroachment of the area has significantly altered the ecological landscape. Unlawful logging activities, land clearing for agriculture, and release expansion have reduced primary forest cover to critical levels in some Tahura. Data show that the average loss of forest cover in Tahura is 2-5% per year, with degradation hotspots concentrated in border areas that are difficult to monitor. The resulting habitat fragmentation not only reduces the effective area for biodiversity conservation, but also disrupts wildlife corridors, damages watershed services, and reduces the resilience of ecosystems to external disturbances.

Tenure conflicts with indigenous peoples represent an unresolved historical dilemma in the management of Tahura. The designation of conservation areas often ignores the existence of indigenous peoples who have inhabited and managed the area for generations. Customary claims to customary land collide with the legal status of Tahura, creating prolonged social tensions. Indigenous peoples who have lost access to traditional sources of livelihood are forced to carry out activities that are considered unlawful according to positive law, but legitimate according to

customary law. This complexity is exacerbated by weak mechanisms for the recognition and accommodation of indigenous peoples' rights within the framework of conservation regulations. The top-down approach in determining the region without free, prior, and informed consent has created latent resistance and conflicts that can escalate into open conflicts at any time.

Limited funding is a structural obstacle that hinders the effectiveness of Tahura's management. The government's budget allocation for conservation is still far from the real needs of managing large areas with complex challenges. The Tahura Technical Implementation Unit operates with a minimum budget that is not even sufficient for basic operations such as routine patrols, infrastructure maintenance, and salaries of honorary employees. The ratio of field officers to area area is very disproportionate, where one officer has to oversee thousands of hectares of forest. The reliance on the APBD which fluctuates and is often cut for other purposes makes long-term planning almost impossible. Alternative funding mechanisms such as conservation funds from the private or international sectors are still constrained by rigid regulations and bureaucracy. Several recent studies highlight the challenges in managing conservation areas in Indonesia. Forest degradation due to unlawful logging and land clearing is still a serious problem, especially in Central Kalimantan, with suboptimal law enforcement (Nurmala, 2024). Tenure conflicts among indigenous peoples and conservation institutions are also a major obstacle, so an approach that recognizes local rights and considers traditional wisdom is needed (Megawati et al., 2023; Setiawan et al., 2023). In policy, forest management reform through land redistribution programs and the integration of ecosystem service values is considered important to maintain biodiversity sustainability (Gunawan et al., 2024; Nugroho et al., 2023). In addition, conservation funding is still a challenge, with potential solutions through the use of ecosystem service mechanisms to support sustainable financing (Nugroho et al., 2022).

The impact of climate change adds a new layer of complexity to the management of Tahura. Changes in rainfall patterns have increased the frequency and intense forest fires, especially in Tahura which has peat areas or is in areas with long dry seasons. Rising average temperatures change the composition of vegetation and force habitat displacement for certain species. Extreme weather events such as flash floods and landslides

are becoming more frequent, damaging conservation infrastructure and threatening the safety of the surrounding community. Tahura, which is supposed to serve as a buffer against the impact of climate change, has become vulnerable due to degradation that has occurred before. The adaptation capacity of ecosystems has decreased drastically, while mitigation endeavors are constrained by limited resources and technical knowledge.

The fragmentation of authority among the central and regional governments creates a governance vacuum that is exploited by exploitative interested parties. The decentralization of natural resource management is not followed by adequate capacity building at the regional level, resulting in a disparity in the quality of management among Tahura. Sectoral egos among forestry agencies, the environment, spatial planning, and general government produce contradictory policies. Tahura is often the victim of asynchronous development planning, where mining, plantation, or infrastructure permits are issued without considering conservation status. Vertical coordination among ministries and regional offices is hampered by differences in regulatory interpretations and political priorities. Existing authority conflict resolution mechanisms have proven to be ineffective and time-consuming, while degradation continues on the ground.

The abundant green economic potential and services of the Tahura ecosystem have ironically not been able to be transformed into a sustainable source of funding for conservation. The total economic value of carbon sequestration, water regulation, biodiversity conservation, and recreational services reaches billions of rupiah per year, but most of it is still in the form of positive externalities that are not monetized. Ecotourism, which should be the flagship program, is still managed amateurishly without a solid business plan and effective marketing strategy. Bioprospecting for the discovery of medicinal compounds from Tahura biodiversity is hampered by the absence of a clear benefit-sharing framework. Payment for ecosystem services that have been successful in other countries are difficult to implement due to regulatory complexity and unclear property rights. REDD+ and carbon trading, which had been a big hope, were halted due to the uncertainty of the global carbon market and technical problems in monitoring, reporting, and verification.

The interconnection among these various pressures creates negative feedback loops that accelerate degradation. Limited funding reduces surveillance capacity, which in turn increases encroachment. Encroachment exacerbates tenure conflicts and lowers the value of ecosystem services. The decline in ecosystem services reduces the revenue potential of the green economy, which further exacerbates funding limitations. The fragmentation of authority makes the answer to this cycle of degradation slow and uncoordinated. Climate change is accelerating all degradation processes while reducing the window of opportunity for effective interventions. This complexity requires a systems thinking approach that can identify leverage points for positive transformation. Without a fundamental paradigm shift in policy and management, Tahura Indonesia risks losing its critical ecological function within the next one to two decades. Various studies show that climate change is further exacerbating ecosystem degradation in Indonesia, especially through land fires and vulnerability of peat ecosystems, which reduces environmental adaptation capacity (Hiller & Fisher, 2023; Nugroho et al., 2023). This problem is exacerbated by the fragmentation of authority and lack of inter-agency coordination, so a jurisdictional approach and cross-sectoral policy alignment are needed to improve forest governance (Hiller & Fisher, 2023; Taylor and Francois Publisher, 2020). Conservation endeavors also face challenges in implementing green economy mechanisms such as REDD+ and certification of ecosystem services due to political conflicts of interest and overlapping regulations (Miller et al., 2022; Ningsih et al., 2020).

1. Vision of Forest Park Policy Transformation

Tahura's vision of policy transformation (fig.13.1.) requires a fundamental shift from conventional conservation approaches to dynamic and responsive adaptive management models. Adaptive management recognizes that ecosystems and social systems are in constant flux conditions, so conservation strategies must be able to evolve according to changing conditions on the ground. This concept goes beyond the rigidity of five-year planning that has dominated the conservation bureaucracy, toward a system that allows for continuous learning and strategy adjustment based on feedback loops from ecological and social monitoring. The integration of biodiversity conservation with community welfare is no longer seen as a trade-off that must be chosen by one, but as a symbiosis

of mutualism where the success of one aspect strengthens another. This vision recognizes that ecological sustainability can only be achieved if local communities derive tangible benefits from the existence of Tahura, creating long-term incentives for active participation in conservation.

Vision of Forest Park Policy Transformation



Figure 13.1. Vision of Forest Park Policy Transformation

The repositioning of Tahura as a center for ecological learning opens a new dimension in the function of conservation areas. Tahura is no longer seen as a static nature museum, but as a living classroom where ecological processes can be studied, understood, and applied to solutions to contemporary environmental challenges. Learning infrastructure such as canopy walks, interpretive trails, and field stations are designed to provide experiential learning for different segments of society, from elementary school students to international researchers. The citizen science program invites the general public to be involved in biodiversity data collection, creating a sense of ownership and expanding monitoring capacity. Collaboration with educational institutions resulted in a place-based curriculum that uses Tahura as a laboratory for science, geography, and even social science subjects. Digital learning platforms enable virtual access to Tahura's wealth of ecological knowledge, expanding the reach of education beyond physical boundaries.

The transformation of Tahura into a nature laboratory opens up opportunities for cutting-edge research that contributes to a global understanding of tropical ecology and climate change impacts. Modern research facilities with automated monitoring equipment, molecular biology labs, and data centers make Tahura a magnet for national and international researchers. Long-term ecological research programs produce valuable datasets on tropical ecosystem dynamics, serving as a reference for evidence-based conservation policies. Bioprospecting, which is regulated with a fair benefit-sharing protocol, opens up the potential for the discovery of bioactive compounds for pharmaceuticals, cosmetics, and other industries. Research partnerships with international universities and research institutions bring not only funding but also technology transfer and capacity building. Scientific publications from research at Tahura increase Indonesia's visibility and credibility in the global conservation community.

Tahura's role as a driver of the regional green economy represents a shift from conservation versus development to conservation for development. The green economy in question is not just a conventional ecotourism, but a complex and sustainable economic ecosystem. Green enterprises based on non-timber forest products are developed with value addition technology and fair market access. Ecosystem services such as clean water provision, microclimate management, and carbon sequestration are valued and monetized through a transparent payment for ecosystem services scheme. The creative economy based on nature-inspired design, eco-art, and cultural tourism creates jobs for the younger generation. Tahura is a hub for green technology demonstrations, from renewable energy to sustainable agriculture, attracting investment and innovation. The multiplier effects of this green economic activity increase regional income and community welfare without sacrificing ecological integrity. Innovative approaches to natural resource management and conservation in Indonesia are increasingly emphasizing the importance of community participation and ecological integration with development. The Adaptive Collaborative Management (ACM) approach proves that empowering local communities through participatory processes can increase environmental resilience to climate change (Colfer & Prabhu, 2023). Community-based ecological education, such as the mangrove education program developed (Gunawan et al., 2025), has also proven

effective in strengthening conservation policies through living classrooms. In the field of green economy, ecotourism models based on local wisdom such as Tri Hita Karana in Bali show the potential for synergies among conservation, culture, and economic growth (Prihadi et al., 2024). In addition, the management of mangrove ecosystems involving the community is an important strategy in mitigating and adapting to climate change, while maintaining ecosystem functions in a sustainable manner (Sutanto et al., 2022).

The landscape management approach recognizes that Tahura does not exist in a vacuum but is an integral part of the broader landscape mosaic. Ecosystem connectivity is a key consideration, where animal corridors, riparian buffers, and stepping stone habitats are managed to maintain gene flow and species movement. Flexible zoning replaces the rigid division among the core zone and the buffer zone, allowing for a gradation of use intensity tailored to the capacity of the ecosystem and the needs of the community. Cross-boundary collaboration with other area managers, both conservation areas, production forests, and agricultural land, creates landscape-level conservation strategies. Integrated watershed management ensures that Tahura's hydrological function provides optimal benefits for all watersheds. Climate change adaptation strategies are implemented at the landscape scale, increasing resilience to extreme events.

Socio-economic dynamics are integral in the planning and management of Tahura, moving beyond tokenistic participation toward genuine co-management. Detailed social mapping identifies stakeholders, power relations, livelihood systems, and cultural values that affect people's interactions with Tahura. Participatory planning processes provide space for diverse voices to be heard and accommodated in decision-making. Traditional ecological knowledge is integrated with scientific knowledge, creating more robust hybrid knowledge systems. Culturally appropriate conflict resolution mechanisms are developed to handle disputes constructively. Gender mainstreaming ensures that females and marginalized groups have equal access to and benefits from conservation programs.

The implementation of this transformative vision requires institutional arrangements that are radically different from conventional bureaucratic structures. Adaptive governance structures with decentralized yet

coordinated decision-making authority allow for rapid response to emerging issues. Multi-stakeholder platforms become an arena for negotiation, shared learning, and collective action. Performance-based management replaces rule-based administration, with success indicators that include ecological integrity, social equity, and economic sustainability. Innovation labs in Tahura's management structure encourage experimentation with new approaches and rapid prototyping of solutions. Digital transformation is changing the way it works from paper-based bureaucracy to data-driven decision-making.

This transformation vision also requires a fundamental change in mindset from conservation officers to conservation facilitators. Capacity building does not only focus on technical skills but also soft skills such as communication, negotiation, and systems thinking. Leadership development programs create a cadre of conservation leaders who are visionary and able to inspire change. Organizational culture shift from command-and-control to collaboration and empowerment requires a systematic change management process. Incentive systems that value innovation and collaboration replace reward structures that are based solely on seniority and compliance.

The realization of this vision requires a realistic timeframe with clear and measurable milestones. Short-term wins are necessary to build momentum and credibility, while long-term sustainability strategies ensure transformation is not just superficial. Regular reviews and adaptive adjustments are an integral part of the implementation process. Political commitment at various levels of government must be secured through persistent advocacy and evidence-based communication. Financial sustainability through diversified funding sources is a prerequisite to avoid reversal when political priorities change. Ultimately, Tahura's policy transformation vision is about creating a conservation model that not only protects biodiversity for future generations, but also improves the quality of life of the current generation, proving that conservation and development is not a zero-sum game but a positive-sum opportunity. Recent studies have emphasized the importance of a holistic approach to landscape management and climate adaptation through multi-stakeholder engagement and strengthening ecosystem connectivity. The social network-based landscape approach is considered effective in aligning ecological and economic interests, including through the protection of

riparian forests that are vital for ecosystem services such as pollution filtration and slope stability (Dinca et al., 2025; Zinngrebe et al., 2020). Adaptive and participatory governance, such as the multi-stakeholder platform in Taiwan and the concept of regenerative systems thinking, provide a model for the transformation of conservation area management such as Tahura (Karimova & Lee, 2022; Majlingova, 2025). The principles of co-management and social justice are also key in building ecosystem and community resilience, especially in small agricultural areas in the Global South (Shumi et al., 2024). Forest Landscape Restoration endeavors rooted in local contexts and cross-sectoral collaboration are increasingly relevant as climate adaptation strategies, supported by mechanisms such as REDD+ and the concept of adaptation services that involve the co-production of ecosystem services (Lavorel et al., 2020; Stanturf & Mansourian, 2020).

2. Restructuring of the Forest Park Regulatory Framework

Harmonization of regulations in the context of Tahura management is a fundamental prerequisite to overcome policy fragmentation that has been hampering the effectiveness of conservation. The complexity of existing regulations creates a bureaucratic labyrinth where Government Regulations on Tahura often collide with other sectoral laws such as the Regional Government Law, the Spatial Planning Law, the Village Law, and the Mineral and Mineral Law. The harmonization in question is not just textual synchronization, but philosophical and operational alignment that ensures that all legal instruments work synergistically in support of conservation goals. This process requires a comprehensive legal review that identifies contradictions, overlaps, and gaps within the existing regulatory framework. A harmonization team involving legal experts, conservation practitioners, and community representatives needs to be formed to ensure that regulatory revisions are not only technically sound but also socially acceptable and practically implementable.

The revision of the Government Regulation on Tahura must adopt an ecosystem-based management paradigm that recognizes the complexity and dynamics of natural systems. The ecosystem-based management approach goes beyond administrative boundaries and focuses on the integrity of ecological functions, which means regulations should allow for management that responds to ecological boundaries rather than political

boundaries. Flexibility in zoning needs to be accommodated, where core zones, use zones, and other zones can be adjusted based on ecological monitoring and changes in field conditions. Adaptive management protocols must be integrated within the legal framework, giving managers the authority to make adjustments without having to go through a lengthy bureaucratic process. New regulations must recognize uncertainty and complexity as inherent characteristics of ecosystems, so that prescriptive rules are replaced with performance-based standards that focus on conservation outcomes.

Multi-stakeholder participation in the management of Tahura requires a strong and clear legal foundation. Existing regulations that tend to be state-centric need to be transformed to accommodate genuine partnerships with indigenous peoples, local communities, private sectors, NGOs, and academic institutions. Legal frameworks for co-management arrangements should clearly define rights, responsibilities, and benefit-sharing mechanisms for each stakeholder. Free, prior, and informed consent (FPIC) mechanisms need to be integrated into all stages of decision-making that affect local communities. Regulations must recognize and protect traditional ecological knowledge as a valid opponent in conservation management. Culturally appropriate and legally binding dispute resolution mechanisms need to be developed to address the inevitable conflicts in multi-stakeholder governance.

The integration of Tahura policy with spatial planning requires fundamental reforms in the way conservation areas are treated in regional development planning. Tahura must be positioned not as a constraint but as a strategic asset in the regional spatial plan. Regulations need to ensure that ecological corridors, buffer zones, and ecosystem services from Tahura are the main considerations in spatial planning. The mandatory Strategic environmental Assessment mechanism for all development plans around Tahura must be strengthened with credible sanctions. Coordination among the Regional Development Planning Agency and the Tahura Management Unit needs to be institutionalized through joint planning protocols. Incentive mechanisms for districts/cities that integrate Tahura conservation in their RTRW need to be developed, such as more special allocation funds or ecological fiscal transfers.

Synchronization with social forestry policies opens up opportunities to resolve historical tenure conflicts while increasing conservation

effectiveness. The new regulations should allow the implementation of social forestry schemes in certain zones of Tahura with strict safeguards to ensure conservation objectives are still achieved. Community Forests, Village Forests, or Forestry Partnerships can be instruments to provide legal access for communities while creating local stewards for conservation. Performance-based agreements with clear indicators for biodiversity conservation, forest cover maintenance, and sustainable use need to be an integral part of licensing. Capacity building for communities receiving social forestry permits must be a mandatory requirement supported by adequate funding. Monitoring and evaluation systems involving independent third parties ensure that social forestry in Tahura truly delivers conservation outcomes.

Strengthening the mitigation and adaptation aspects of climate change in Tahura regulations is an urgent necessity considering the crucial role of conservation areas in climate regulation. Legal frameworks for carbon accounting and trading from Tahura need to be developed taking into account international standards and national circumstances. Regulations must allow Tahura to access climate finance both from domestic and international sources, with transparent and accountable mechanisms. Ecosystem-based adaptation strategies need to be integrated in management plans with adequate regulatory support. Disaster risk reduction protocols that consider the role of Tahura in reducing climate-related hazards must be part of the regulatory framework. Coordination with the Peat and Mangrove Restoration Agency and other climate change-related institutions needs to be formalized through inter-agency agreements.

The development of legal mechanisms for conservation partnerships require bold but prudent regulatory innovation. Public-private partnerships in the management of Tahura must be regulated with frameworks that protect the public interest while providing adequate incentives for private sector involvement. Concession models for ecotourism, bioprospecting, or ecosystem services management need a clear legal basis with transparent bidding processes and robust monitoring systems. Corporate social responsibility programs directed at Tahura conservation require regulatory guidance to ensure effectiveness and sustainability. The legal personality for Tahura as an entity that can enter into contracts and receive endowments needs to be considered, following international precedents.

Intellectual property rights arrangements for innovations and discoveries from Tahura must balance among incentivizing research and ensuring benefit-sharing.

Payment for Ecosystem Services (PES) as an economic instrument for conservation requires a comprehensive legal framework that regulates various aspects of environmental service transactions. Regulations should clearly define the types of ecosystem services that can be traded, methods for valuation, and mechanisms for payment collection and distribution. Water fund models where downstream users pay for watershed protection services from Tahura require a strong legal basis and credible enforcement mechanisms. Carbon credits from avoided deforestation or reforestation in Tahura need regulatory clarity, especially related to ownership, verification, and trading procedures. Biodiversity offsets as compensation for development impacts elsewhere require strict regulations to ensure additionality and permanence. Institutional arrangements for managing PES revenues, including trust funds or special accounts, need transparent governance structures that are legally mandated.

The bio-economy as an emerging sector requires anticipatory regulation that advises innovation while protecting biodiversity and community rights. Bioprospecting regulations should ensure that Tahura's genetic resources are accessed and utilized by the Nagoya Protocol on Access and Benefit-Sharing. Synthetic biology and biotechnology applications using biodiversity from Tahura need regulatory oversight that balances promoting research and preventing biopiracy. Value chains for bio-based products from Tahura require quality standards and certification systems that are legally recognized. Small and medium enterprises based on bio-resources need regulatory support including simplified licensing procedures and tax incentives. Research and development collaborations among universities, the private sector, and Tahura management need to clear legal frameworks, especially related to intellectual property and commercialization rights.

The implementation of this regulatory restructuring requires careful sequencing and transition arrangements. Grandfathering clauses for existing uses that are not by the new regulations need reasonable timeframes for adjustment. Capacity building for law enforcement officers, judges, and legal practitioners on new regulatory frameworks is a critical success factor. Meaningful public consultation processes must precede any

major regulatory change to ensure buy-in and identify potential implementation challenges. Comprehensive regulatory impact assessments need to be carried out to anticipate unintended consequences. Pilot implementations in selected Tahura can provide learning opportunities before the nationwide rollout. Regular reviews every 3-5 years ensure that regulatory frameworks remain relevant and responsive to changing circumstances. Ultimately, restructuring the regulatory framework is not only about changing the legal text, but transforming the entire governance ecosystem to support Tahura's vision as an innovative, inclusive, and sustainable conservation model.

3. Centralism Toward Collaborative Governance

The transformation of Tahura governance from a centralistic model to a collaborative governance represents a fundamental paradigm shift in the perspective of authority and legitimacy in conservation. The centralistic model that has dominated so far, where decisions are made top-down by government bureaucracy with minimal input from other stakeholders, has proven ineffective in dealing with the complexity of contemporary conservation challenges. The command-and-control approach ignores local knowledge, alienates communities that are supposed to be conservation partners, and creates implementation gaps due to limited enforcement capacity. Collaborative governance, on the other hand, recognizes that effective conservation requires the mobilization of diverse resources, knowledge, and legitimacy spread across various actors. This model does not eliminate the role of the state, but transforms it from a sole authority to a facilitator and coordinator in network governance involving multiple stakeholders with different interests and capacities.

The establishment of the Tahura Management Board as a multi-stakeholder institution is a cornerstone in the operationalization of collaborative governance. This Council is not just an advisory body that provides non-binding input, but has real decision-making authority in key aspects of Tahura's management. The composition of the Council must be carefully balanced to ensure fair representation of the various constituencies: the government (central and local) carries legal authority and public resources; academics contribute scientific knowledge and analytical capacity; indigenous peoples bring traditional ecological knowledge and historical legitimacy; the private sector offers business

acuity and potential funding; while NGOs provide advocacy skills and grassroots connections. The selection mechanism for board members should be transparent and merit-based, with term limits to ensure regeneration and prevent capture by certain interest groups. Decision-making protocols in the Council need to adopt consensus-building approaches that respect diverse perspectives while ensuring that conservation objectives are not compromised.

The structure and functions of the Board of Trustees should be designed to address collective action problems inherent in multi-stakeholder governance. Clear mandates and boundaries of authority need to be defined to avoid overlaps or gaps with existing institutions. The Board can have several committees that focus on specific aspects such as the scientific advisory committee, community relations committee, and finance committee, allowing for deeper engagement according to each stakeholder's expertise. Regular meetings with a well-structured agenda and transparent documentation ensure continuity and accountability. Internal conflict resolution mechanisms need to be developed to deal with inevitable disagreements within diverse groups. Capacity building for Council members, especially from local communities who may be less familiar with formal governance processes, is essential to ensure meaningful participation.

The integration of digital technology in the Tahura monitoring system opens up possibilities for unprecedented levels of transparency and real-time management. Geographic Information Systems (GIS) integrated with satellite imagery allow high-precision tracking of forest cover changes and regular updates. Drone technology with thermal and multispectral cameras can conduct cost-effective surveillance for large and hard-to-access areas. Camera traps with AI-powered species identification provide continuous and impartial biodiversity data. Environmental sensors network that measures parameters such as air quality, soil moisture, and air temperature provides early warning of ecological changes. All of these data streams can be integrated into a unified dashboard that is accessible not only to managers but also to the public, creating radical transparency that increases trust and accountability.

Citizen science as an opponent of the monitoring system brings dual benefits: expanding data collection capacity while increasing public engagement with conservation. User-friendly mobile applications allow

the public to report wildlife sightings, unlawful activities, or environmental changes with geo-tagged photos and standardized forms. Gamification elements can increase participation rates, with a rewards system that recognizes the contributions of citizen scientists. Training programs for local communities in scientific observation methods improve data quality while building local capacity. Student involvement through partnerships with schools and universities creates a pipeline for future conservationists. Data validation protocols that combine automated checks with expert verification ensure that citizen-generated data meets scientific standards. Integration with traditional monitoring by rangers creates a more robust and comprehensive complementary system.

Digital platforms for transparency and accountability must go beyond simple information dissemination toward interactive engagement. Public dashboards that visualize key performance indicators such as forest cover trends, biodiversity indices, and budget use in easily understandable formats increase public oversight. Online portals for permit applications, complaints, and feedback create accessible channels for public participation. Blockchain technology can be used to create immutable records of critical decisions and transactions, preventing post-facto manipulations. Regular virtual town halls using video conferencing platforms allow for broader participation in public consultations. Social media integration with official data monitoring can counter misinformation with authoritative real-time information. Automated reporting systems that generate regular updates for various stakeholder groups ensure consistent communication flows.

Adaptive management as an operational philosophy requires fundamental shifts in organizational culture and procedures. Traditional bureaucratic approaches that emphasize rigid planning and rule compliance must transform into learning-oriented systems that embrace uncertainty and change. Structured decision-making frameworks that explicitly incorporate monitoring results, stakeholder feedback, and changing conditions become standard operating procedures. Hypothesis-driven management where each intervention is treated as an experiment with clear predictions and success metrics allows for systematic learning. Regular review cycles that not only evaluate outcomes but also question underlying assumptions create double-loop learning. Documentation of

successes and failures in accessible knowledge management systems ensure an accessible institutional memory for future decisions.

The continuous learning cycle in adaptive management requires specific mechanisms and incentives. After-action reviews for each major management intervention or incident are mandatory, with structured protocols for extracting lessons learned. Peer learning networks with other Tahura, both national and international, help knowledge exchange and adoption of best practices. Innovation funds that support experimentation with new approaches create space for calculated risk-taking. Failure tolerance policies that distinguish among negligence and good-faith experiments gone wrong encourage honesty in reporting and learning from mistakes. Academic partnerships for action research ensure that learning processes meet scientific rigor while remaining relevant for practical management.

Rapid response to changing conditions in the field requires delegation of authority and streamlined procedures that balance agility and accountability. Threshold-based response protocols that pre-authorize certain actions when specific conditions are met allow for rapid deployment without lengthy approval processes. Emergency response teams with clear mandates and resources can be mobilized quickly for threats such as forest fires or wildlife poaching surges. Real-time communication systems that connect field staff, management, and stakeholders ensure coordinated responses. Contingency funds that can be accessed with simplified procedures for urgent conservation needs avoid bureaucratic delays. Partnership agreements with local communities, NGOs, and the private sector that pre-position resources and capabilities create surge capacity for emergency situations.

The institutionalization of this innovative governance model requires careful attention to change management and sustainability. Pilot implementations at selected sites can demonstrate benefits and identify challenges before system-wide rollout. Change champions at various levels of organizations and stakeholder groups can drive adoption and overcome resistance. Gradual transition with clear milestones and support systems helps stakeholders adapt to new ways of working. Legal frameworks that support collaborative governance and adaptive management need to be developed or revised to provide legitimacy and permanence. Financial sustainability through diversified funding sources

that align with the collaborative model ensures that innovations are not dependent on short-term political support. Performance incentives that reward collaboration, innovation, and adaptive behavior replace traditional metrics that only measure compliance.

Monitoring and evaluation of governance innovations itself is critical to ensure continuous improvement. Governance indicators that measure not only efficiency but also inclusiveness, transparency, and adaptiveness need to be regularly tracked. Independent evaluations involving external experts provide impartial assessments of strengths and weaknesses. Regular stakeholder satisfaction surveys provide feedback on the perceived legitimacy and effectiveness of governance arrangements. Comparative studies with other conservation areas can identify relative performance and transferable lessons. Meta-learning about governance transformation process itself creates a knowledge base for future institutional innovations. In the terminate, the innovation of the Tahura governance model is not a one-time reform but an ongoing process of institutional evolution that is responsive to changing ecological and social contexts, proving that effective conservation in the 21st century requires governance systems that are equally sophisticated with the ecological systems they manage.

4. Sustainable Funding Strategy

Diversification of funding sources (fig.13.2.) is a fundamental strategy in ensuring the sustainability of the management of Forest Parks (Tahura) in Indonesia. Reliance on a single source of funding, especially from limited government budgets, has proven inadequate to manage vast conservation areas with complex challenges. A multi-source approach to funding not only increases the availability of funds, but also advises the participation of various stakeholders in conservation endeavors, creates a sense of shared ownership, and builds financial resilience to economic fluctuations or changes in political priorities.

Green bonds offer a significant opportunity to attract private investment in Tahura's management. These financial instruments allow local governments or Tahura managers to raise capital from investors interested in environmentally friendly projects. The funds obtained can be used for various conservation activities such as ecosystem restoration, sustainable ecotourism infrastructure development, or community empowerment programs. The success of green bonds depends on the

transparency of the use of funds, a credible monitoring system, and the ability to demonstrate measurable positive impacts on the environment. The development of a clear regulatory framework, strict verification standards, and accountable reporting mechanisms are prerequisites for building investor trust.

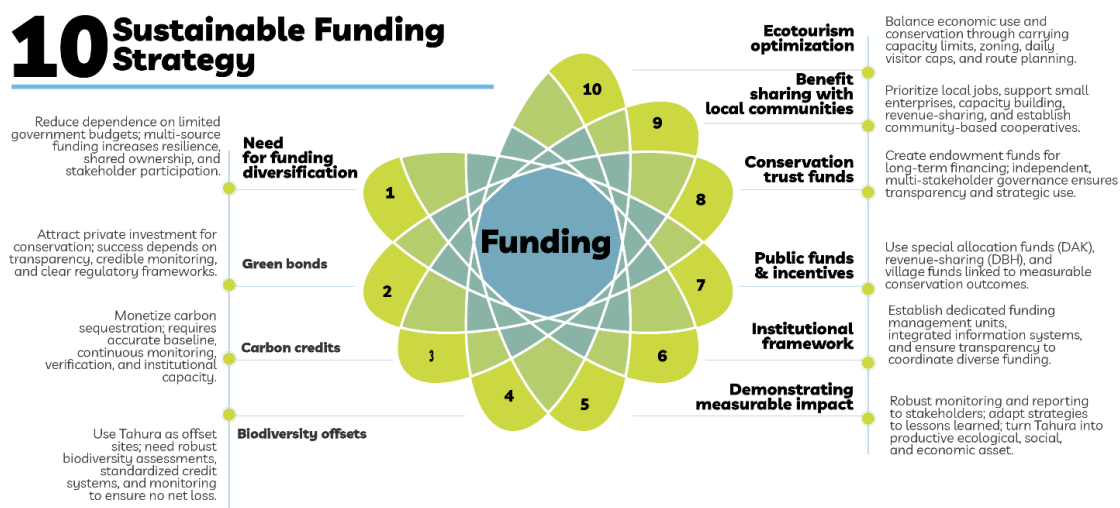


Figure 13.2. Sustainable Funding Strategy

The carbon credit scheme opens up opportunities to monetize ecosystem services provided by Tahura, especially in carbon sequestration and storage. Forests in Tahura play a vital role in mitigating climate change through carbon sequestration, and the economic value of this function can be capitalized through carbon markets. The implementation of this scheme requires an accurate baseline assessment of carbon stocks, a continuous monitoring system, and independent verification to ensure credibility. Revenues from carbon credits can be allocated for forest protection, deforestation prevention, and degraded land restoration. The main challenges lie in the technical complexity of carbon calculations, cost fluctuations in the global carbon market, and the need for adequate institutional capacity to manage these schemes.

Biodiversity offsets offer a compensation mechanism for companies or development projects that impact biodiversity in other locations. Tahura with its rich biodiversity can be an attractive offset location, where companies invest in habitat conservation or restoration as compensation for their environmental impact. The development of this scheme requires a robust biodiversity assessment method, a standardized credit system, and

a long-term monitoring mechanism. The success of biodiversity offsets depends on the principle of no net loss or even net positive impact, where conservation endeavors in Tahura must at least equal to or exceed the damage that occurred in other locations.

Optimizing the potential of ecotourism in Tahura requires a very careful approach to balance economic use and ecosystem preservation. The principle of carrying capacity is a fundamental guide in determining the maximum limit of visitors and tourist activities that can be accommodated without disturbing the ecological integrity of the area. The determine carrying capacity should consider a variety of factors including habitat sensitivity, wildlife behavior, infrastructure capacity, and the cumulative impact of tourism activities. Zoning areas with different levels of access, limiting the number of daily visitors, and setting up tourist routes that minimize disruption to the ecosystem are important instruments in the implementation of this principle.

The mechanism of benefit-sharing with local communities is a crucial aspect in the development of sustainable ecotourism in Tahura. Communities living in or within the Tahura area are often the traditional custodians of the ecosystem, but they can also be a source of pressure if not fairly involved in economic use. Benefit-sharing schemes should include various aspects such as priority employment opportunities for local communities, the development of micro and small enterprises that support ecotourism, capacity building programs, and the allocation of a certain percentage of tourism revenue for community development. The establishment of cooperatives or village-owned enterprises that manage certain aspects of ecotourism can strengthen the community's sense of ownership and responsibility.

Conservation trust funds offer solutions to long-term funding challenges often faced in the management of conservation areas. A professionally managed endowment fund can generate sustainable income from investments, while maintaining principal capital. An independent governance structure with multi-stakeholder representation ensures transparency and accountability in fund management. Initial sources of capital can come from international donors, private philanthropy, or special allocations from the government. The success of trust funds depends on prudent investment management, minimal

overhead costs, and strategic allocation of funds for priority conservation activities.

The use of regional transfer funds and village funds for Tahura conservation requires the development of clear and measurable incentive mechanisms. The environmental Special Allocation Fund (DAK) can be directed especially for the management of Tahura with clear performance indicators. The Natural Resources Revenue Sharing Fund (DBH) can be partially allocated for conservation as compensation for ecosystem services provided by Tahura. For village funds, the development of a PES scheme can encourage villages around Tahura to actively participate in conservation. Incentive mechanisms should be designed based on performance-based principles, where the allocation of funds is linked to the achievement of measurable conservation targets such as reducing deforestation rates, increasing forest cover, or restoring key species populations.

The integration of these various funding sources requires a strong institutional framework with adequate planning, implementation, and monitoring capacity. The establishment of a special funding management unit at the Tahura level with expertise in financial management, fundraising, and impact assessment is an urgent need. The development of an integrated management information system can help coordination among funding sources and ensure that there is no duplication or gap in the financing of conservation activities. Transparency and accountability in the management of funds from various sources are key to building trust and ensuring the sustainability of financial support.

The success of Tahura's funding diversification ultimately depends on the ability to demonstrate a measurable positive impact, both in conservation and community welfare. The development of a robust monitoring and evaluation system, periodic reporting to various stakeholders, and the adaptation of strategies based on learning are important elements in building a financially and ecologically sustainable Tahura management model. With a holistic and innovative approach to funding, Tahura can transform from a budget burden to a productive asset that provides ecological, economic, and social benefits for current and future generations.

B. Institutional and Operational Innovation

1. Institutional Capacity Strengthening

Strengthening the institutional capacity (fig.13.3.) of the Tahura Technical Implementation Unit (UPT) is a critical foundation in realizing effective and adaptive management of conservation areas to contemporary challenges. This institutional transformation is not just a structural change, but a paradigm shifts toward a dynamic, responsive, and knowledge-based learning organization. UPT Tahura must evolve from a traditional technical implementation unit that focuses on administrative and security functions to a modern institution that can integrate biodiversity conservation, sustainable development, and community welfare in one coherent management framework.

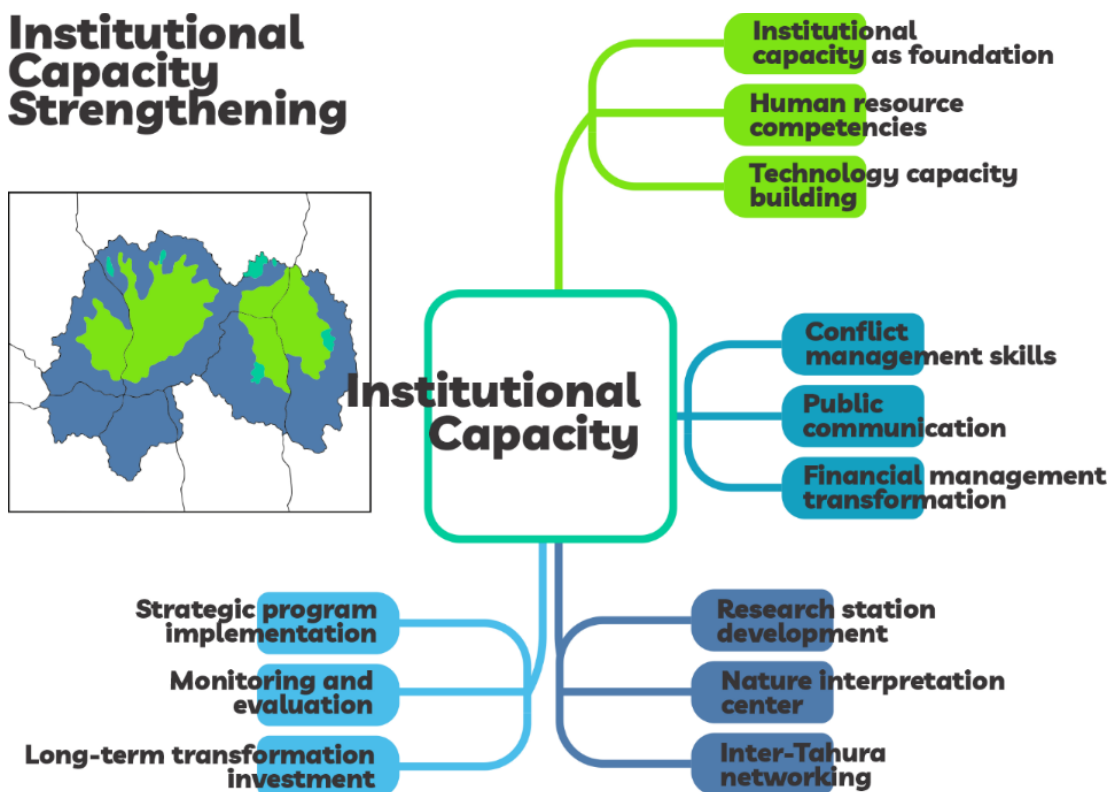


Figure 13.3. Institutional Capacity Strengthening

Improving the competence of human resources in modern ecosystem management is a top priority given the complexity of current conservation challenges. Tahura managers are no longer enough to have only basic knowledge of forestry, but must master an interdisciplinary approach that includes landscape ecology, conservation biology, socio-economics, and

information technology. An in-depth understanding of ecosystem dynamics, species interactions, and the impact of climate change is an essential competency. Spatial analysis skills, ecological modeling, and interpretation of scientific data are necessary to make scientifically accountable evidence-based management decisions.

Capacity building programs in conservation technology must be designed systematically and in stages, starting from mastery of basic technology to advanced applications. Training on the use of GPS and GIS for mapping and monitoring areas is a basic competency that must be mastered by all field staff. The use of drones for aerial surveys, camera traps for animal monitoring, and remote sensors for early detection of forest fires require special and ongoing training. Mastery of DNA barcoding technology for species identification, acoustic monitoring for biodiversity surveys, and satellite imagery analysis for the detection of land cover changes are advanced skills that need to be developed in certain staff. The implementation of blockchain technology for the chain of custody of forest products and artificial intelligence for the analysis of animal movement patterns opens up innovation opportunities in the management of Tahura.

Conflict management is a crucial competency considering that Tahura is often an arena for the meeting of various potentially conflicting interests. Human-wildlife conflicts, territorial boundary disputes, resource use by communities, and clashes among conservation and development require sophisticated resolution approaches. Mediation, negotiation, and facilitation training in multi-stakeholder dialogue are urgent needs. An understanding of customary law, the social dynamics of local communities, and a collaborative governance approach are needed to transform conflict into collaborative opportunities. The development of clear conflict management protocols, early warning mechanisms, and regular dialogue platforms can prevent conflict escalation and build trust with various parties. Effective public communication skills are becoming increasingly important in the digital information age where public perception can influence political and social support for conservation. Tahura staff need to master storytelling techniques to communicate conservation values, media relations with build a positive image, and social media management to engage with the younger generation. The development of engaging educational content, creative awareness campaigns, and inclusive outreach programs requires a combination of communication, design, and

understanding of mass psychology. Crisis communication skills are vital to manage sensitive issues such as animal conflicts or forest fires that can trigger negative public reactions.

Sustainable financial management requires a transformation from a routine budget management mindset to entrepreneurial thinking that can identify and optimize various sources of income. Financial planning, budgeting, and accounting training specific to conservation organizations is the foundation. The ability to prepare competitive funding proposals, manage multiple funding sources with different requirements, and conduct financial reporting that meets international standards are critical skills. Understanding innovative financing mechanisms such as green bonds, carbon trading, and PES requires special training. The development of a business plan for conservation business units such as ecotourism or non-timber forest products require a combination of conservation and business knowledge.

The development of a research station in Tahura opens up transformative opportunities to improve the scientific knowledge base while positioning Tahura as a center of excellence in conservation research. A well-equipped research station with field laboratories, research accommodation facilities, and data infrastructure can attract collaboration with national and international universities and research institutions. Research focuses can include biodiversity assessment, ecosystem services valuation, climate change impacts, and sustainable livelihood models. The development of standardized research protocols, database management systems, and knowledge sharing mechanisms ensures that research results can be accessed and utilized for management improvement. Research fellowships, student internships, and citizen science programs can expand research capacity while building a broader conservation constituency.

The natural interpretation center serves as an interface among Tahura and the community, transforming complex scientific knowledge into an engaging and memorable learning experience. The design of interpretation centers must integrate modern technologies such as virtual reality for immersive experiences, interactive displays for hands-on learning, and multimedia presentations for powerful storytelling. The development of a tiered interpretive program for a wide range of age groups and backgrounds, from schoolchildren to researchers, requires creativity and pedagogical understanding. Training interpreters who are

able to bring conservation stories to life, help experiential learning, and inspire action for conservation is an important investment.

The strengthening of inter-Tahura networks creates a collective learning platform that accelerates the adoption of innovations and best practices. The establishment of regular forums for knowledge exchange, both through physical meetings and digital platforms, helps the sharing of experiences in overcoming similar challenges. The development of a community of practice for specific topics such as wildlife management, ecotourism development, or community engagement can deepen expertise. The inter-Tahura staff exchange program provides exposure to different management approaches and builds a professional network. The standardization of the monitoring and reporting system among Tahura allows for systematic benchmarking and comparative learning.

The implementation of this capacity building program requires a strategic and systematic approach. The preparation of a comprehensive training needs assessment is the first step to identify competency gaps. The development of clear learning pathways for various positions and career paths ensures structured human resource development. The combination of formal training learning methods, mentoring, on-the-job learning, and self-directed learning accommodates a variety of learning styles. Establishing partnerships with educational institutions and training providers ensures access to the expertise and resources needed.

Monitoring and evaluating the effectiveness of capacity building programs is crucial to ensure return on investment. Development of key performance indicators that measure not only knowledge improvement but also behavioral changes and impacts on management effectiveness. Pre and post training assessments, 360-degree feedback, and impact evaluations can provide insights for program improvement. Documentation and dissemination of best practices from capacity building programs can inspire replication and scale-up in another Tahura.

The institutional transformation of UPT Tahura through capacity building is a long-term investment that requires sustained commitment from various levels of government. Adequate and consistent budget allocation for human resource development, enabling policy support, and visionary leadership are critical enablers. With strong institutional capacity, Tahura can transform into a conservation area management model that not only protects biodiversity but also contributes significantly to

sustainable development and community welfare. The success of this transformation will determine the future of Tahura as the last bastion of biodiversity as well as a living laboratory for harmony among humans and nature.

2. Integration of Technology and Innovation

The integration of technology and innovation (fig. 13.4.) in Tahura management marks a paradigm shift from conventional approaches to smart-conservation management that is more efficient, accurate, and responsive. This digital transformation is not just the adoption of advanced devices, but a fundamental restructuring in the way Tahura is managed, monitored, and communicated to the public. Technology enables managers to overcome human resource limitations, expand the scope of monitoring, improve data accuracy, and accelerate real-time scientific evidence-based decision-making.

GIS have revolutionized the way Tahura managers understand and manage the complex landscape of conservation areas. Multi-layer spatial data integration allows for comprehensive visualization of vegetation distribution, animal habitats, use zones, and potential conflict areas in a single, integrated platform. Advanced spatial analysis capabilities such as habitat suitability modeling, corridor analysis, and fragmentation assessment provide critical insights for conservation planning. Regular data updates through high-resolution satellite imagery allow for the detection of land cover changes, the identification of deforestation hotspots, and the monitoring of restoration effectiveness. The development of a centralized geodatabase with consistent metadata standards helps data sharing among institutions and supports collaborative decision-making.

Drone technology has opened up a new dimension in Tahura monitoring that was previously unaffordable or too expensive with conventional methods. The drone's ability to access difficult areas, produce ultra-high-resolution imagery, and perform rapid surveys of large areas makes it an invaluable tool for a wide range of applications. Routine monitoring of vegetation health using multispectral sensors can detect plant stress before it is visible to the naked eye, allowing early intervention against diseases or pests. The use of thermal imaging to detect nocturnal animals or monitoring fire hotspots provides data that was previously very difficult to obtain. The drone's LiDAR technology enables 3D mapping of

forest structures with centimeter precision, providing accurate biomass and carbon stock data for carbon trading schemes.

Camera trap networks have transformed wildlife monitoring from sporadic activity to systematic 24/7 surveillance. The strategic placement of camera traps in wildlife corridors, salt licks, and water sources results in comprehensive data abundance, distribution, and behavior patterns. The integration of artificial intelligence for automatic species identification accelerates the analysis of thousands of photos and videos, reducing the time-consuming manual workload.

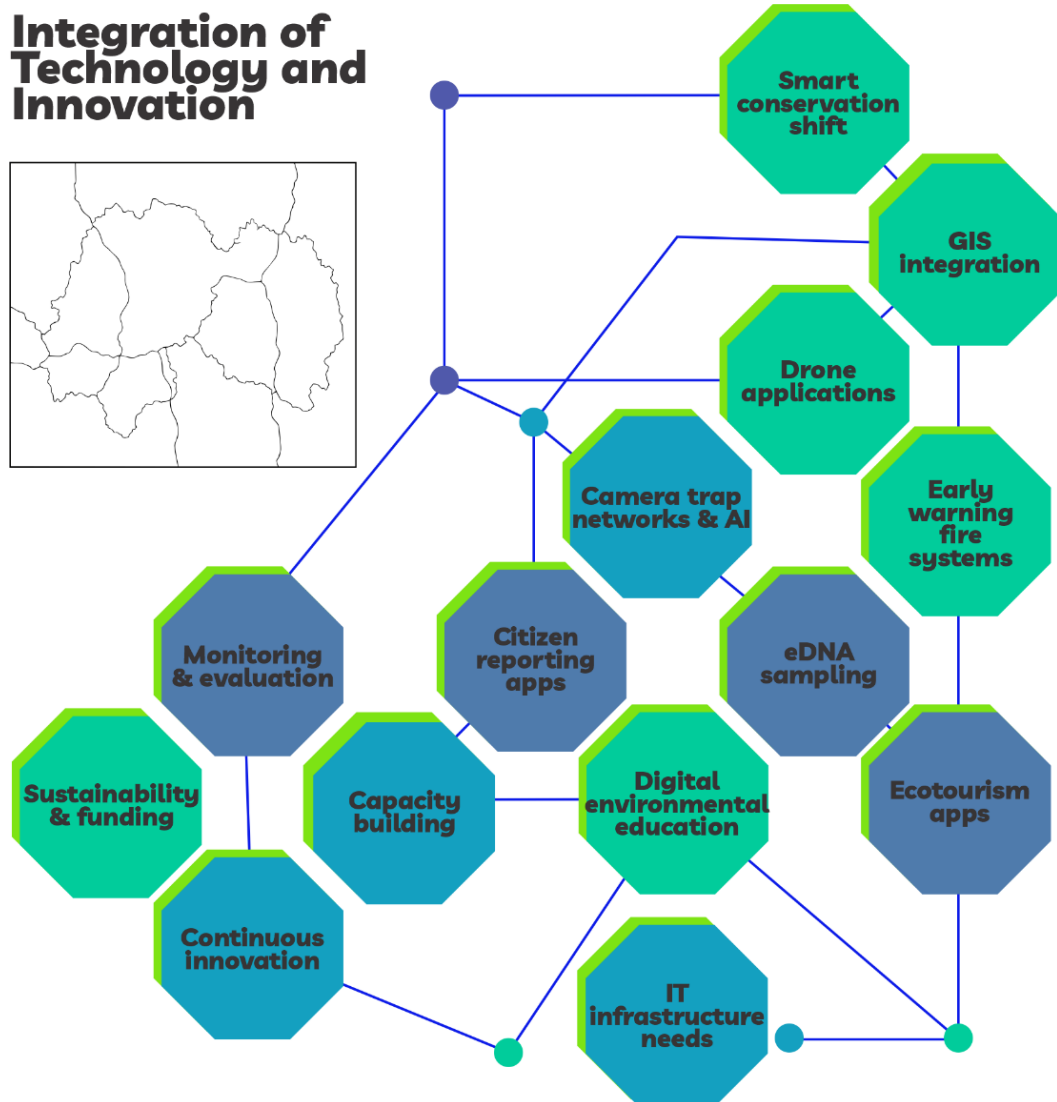


Figure 13.4. Intrgation of technology and innovation

The development of camera traps with cellular or satellite connectivity allows real-time monitoring and rapid response to poaching

activities or the presence of conflict animals. Individual identification using pattern recognition for species such as tigers or leopards provides precise population data for conservation planning. Environmental DNA (eDNA) sampling represents a new frontier in biodiversity assessment that is non-invasive and highly sensitive. The ability to detect the presence of species from water or soil samples without the need for direct observation opens up opportunities for monitoring cryptic, rare, or elusive species that are difficult to detect with conventional methods. The development of standardized sampling protocols, mobile laboratories for field analysis, and local DNA reference databases are the keys to effective implementation. eDNA metabarcoding allows for a comprehensive assessment of biological communities from a single sample, providing a comprehensive baseline of biodiversity data. The apply eDNA for early detection of invasive species or monitoring the health of aquatic ecosystems provides a powerful tool for adaptive management.

Digital platforms for public reporting create participatory surveillance networks that expand the scope of monitoring beyond the manager's formal capacity. A user-friendly mobile application that allows the public to report wildlife sightings, unlawful activities, or environmental hazards with geo-tagged photos creates an early warning system based on crowdsourcing. Gamification elements such as points, badges, and leaderboards can increase engagement and sustain long-term participation. Integration with social media platforms expand reach and creates community conservation champions. Verification mechanisms and quality control protocols ensure the reliability of data from citizen scientists.

Early warning systems for wildfires integrate multiple data sources for accurate prediction and early detection. Satellite-based fire detection systems such as MODIS or VIIRS provide coverage of a wide area with frequent updates, while ground-based sensors provide real-time microclimate and fuel moisture data. Machine learning algorithms that analyze historical fire patterns, weather data, and vegetation conditions can predict fire risk with high accuracy. Integration with communication systems allow automatic alerts to fire teams, affected communities, and relevant stakeholders. The development of fire behavior modeling helps plan effective suppression strategies and evacuation plans. The development of mobile applications for ecotourism transforms the visitor experience while increasing conservation awareness. Interactive trial

guides with augmented reality features provide contextual information about the flora, fauna, and ecosystems encountered. Multi-lingual audio guides expand accessibility for international travelers. Integrated booking systems for permits, guides, and accommodation simplify planning and ensure carrying capacity compliance. Digital payment integration reduces cash handling and increases revenue transparency. Visitor feedback mechanisms and rating systems provide data for continuous improvement services.

Environmental education through digital platforms expand the reach of awareness programs beyond physical visits to Tahura. Virtual field trips using 360-degree videos and virtual reality provide immersive experiences for schools that are far away or unable to make physical visits. Interactive e-learning modules with multimedia content, quizzes, and certificates create structured learning pathways. Online webinar series with experts provides access to cutting-edge conservation knowledge. Social media campaigns with viral content potential reach a digital-native young demographic. Development of educational games that are entertaining yet information teaches conservation concepts through play-based learning. The implementation of this technology requires a robust and reliable supporting infrastructure. The development of IT infrastructure including servers, network connectivity, and sustainable power systems is a prerequisite. Cybersecurity measures to protect sensitive data about endangered species or enforcement operations are critical. Cloud-based solutions provide scalability and accessibility, but require reliable internet connectivity which is still a challenge in remote areas. Hybrid solutions that combine cloud and local storage can solve connectivity issues.

Capacity building for technology adoption is just as important as the technology itself. Training programs that range from basic digital literacy to advanced data analysis ensure that staff can optimize technology investments. The establishment of a dedicated IT support team or partnerships with tech companies ensures timely troubleshooting and maintenance. Clear documentation and standard operating procedures help knowledge transfer and sustainability. Regular technology audits and updates ensure systems remain current and secure. Data management and integration are challenges as well as opportunities in technology adoption. The development of integrated data management systems that can accommodate various data types from multiple sources requires

careful planning. Data standardization protocols ensure interoperability among systems. User-friendly analytics dashboards transform raw data into actionable insights for decision makers. Open data policies that are balanced with security concerns can help research collaborations and innovation.

Monitoring and evaluating technology effectiveness is crucial to justify investments and guide future development. Key performance indicators that measure efficiency gains, accuracy improvements, and conservation outcomes provide evidence for continued support. A comprehensive cost-benefit analysis considers not only financial returns but also conservation and social impacts. User satisfaction surveys and usability testing ensure that technology remains relevant and user-friendly. Documentation best practices and lessons learned help replication and scaling. Sustainability technology initiatives require viable business models and diversified funding strategies. Revenue generation through data services, technology licensing, or consulting can offset operational costs. Partnerships with tech companies through corporate social responsibility programs can provide expertise and resources. Grant funding from conservation technology initiatives can support pilot projects and innovations. Government budget allocations that recognize technology as essential infrastructure for modern conservation are critical for long-term sustainability. The integration of technology in the management of Tahura is not a destination but a continuous journey that requires adaptability and innovation mindset. Emerging technologies such as Internet of Things sensors, blockchain for supply chain tracking, or quantum computing for complex ecological modeling will continue to open up new possibilities. The success of technology integration will be determined by the ability to align technological capabilities with conservation objectives, ensuring that technology remains as an enabler to achieve the ultimate goal of preserving biodiversity and ecosystem services for future generations.

C. Implementation and Sustainability

1. Community Empowerment and Local Wisdom

Community empowerment and the integration of local wisdom in the management of Tahura represent a fundamental shift from an exclusive conservation approach to an inclusive model that recognizes communities as equal partners in nature conservation. This new paradigm recognizes

that long-term conservation sustainability is impossible without the active support and substantive involvement of the communities living in and around the Tahura region. Indigenous and local peoples who have inhabited and managed these landscapes for generations have in-depth knowledge of ecosystems, seasonal patterns, animal behaviors, and natural resource dynamics that are often more detailed and nuanced than modern scientific knowledge.

Recognition of the rights of indigenous and local peoples requires a fundamental policy transformation, moving from a state-centric approach to collaborative governance that respects legal pluralism. These rights include not only access to resources for subsistence livelihoods, but also the right to participate in decision-making, the right to cultural identity, and the right to maintain traditional management systems that have proven to be sustainable. The implementation of FPIC in every policy or program that affects society is a nonnegotiable principle. The development of a legal mechanism that recognizes customary management areas in the Tahura zoning, while maintaining the conservation function, creates a win-win model that respects rights while strengthening ecosystem protection.

Conservation partnership schemes must be built on a foundation of equality, mutual respect, and fair benefit-sharing. This partnership model moves beyond tokenism toward a substantive role sharing where the community becomes co-managers with clear authority and responsibility. The development of detailed conservation agreements regulate the rights and obligations of each party, a joint decision-making mechanism, and a participatory monitoring system. The establishment of joint management committees with balanced representation ensures that the voice of the community is heard at every level of decision-making. Capacity building for communities in the technical aspects of conservation, organizational management, and negotiation ensures they can participate effectively as equal partners.

The benefit-sharing mechanism must be comprehensive and equitable, including direct economic benefits, capacity building, and socio-cultural recognition. Revenue sharing from ecotourism, carbon credits, or bioprospecting must be transparent with a mutually agreed formula. Prioritize employment for local communities in various Tahura management positions, from ranger to level management, with clear career development pathways. Investing in community infrastructure such

as access to clean water, education, and health as an integral part of conservation benefits. Recognition and celebration of local wisdom through documentation, cultural festivals, and integration in environmental education programs strengthen community pride and ownership.

Livelihood improvement programs that are synergistic with conservation require a holistic approach that understands the complexity of people's livelihood systems. Agroforestry as a sustainable agricultural system integrates native tree species with food crops and cash crops, creating a mosaic landscape that supports biodiversity as well as economic productivity. Development of a site-specific agroforestry model, taking into account local ecological conditions, community preferences, and market opportunities. Technical help for the selection of optimal combination species, nursery development for quality seeds, and market linkages for agroforestry products. Organic or sustainable certification for premium pricing can increase income while encouraging environmentally friendly practices.

The silvopastur system integrates trees, animal feed, and livestock in a single management unit, creating a synergy that increases land productivity while providing ecosystem services. The selection of fodder trees that are nutritious and adaptive to local conditions, rotational grazing systems that prevent overgrazing, and the integration of resilient local livestock. Development of value chains for livestock products and their derivatives with processing facilities at the community level. Silvopastur not only reduces grazing pressure within Tahura but also improves carbon sequestration and soil health in buffer zone lands. The cultivation of non-timber forest products (NTFP) offers sustainable economic opportunities without damaging the forest structure. Identify potential NTFPs through ethnobotanical studies involving local knowledge, from medicinal plants, forest fruits, resins, to craft materials. Development of cultivation protocols that maintain genetic diversity and ecological functions. The establishment of cooperatives for collective marketing and value addition strengthens the bargaining position of the community. Quality control and certification systems ensure market acceptance and premium pricing. Research and development for product innovation can open up new market opportunities.

The revitalization of local wisdom in natural resource management requires a respectful approach that recognizes the validity and value of

traditional knowledge. Systematic documentation of local knowledge through participatory research methods, involving elder knowledge holders and youth to ensure inter-generational transmission. Scientific validation of traditional practices can strengthen legitimacy and encourage wider adoption. The integration of traditional ecological calendars with modern conservation planning optimizes the timing of interventions. Sacred forests and customary-protected ritual sites are often important biodiversity refuges for conservation. Traditional management systems such as sasi, lubuk larangan, or customary forests contain sophisticated sustainability principles. Temporal restrictions on harvesting allow for resource regeneration, spatial zoning protects critical habitats, and social sanctions ensure compliance without costly formal enforcement. Strengthening customary institutions with legal recognition and resource support can revitalize these systems. Bridging traditional knowledge with scientific methods through collaborative research creates hybrid knowledge systems that are more robust and adaptive.

The implementation of community empowerment requires a fundamental change in the mindset of government officials and conservation practitioners. Moving beyond paternalistic approaches toward genuine partnerships requires humility, patience, and a willingness to learn from the community. Cultural sensitivity training for Tahura staff ensures respectful engagement. Conflict resolution mechanisms that integrate customary law with formal legal systems can resolve disputes fairly and culturally appropriate. The development of a platform for dialogue and knowledge exchange among the community, Tahura managers, and other stakeholders creates dynamic learning networks. Regular community forums for discussing issues, sharing experiences, and collective problem-solving. Exchange visits among communities for cross-learning best practices. Youth engagement programs that bridge traditional knowledge with modern conservation approaches, prepare next generation conservation leaders who are rooted in local wisdom but equipped with contemporary skills.

Monitoring and evaluation of empowerment programs must use holistic indicators, not only measuring conservation outcomes but also wellbeing improvements and cultural vitality. Participatory monitoring methods that involve the community in data collection and analysis build ownership and capacity. Regular social impact assessments ensure that

programs remain beneficial and do not cause unintended negative consequences. Adaptive management that is responsive to community feedback ensures that programs remain relevant and effective. Scaling up successful community empowerment initiatives requires enabling policy environment and institutional support. Policy reforms that recognize community-based conservation as a legitimate and effective approach. Adequate budget allocations for community programs, not only for enforcement and infrastructure. Capacity building for government officials in participatory approaches and collaborative governance. Documentation and dissemination best practices to inspire replication in another Tahura. The long-term sustainability of community empowerment depends on internalizing conservation values in the cultural fabric of the community. When conservation becomes an integral part of the community's identity and pride, not an imposed obligation, then sustainability is guaranteed. Culturally grounded environmental education for the younger generation, integration of conservation themes in cultural expressions such as music and art, and celebration success stories can strengthen conservation culture. Sustained economic empowerment ensures that communities have long-term incentives for conservation.

The integration of community empowerment and local wisdom in the management of Tahura is not only a more effective conservation strategy, but also an imperative of social justice. Recognizing communities as legitimate custodians of the landscapes they have inhabited for generations, respecting their knowledge and practices, and ensuring they receive a fair share of conservation benefits is the foundation for truly sustainable conservation. This model transforms Tahura from protected areas that separate humans from nature to lived landscapes where human welfare and natural preservation reinforce each other in a harmony that has been proven to last for centuries.

2. Communication and Advocacy Strategy

Effective communication and advocacy strategies are a fundamental catalyst in the transformation of Tahura management policies, given that long-term conservation success is highly dependent on broad public support and sustained political commitment. In the dynamic digital information age, traditional one-way, top-down communication approaches are no longer adequate to build strong conservation

constituencies. A sophisticated, multi-channel, and adaptive communication strategy is needed that can reach various segments of society with relevant, engaging, and persuasive messages. Transforming public perception of Tahura from just a prohibited area to a valuable asset that provides tangible benefits to the community requires a compelling and evidence-based narrative. Awareness campaigns about the value of the Tahura ecosystem must be built on a deep understanding of the target audience, their motivations, and the most effective communication channels. Audience segmentation based on demographics, psychography, and behavior allows for the customization of messages that resonate with each group. For the urban middle class, the emphasis on recreational values and Tahura's contribution to air and water quality can be more persuasive. For rural communities, the focus on ecosystem services that support agriculture and fisheries and the economic opportunities from conservation are more relevant. For the youth demographic, framing conservation as a movement for climate action and sustainable future can trigger passionate engagement.

The multimedia approach in the awareness campaign optimizes the power of various mediums to convey conservation messages comprehensively and engagingly. A cinematographic documentary about Tahura's biodiversity can trigger a powerful emotional connection. Podcast series with local conservation heroes provide relatable human stories. Visually appealing infographics simplify complex data about ecosystem services into easy-to-understand and shareable information. Immersive virtual reality experiences bring audiences to "visit" Tahura without leaving home. Stunning photography exhibitions showcasing the beauty and uniqueness of Tahura can reach art enthusiasts who may not be interested in conventional conservation messaging. Influencer engagement has become a game-changer in the modern communication landscape, especially to reach the younger generation who are skeptical of institutional messaging. Identifying and collaborating with local micro-influencers who have an authentic connection with their followers can be more effective than expensive celebrity endorsements. Travel bloggers who explore Tahura ecotourism, environmental activists who voice conservation issues, and local celebrities who have genuine concern for the environment can be credible ambassadors. Content creation workshops for influencers

ensure they have accurate knowledge and can communicate conservation messages authentically in their own style.

Environmental education programs that are integrated with local school curricula create a long-term foundation for conservation awareness. The development of learning modules that are aligned with national curriculum standards but contextualized with local issues ensures relevance and adoption by schools. Comprehensive teacher training programs equip educators with the knowledge, skills, and resources to teach environmental topics in an engaging. Well-designed field trips to Tahura with pre and post activities maximize learning outcomes. School conservation clubs that are helped can be an incubator for young conservation leaders. Innovation in environmental education includes the use of technology and experiential learning approaches. Gamified mobile apps teach biodiversity identification while encouraging outdoor exploration. Citizen science projects where students contribute to real research provide a sense of purpose and ownership. School gardens that apply Tahura ecological principles on a micro scale provide hands-on learning opportunities. Art and cultural competitions with the theme of Tahura conservation encourage creative expression as well as deepening understanding. Mentorship programs that connect students with conservation professionals provide career pathway inspiration.

Regular policy briefs for decision makers require a different strategic approach from public communication. Understanding policy cycles, budget processes, and political dynamics is crucial for effective timing and framing. Policy briefs must be concise but comprehensive, present robust yet accessible evidence, and provide actionable recommendations that are feasible. Data visualization through charts and maps helps busy policymakers quickly grasp key points. Case studies from other regions that have successfully integrated conservation with development provide a persuasive precedent. The content of the policy brief must emphasize the co-benefits of Tahura conservation that are aligned with regional development priorities. The economic valuation of ecosystem services shows Tahura's concrete contribution to the regional economy. The health benefits of urban forests in reducing air pollution and heat island effects are relevant to the public health agenda. Disaster risk reduction through watershed protection resonates with concerns about flooding and drought. Job creation potential from sustainable tourism and forest-based

enterprises addresses unemployment issues. Framing conservation as an investment for sustainable development rather than constraint can shift political perspectives. Building relationships with key decision makers requires sustained engagement beyond formal policy briefs. Regular informal briefing sessions can build trust and understanding. Well-organized field visits provide first-hand experience of Tahura's values and challenges. Participation in policy forums and development planning processes ensures conservation perspectives are represented. Coalition building with other sectors such as tourism, agriculture, and health can amplify advocacy voices. Strategic media engagement can create public pressure for political action.

Digital advocacy campaigns optimize the power of social media and online platforms to mobilize public support. Catchy hashtag campaigns can go viral and create momentum for policy change. Well-crafted online petitions with clear questions can demonstrate public support to decision makers. Social media monitoring and analytics provide insights into public sentiment and campaign effectiveness. Rapid response teams that can quickly address misinformation or respond to emerging issues maintain narrative control. Integration of online and offline campaigns creates powerful omni-channel advocacy. Storytelling as a core element of communication strategy humanizes conservation issues and creates emotional connections. Success stories from communities who benefited from Tahura conservation provide tangible examples. Wildlife stories that are dramatic but scientifically accurate can capture the public imagination. Historical narratives about community relations with Tahura strengthen the sense of heritage and identity. Vivid future scenarios illustrate the consequences of today's action or inaction. Personal testimonials from various stakeholders provide multiple perspectives that enrich understanding.

Monitoring and evaluating the effectiveness of communication and advocacy is essential for adaptive management. Media monitoring for track coverage volume and sentiment provides immediate feedback. Survey research to measure awareness levels and attitude changes provides deeper insights. Website and social media analytics show engagement patterns and content preferences. Policy tracking to monitor adoption of recommendations shows advocacy impact. Documentation lessons learned and best practices help continuous improvement and

knowledge sharing. Partnerships and collaborations in communication and advocacy can multiply impact with pooled resources and expertise. Media partnerships can ensure sustained coverage and professional content production. NGO coalitions can coordinate messaging and avoid duplication. Academic partnerships can provide research backing and credibility. Private sector partnerships can bring marketing expertise and funding. International partnerships can provide global visibility and technical support. Community partnerships ensure grassroots authenticity and local ownership.

Sustainability of communication and advocacy strategies requires adequate institutionalization and resource allocation. Dedicated communication units in the management of Tahura with professional staff and sufficient budget. Communication strategies that are formally adopted with clear objectives and indicators. Continuous capacity building programs for staff and partners. Innovation funds for experimenting with new approaches and technologies. Knowledge management systems for capturing and sharing communication assets and learnings. Crisis communication preparedness is crucial considering the potential for negative events such as forest fires, wildlife conflicts, or corruption cases. Pre-developed protocols and messaging for various scenarios enable rapid response. Spokesperson training ensures consistent and credible communication. Stakeholder mapping for quick mobilization of supporters. Strong media relationships help balanced coverage. Transparent communication that acknowledges challenges while emphasizing solutions can maintain public trust even in difficult situations.

Tahura's policy transformation through effective communication and advocacy is not a quick fix but a long-term investment in changing hearts, minds, and ultimately behaviors. Success requires persistence, creativity, and adaptability in the face of changing media landscapes and political dynamics. When the wider community understands and appreciates the value of Tahura, when the younger generation is inspired to become conservation champions, and when decision makers see conservation as a political asset rather than a liability, then sustainable policy transformation can be realized. Strategic communication and advocacy are bridges that connect scientific knowledge with public action, conservation goals with political will, and ultimately, present challenges with future solutions.

3. Monitoring and Evaluation Mechanism

Monitoring and evaluation mechanisms in natural resource management are fundamental components that ensure the effectiveness of program implementation and long-term sustainability. The system is designed as a comprehensive framework that integrates systematic data collection, in-depth analysis, and continuous feedback to support evidence-based decision-making. A holistic monitoring approach considers the complexity of interactions among ecological systems, social dynamics, and economic aspects, thus providing a comprehensive picture of the impact and effectiveness of management interventions. Ecological indicators are critical parameters in measuring ecosystem health and the effectiveness of conservation endeavors.

Biodiversity measurements are carried out through a variety of methods including species surveys, genetic diversity analysis, and assessment of ecological community structures. Forest cover monitoring uses remote sensing and ground truthing technology to detect temporal changes in habitat area and quality. Water quality is analyzed through physico-chemical and biological parameters that reflect the integrity of the aquatic ecosystem. This ecological data is collected periodically with standard protocols to ensure consistency and comparability among times.

The social dimension in monitoring includes an in-depth assessment of the dynamics of community participation and conflict management. The level of participation is measured not only quantitatively through the number of participants in the activity, but also the quality of involvement, the representation of various social groups, and the influence of the community in decision-making. Conflict monitoring involves identifying the sources of tension, the frequency and intense disputes, and the effectiveness of the resolution mechanisms implemented. Gender analysis and social inclusion are integral to ensuring equitable distribution of benefits and meaningful participation of marginalized groups. Economic indicators are designed to capture the impact of management on the welfare of local communities and the financial sustainability of the program.

Household income measurements were carried out through periodic surveys that compared welfare levels before and after the intervention. Green job creation is monitored through documentation of new economic opportunities arising from conservation and sustainable management

activities. The value chain analysis of eco-friendly products provides insight into the long-term economic potential of sustainable management practices.

The implementation of periodic reviews every 3-5 years is a crucial moment for deep reflection and strategic adjustment. The review process involves a comprehensive analysis of target achievement, identification of key learnings, and evaluation of the assumptions underlying the program design. The multidisciplinary review team integrates technical, social, and managerial perspectives to produce holistic recommendations. The results of the review are the basis for revising the management plan, reallocating resources, and adapting strategies according to changes in context and lessons learned. Independent environmental and social audits provide an more layer of accountability and credibility in management systems. External auditors with specific expertise conduct impartial verification of claims of achievement and compliance with applicable standards. The audit process includes documentation review, field verification, and consultation with various stakeholders to validate the information. The audit findings are published transparently to increase public trust and provide lessons for similar initiatives.

Information technology plays a transformative role in improving the efficiency and effectiveness of monitoring systems. Digital platforms enable real-time data collection through mobile apps, integration of data from multiple sources, and easy-to-understand visualization of information. GIS help in-depth spatial analysis of landscape changes and impact distributions. The interactive dashboard gives decision makers quick access to key information for timely responses. Institutional capacity to carry out effective monitoring and evaluation requires continuous investment in human resource and systems development. Regular training for field staff in data collection methodologies, statistical analysis, and reporting improves the quality of the information generated. The establishment of a dedicated monitoring and evaluation unit with adequate budget allocation ensures continuity and professionalism in the implementation of this function. Partnerships with research institutions and universities enrich analytical capacity and provide scientific validation of monitoring findings.

4. Synergy with the Global Agenda

Aligning the transformation of Forest Parks policy with the global agenda is a fundamental strategy to maximize conservation impacts while accessing substantial international support. Indonesia, as a mega biodiversity country with the third largest tropical forest in the world, has a strategic position in the global environmental governance architecture. The integration of Tahura management into the framework of international commitments not only enhances the effectiveness of local conservation, but also strengthens Indonesia's position in global environmental diplomacy and opens up access to significant technical and financial resources. Tahura's contribution to Indonesia's Nationally Determined Contribution (NDC) is very crucial considering the ambitious target of reducing emissions of 31.89% with its own endeavors or 43.20% with international support by 2030. Tahura, with its function as a carbon sink and water system regulator, can make a significant contribution through ecosystem restoration programs, deforestation prevention, and sustainable forest management. Quantification of carbon stocks in Tahura through an internationally standardized method allows credible reporting in the national greenhouse gas inventory. The implementation of nature-based solutions in Tahura, such as peatland restoration and mangrove rehabilitation, provides co-benefits of climate change adaptation and mitigation that can be counted in the achievement of NDCs.

The linkage with the Sustainable Development Goals (SDGs) reflects a holistic approach to Tahura management that integrates environmental, social, and economic dimensions. Tahura contributes directly to SDG 15 (Life on Land) through biodiversity conservation and terrestrial ecosystem restoration. Tahura's integrated management supports SDG 6 (Clean Water and Sanitation) by protecting water catchment areas and maintaining the quality of water resources. Community empowerment programs around Tahura contribute to SDG 1 (No Poverty) and SDG 8 (Decent Work and Economic Growth) through the creation of sustainable livelihoods. The inclusive approach in Tahura's governance supports SDG 5 (Gender Equality) and SDG 10 (Reduced Inequalities) by ensuring meaningful participation from marginalized groups. Harmonization with the Post-2020 Global Biodiversity Framework adopted in the Kunming-Montreal Global Biodiversity Framework positions Tahura as a key instrument for achieving the 30x30 conservation target. The framework

targets the protection of 30% of the global land and oceans by 2030, to which Tahura can contribute through the expand effective conservation areas and improved ecological connectivity. The implementation of specific targets such as the restoration of degraded ecosystems, the management of invasive species, and the integration of biodiversity values in development planning can be operationalized through measurable and reported Tahura programs.

Access to international climate finance opens up transformative opportunities to increase the scale and impact of Tahura's management. The Green Climate Fund (GCF), with a portfolio of more than \$10 billion, provides funding for projects that have a significant impact on climate change mitigation and adaptation. Tahura can access GCF funding through the development of proposals that demonstrate transformational impact, country ownership, and paradigm shift in forest management. Projects such as ecosystem-based adaptation, REDD+, and climate-smart landscapes in Tahura have high potential to gain GCF support. The GEF offers funding for projects that generate global environmental benefits in various focal areas including biodiversity, climate change, and land degradation. Tahura can access GEF funding through the development of integrated landscape management projects that address multiple environmental challenges synergistically. GEF-8s programmatic approach that emphasizes systems transformation prompted Tahura to develop initiatives that integrate conservation with sustainable development on a landscape scale.

Innovative funding mechanisms such as debt-for-nature swaps, conservation trust funds, and PES open up opportunities to diversify funding sources for Tahura. The development of green bonds or sustainability-linked bonds that are associated with the achievement of conservation targets in Tahura can attract institutional investors who pay more attention to Environmental, Social, and Governance (ESG) criteria. Carbon credits from REDD+ projects or nature-based solutions in Tahura can be traded on the voluntary carbon market at a premium cost for projects that have verified biodiversity and social co-benefits. Sister parks programs with conservation areas in other countries create a mutually beneficial knowledge exchange platform. Partnerships with national parks in countries with similar ecosystems such as Brazil, Congo, or Malaysia allow for the exchange of best practices in tropical forest management.

Collaboration with developed countries that have mature conservation area management systems such as the United States, Canada, or Australia provides access to the latest technologies and methodologies. Staff exchange programs, joint research, and capacity building enrich Tahura's management capacity with international perspectives and experiences.

Participation in global networks and initiatives such as the IUCN World Commission on Protected Areas, the Global Partnership on Forest Landscape Restoration, and Cities4Forests increases the visibility and credibility of Tahura at the international level. Active involvement in these platforms helps access to technical help, funding opportunities, and policy influence. Sharing experiences and learnings from Tahura management in international forums positions Indonesia as a thought leader in tropical forest conservation. The development of a monitoring, reporting, and verification (MRV) system that aligns with international standards is a prerequisite for accessing funding and building global credibility. The adoption of internationally recognized methodologies such as the IUCN Green List Standards or the Climate, Community and Biodiversity Standards ensures that conservation achievements in Tahura can be independently verified. Transparency in reporting through global platforms such as the Protected Planet Database or Global Forest Watch increases accountability and helps cross-border learning.

The transformation of the Taman Hutan Raya (Tahura) policy represents a fundamental effort in reforming the paradigm of conservation area management in Indonesia, which has been facing a dilemma among ecological preservation and the socio-economic needs of the community. This transformation process requires careful orchestration among various elements of governance, ranging from the reformulation of the regulatory framework, institutional restructuring, to the reconfiguration of relationships among the state, society, and ecosystem. This complexity demands an approach that goes beyond just technical-administrative changes, but rather a fundamental shift in the way natural heritage is viewed and managed as a multidimensional asset with ecological, economic, social, and cultural value.

Political commitment is the main foundation that determines the depth and sustainability of Tahura's policy transformation. This commitment must be manifested not only in political statements or policy documents, but in adequate resource allocation, consistency of

implementation across leadership periods, and courage to face resistance from various interests that have benefited from the status quo. Political will must be translated into concrete forms such as strengthening the budget for Tahura management, the establishment of special units that have the authority and capacity to oversee transformation, and incentive systems that encourage innovation and performance in the management of conservation areas. Political continuity is a challenge given the relatively short electoral cycle compared to the time horizon needed to see the results of ecological transformation. Institutional mechanisms are needed that can ensure the sustainability of the program beyond the change of leadership, such as the establishment of an endowment fund for Tahura, strong legislation with a strict review mechanism, and the development of a broad political constituency that will become a pressure group to maintain commitment to the conservation agenda. A bipartisan approach to environmental issues needs to be developed to avoid counterproductive politicization.

Technical innovations in the context of Tahura cover a wide spectrum, ranging from the apply satellite- and drone-based monitoring technology for area surveillance, the development of integrated information systems for ecosystem data management, to the apply biotechnology for habitat restoration and ex-situ conservation of endangered species. Remote sensing technology allows for early detection of land cover changes, identification of fire hotspots, and monitoring of vegetation health in real-time. Artificial intelligence can be used for pattern recognition in animal behavior, prediction of ecological threats, and optimization of patrol routes for area protection. Resource management innovation requires an ecosystem-based management approach that considers the complex interconnections among the various components of the ecosystem. This includes the development of ecological corridors to ensure habitat connectivity, the implementation of adaptive management that is responsive to changing environmental conditions, and the integration of traditional ecological knowledge from local communities with modern scientific knowledge. PES can be an innovative instrument to provide economic incentives for conservation, while nature-based solutions can integrate ecological functions with infrastructure development needs.

Social participation is a crucial element that determines the legitimacy and effectiveness of Tahura's policy transformation. The old

paradigm that places communities as a threat to conservation must be changed to an approach that recognizes communities as custodians who have a long-term interest in ecosystem sustainability. Community-based conservation requires the devolution of management authority to local communities, accompanied by adequate capacity building and a clear accountability system. A fair benefit-sharing mechanism must be developed to ensure that communities benefit economically from conservation, whether through ecotourism, sustainable harvesting, or compensation for ecosystem services. Social capital development is a long-term investment that is no less important than physical investment. This includes strengthening local institutions, developing leadership capacity at the community level, facilitating collective action for common resource management, and building trust among various stakeholders. Social learning processes need to be helped to allow for the exchange of knowledge and experience among communities, while conflict resolution mechanisms need to be in place to manage disputes that will inevitably arise in the management of shared resources.

The integrative approach in Tahura's transformation requires transcendence from silo thinking that has so far separated conservation from development, ecology from economics, and science from local knowledge. A landscape approach that sees Tahura as part of a broader mosaic, including agricultural lands, settlements, and industrial areas, allows for more holistic management. This requires effective cross-sectoral coordination, harmonization of various policy instruments, and the development of integrated planning that takes into account multiple objectives and trade-offs. The complexity of the Tahura ecosystem demands a deep understanding of ecological processes, species interactions, and ecosystem dynamics. Comprehensive biodiversity assessments are needed to establish baseline and monitor changes over time. Understanding of keystone species, ecological thresholds, and tipping points is crucial to avoid irreversible damage. Climate change considerations must be integrated into all aspects of management, given shifting species distributions, changing precipitation patterns, and increased frequency of extreme events.

The social dynamics around Tahura reflect historical processes, power relations, and cultural values that are deeply embedded in society. Policy transformation must be sensitive to social stratification, gender dynamics,

and inter-generational equity. Indigenous rights and customary tenure systems need to be recognized and integrated into formal governance structures. Migration patterns, demographic changes, and urbanization pressures must be anticipated in long-term planning. Tahura's resilience to various shocks and stresses is the ultimate test of successful transformation. Ecological resilience requires maintenance of biodiversity, functional redundancy, and spatial heterogeneity. Social resilience depends on the adaptive capacity of the community, diversification of livelihoods, and the strength of social networks. Institutional resilience requires flexible governance arrangements, learning mechanisms, and crisis management capabilities. Building resilience is not just about bouncing back from disturbances, but bouncing forward with adaptation and transformation that increases sustainability.

Tahura productivity in the modern context must be understood multidimensionally, not only in timber or NTFP, but also ecosystem services such as carbon sequestration, water regulation, and biodiversity conservation. Eco-tourism potential can be developed with careful planning to avoid over-exploitation. Research and education functions of Tahura can produce knowledge products that are valuable for science and policy. Cultural and spiritual values, although difficult to quantify, are no less important forms of productivity. The long-term sustainability of Tahura requires an inter-generational perspective that considers the needs of future generations. This requires a precautionary approach in the exploitation of resources, investment in natural capital maintenance, and the development of institutions that can survive political and economic turbulence. Environmental education for the younger generation is crucial to build conservation ethics. Documentation and preservation of traditional knowledge ensures wisdom transfer across generations. Tahura's policy transformation is ultimately about reimagining the relationship among humans and nature in a unique Indonesian context with extraordinary mega biodiversity and cultural diversity. The success of this transformation will be a legacy that determines whether Indonesia can become a model for tropical forest conservation that integrates ecological integrity with social justice and economic development. This journey requires courage to leave the comfort zone of conventional approaches, wisdom to learn from successes and failures, and persistence to keep moving forward despite the setbacks and obstacles that are inevitable in every transformative process.

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Synopsis

This book provides an in-depth examination of the importance of policy transformation in enhancing public awareness and improving the management of conservation areas, with a specific focus on Raden Soerjo Forest Park (Tahura R. Soerjo) in East Java. As one of the region's most significant protected areas, Tahura R. Soerjo holds high ecological, social, and cultural value, yet faces numerous challenges including land use conflicts, socio-economic pressures, and institutional and regulatory limitations.

Through a multidisciplinary and participatory approach, this book explores innovative policy strategies to address these issues, including strengthening collaborative governance, integrating technology into forest management, environmental education, and empowering local communities. It also discusses the application of analytical tools such as Social Network Analysis (SNA), Participatory Action Research (PAR), Integrated Valuation of Ecosystem Services and Trade-offs (InVEST), and Structural Equation Modeling (SEM) to assess policy impact, stakeholder participation, and governance effectiveness.

Emphasizing principles of environmental ethics, indigenous rights, and sustainability, the book offers short-, medium-, and long-term policy recommendations that serve as valuable references for policymakers, academics, environmental practitioners, and civil society organizations working toward inclusive and sustainable conservation management.

This publication is highly relevant as a reference material for building collective awareness about the importance of preserving natural ecosystems for a greener and more sustainable future.