

Digital Innovation in Sustainable Mangrove Agroedutourism: Community Empowerment in Patuguran Village

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ABSTRACT

A community service program in Patuguran Village, Rejoso District, Pasuruan Regency, was implemented to address the declining appeal of mangrove tourism due to the COVID-19 pandemic, limited educational facilities, weak digital promotion, and the absence of a sustainability reporting system. The solutions offered include the development of MANGROVEX as a digital agroedutourism platform, the EKOMANG system for standards-based sustainability reporting, and the optimization of social media-based tourism promotion. The implementation of these initiatives has enhanced digital information accessibility, encouraged greater participation from academics and educational tourists, increased engagement through social media and positive visitor feedback, and strengthened the professionalism of Pokdarwis in preparing sustainability reports. This program has made a tangible contribution to revitalizing the attractiveness of Patuguran Mangrove Tourism, improving Pokdarwis management, and supporting sustainable development through the pillars of the blue economy in line with the agendas of SDG 8, SDG 9, and SDG 13.

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INTRODUCTION

Patuguran Village, Rejoso District, Pasuruan Regency has a mangrove ecotourism area that was once visited by many tourists and contributed to local revenue. The COVID-19 pandemic caused this tourist attraction to close, and after the pandemic ended, this area was not properly maintained, resulting in degradation and conversion into a fish pond (1). Various types of mangrove trees grow in this area, which play a vital role in maintaining the balance of the coastal ecosystem, preventing abrasion, supporting environmental resilience, and providing habitat for various coastal fauna species. Mangroves in this area also provide an economic source for the community through ecotourism, fisheries, and mangrove-derived products. Sustainable management is needed to support the ecological and economic balance of local communities. (1) However, until now, there are no educational facilities available for visitors about this diversity, so that agroedutourism has not been utilized optimally.

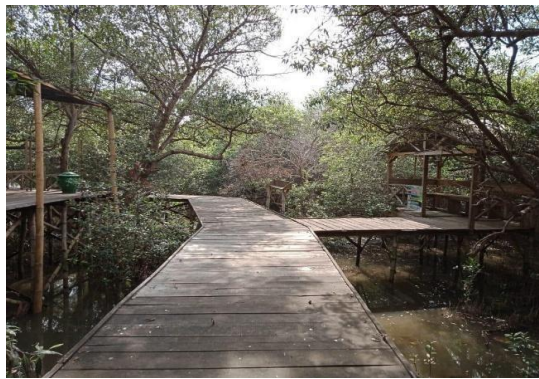


FIGURE 1. Patuguran Mangrove Tourism

Apart from ecological aspects, the sustainability of mangrove forest tourism also influences the social and economic aspects of the surrounding community (2). Sustainable management of mangrove forests is also very important to maintain the balance of coastal ecosystems (3). Limitations in the digitalization of tourism promotion and management make this tourism less competitive with other educational tourism destinations in Pasuruan Regency, such as Safari Park Prigen, Purwodadi Botanical Gardens, and various other tourist attractions.



FIGURE 2. Review from Google Maps

These results indicate that there is a disparity between Patuguran Mangrove Tourism and other educational tourism in Pasuruan Regency. significant gap in the number of reviews of these three educational tours. Safari Park Prigen received 29,362 reviews with a rating of 4,6, followed by

Purwodadi Botanical Gardens with 12,013 reviews with a rating of 4.4. Meanwhile, Patuguran Mangrove Tourism only got 52 reviews with a rating of 4.2. This difference is caused by facilities provided, marketing strategy, and *powertarik tourisma*. Prigen Safari Park and Purwodadi Botanical Gardens supported modern facilities, strong branding, digital promotion, and tourism sustainability programs. While the facilities at Patuguran Mangrove tourism is still limited and not adequate to attract optimal tourist interest (4).



FIGURE 3. Observation of Patuguran Mangrove with the Regional Government and Community

This condition indicates that facilities need to be improved to increase tourist appeal. Patuguran Mangrove Tourism doesn't yet have a strong identity, making it less well-known than other destinations in Pasuruan Regency. A lack of digital promotion also makes it difficult to reach a wider audience. and the absence of a tourism sustainability program and sustainability report reduces the attractiveness of Patuguran Mangrove Tourism as an educational and ecotourism destination, because tourists and academics tend to choose destinations with maintained ecological transparency and sustainability. This also needs to get support from the community to increase digitalization and branding to increase public appeal and involvement.

The Tourism Awareness Group (Pokdarwis), as the manager of Patuguran Mangrove Tourism, has great potential in driving the tourism-based economy. blue economy (5). The main challenges faced include limitations in digital-based tourism management, low understanding of technology, and the unavailability of digital-based education (MANGROVEX) to support agroedutourism. Lack of innovation in promotional strategies and branding. Digital-based tourism is also a constraint, resulting in low tourist visits and a lack of public awareness of the potential of mangrove tourism. Limitations in the preparation of sustainability reports (EKOMANG) further weaken transparency and professionalism in tourism management. In line with this, strengthening the capacity of the Tourism Awareness Group (Pokdarwis) in tourism digitalization, marketing, and implementation is crucial. Agroedutourism Sustainable development is very necessary to increase competitiveness and optimize mangrove tourism as part of the strategyblue economy.

Based on these problems, technology-based revitalization efforts and community empowerment are needed. Website MANGROVEX is expected to be a solution to improve quality agroedutourism. This is achieved through the provision of digital-based ecological information and supporting educational

experiences for tourists. Improved tourism facilities must be integrated with digital technology, for example, through interactive tourist trails equipped with QR code-based educational information. and digital content. Strategy, branding, and effective communication is also needed, including the use of social media, collaboration with influencers, as well as technology-based digital marketing to increase the awareness of Patuguran Mangrove Tourism. Limited digital promotion can be addressed through more creative digital marketing strategies, such as optimizing social media, creating interactive content, and partnering with digital tourism. Moreover, the development of community-based mangrove ecotourism areas can increase local income while preserving the mangrove ecosystem. (6). In addition, the optimization of EKOMANG as a platform for sustainability reporting that records environmental, economic, and social impacts transparently, and strengthens coordination between Pokdarwis, academics, government, and stakeholders so that tourism management becomes more professional and has a broad impact on the regional economy.

This community service program aligns with the concept of Independent Learning, Independent Campus (MBKM), and contributes to the development of Pasuruan Regency through the MBKM program. The Patuguran Village Tourism Group (Pokdarwis) is encouraged to play an active role in developing the Patuguran Mangrove Tourism as a destination. agroedutourism digital-based and sustainable. The MBKM scheme implemented involves students in developing MANGROVEX innovations, a digital education platform. The application of the educational tourism concept in mangrove areas can increase public awareness of the importance of environmental conservation through education-based tourism activities (7). Students also play a role in digitalizing social media-based tourism promotions, preparing financial reports, sustainability reports through EKOMANG, and analyzing the economic feasibility of mangrove tourism. This involvement enhances the professionalism of ecotourism management and the competitiveness of mangrove-based tourism. agroedutourism.

METHODS

This community service program adopted a participatory action research (PAR) approach combined with a descriptive qualitative method. The approach was chosen to ensure that the program was not only implemented for the community but also with active participation from the community as co-creators of knowledge. The methodology emphasizes documentation of the implementation process, participatory evaluation, and reflection on lessons learned.

Participants and Sample Selection

The primary participants in this program included:

- Village Government Officials – particularly those responsible for tourism, environmental management, and local economic development.
- Tourism Awareness Group (Pokdarwis) – as the key institution managing mangrove ecotourism activities.
- Local Community Representatives – including fishers, youth groups, and women's groups involved in tourism-related economic activities.

A purposive sampling technique was applied, selecting participants based on their relevance, involvement, and contribution to mangrove ecotourism. A total of 45 participants were directly engaged in various program activities, with an additional wider audience reached through social media

campaigns and digital platform dissemination.

Program Stages and Implementation Procedures

The implementation of the program consisted of several structured stages:

- Needs Assessment and Initial Coordination
 - Conducted through meetings with village officials and Pokdarwis to identify core problems, align expectations, and design a context-based program.
 - Collected baseline information regarding tourism challenges (limited promotion, weak digital literacy, absence of sustainability reporting).
- Focus Group Discussions (FGDs)
 - Organized to explore community perceptions, aspirations, and strategies for digital tourism innovation.
 - FGDs allowed for problem mapping and prioritization of solutions.
- Educational and Capacity-Building Seminars
 - Sessions focused on mangrove conservation, agroedutourism, the application of the blue economy, and strategies for sustainable tourism management.
 - Delivered by academic facilitators with materials adapted to local contexts.
- Introduction of Digital Platforms
 - Demonstration of the MANGROVEX digital platform (promotion, education, and information system).
 - Simulation of EKOMANG (sustainability reporting system), including data input practice and reporting formats aligned with SNI and GRI standards.
- Digital Marketing Training
 - Practical sessions covering social media optimization, content creation (photo, video, storytelling), online review management, and SEO basics.
 - Designed to equip Pokdarwis members with applicable skills for daily tourism promotion.
- Community Engagement and Reflection
 - Open discussions to gather community feedback, share experiences, and reflect on program implementation.
 - Facilitated participatory evaluation to encourage local ownership and long-term sustainability.

Data Collection Instruments

To evaluate program outcomes, several instruments were employed:

- Observation sheets – used by facilitators to assess participation levels, engagement, and digital literacy progress.
- Questionnaires – distributed pre- and post-training to measure participants' perceptions of program

relevance, knowledge gained, and readiness to apply new skills.

- Documentation analysis – including photographs, meeting notes, and social media activity records.
- Participant reflections – collected through semi-structured interviews and group discussions to capture qualitative insights.

Data Analysis Procedures

Data were analyzed using a thematic qualitative analysis approach. Responses from questionnaires, interviews, and reflection sessions were coded into themes such as digital literacy improvement, tourism promotion practices, and sustainability awareness. Observational data were triangulated with participant feedback and documentation to ensure reliability. Social media activity (likes, comments, shares, and content reach) was reviewed descriptively to assess the visibility of promotional outputs, but without applying unsupported quantitative claims.

Timeline

The program was implemented during June 2025 in a series of sequential activities:

- Week 1 – Coordination and needs assessment.
- Week 2 – FGDs and planning workshops.
- Week 3 – Educational seminars and digital platform introduction.
- Week 4 – Training in digital marketing, sustainability reporting, and reflection sessions.

Follow-up mentoring is planned for the subsequent three months to ensure adoption of MANGROVEX and EKOMANG.

Ethical Considerations

- Participation was voluntary with informed consent obtained from all participants.
- Anonymity and confidentiality of responses were maintained.
- Community input was respected, and program decisions were made collaboratively with village stakeholders.
- Ethical approval for program implementation was obtained from the institution's community service board, in line with university regulations.

Limitations

This program was primarily qualitative and descriptive in nature. While process outcomes were well documented, quantitative measurement of impacts (e.g., increases in visitors, engagement percentages) was not systematically conducted. As such, results are reported in terms of improved capacity, community perceptions, and qualitative evidence of digital platform usage. Future studies may integrate mixed-methods approaches to validate program impacts with statistical rigor.

RESULTS AND DISCUSSION

The community service activities were implemented according to the planned methodology, using a face-to-face approach involving village officials, the Tourism Awareness Group (Pokdarwis), and the community. The results demonstrated an increased understanding of sustainable tourism management among participants and their readiness to adopt digital technology to support the promotion and management of tourism villages.

The initial phase of the activity, which involved coordination with village officials and the Tourism Awareness Group (Pokdarwis), successfully aligned perceptions and built a shared commitment to the program's goals and benefits. In this session, participants demonstrated high enthusiasm for understanding the long-term impacts of strengthening the tourism sector through agro-edutourism, particularly in improving community welfare while preserving the environment.



FIGURE 4. Coordination with Pokdarwis and Patuguran Village Apparatus

The Focus Group Discussion (FGD) provided a platform for village officials, tourism groups (Pokdarwis), and the community to share their aspirations, challenges, and strategies for developing mangrove tourism. The discussion revealed an urgent need for innovation in tourism digitalization, particularly in promotion and visitor management. The FGD also identified local potential that could be developed as additional tourist attractions and formulated a strategy for active community involvement in maintaining the sustainability of coastal ecosystems.

During the educational and capacity-building seminar, participants received material on mangrove conservation, the application of the blue economy concept, and digitalization strategies in tourism management. The material successfully broadened participants' understanding of the importance of balancing economic, social, and ecological aspects in managing agro-edutourism. Interactive discussions during the seminar demonstrated that the community is beginning to understand their role not only as beneficiaries but also as key actors in supporting the sustainability of village tourism.



FIGURE 5. Coordination with Pokdarwis and Patuguran Village Apparatus

Mentoring was conducted after the training to ensure the equipment could be used independently. Mentoring activities included monitoring equipment use, technical consultations, and regular documentation. Observations showed that most participants were becoming accustomed to using the equipment in their daily activities, although some still needed more time to adapt.

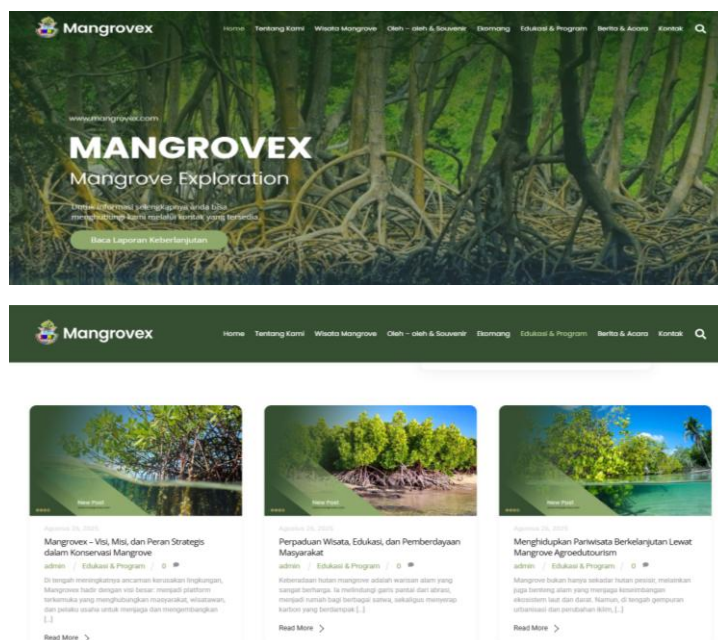


FIGURE 6. Mangrovex Website

The implementation of the EKOMANG Program has demonstrated positive results in the context of training and community outreach, particularly regarding understanding the importance of recording and reporting on tourism sustainability. Through a series of training sessions, participants were not only introduced to reporting standards that can be used as a reference in sustainable tourism management but also gained hands-on experience through data recording simulations in the EKOMANG system.



FIGURE 7. Ekowisata Mangrove Sustainability Reporting (EKOMANG)

These activities helped participants understand the practice of systematic information input while fostering awareness of sustainability aspects relevant to local potential. The technical assistance provided further strengthened participants' skills in compiling and evaluating sustainability reports, thereby encouraging increased accountability and transparency in village tourism management. These results confirm that EKOMANG Program-based outreach and training play a significant role in increasing community literacy on sustainability issues while building technical capacity to support the implementation of sustainable development concepts in the tourism sector.

The introduction to digital marketing strategies provides participants with practical insights into the use of social media, creative content production, and placement.site planat Patuguran mangrove ecotourismParticipants showed high interest in the material, particularly due to its relevance to current conditions where digital-based promotion is a key need to expand the reach of the tourism market. The discussions that emerged demonstrated a new awareness that digital marketing can be an effective strategy for increasing tourist appeal while strengthening the image of tourist villages. The activity concluded with an interactive discussion directly involving the community. In this session, the community shared various input, ideas, and challenges they face in tourism management. The discussion emphasized the importance of collaboration between the village government, Pokdarwis, and the community to maintain the sustainability of the mangrove ecosystem. Furthermore, a shared commitment was formed to support follow-up programs, particularly in the aspects of conservation and digital tourism promotion.



FIGURE 8. Creative content production and collaboration with Pokdarwis

The outputs of this series of activities include increased human resource capacity in tourism management, strengthening digital-based promotional strategies, and publicizing activities through reports and media articles. Initial evaluations indicate positive impacts, including improved participant skills in utilizing digital technology and increased awareness of the importance of coastal ecosystem conservation. Ongoing evaluation through observations, questionnaires, and collaborative reflection is expected to ensure program effectiveness and design long-term mentoring strategies, including optimizing the use of the MANGROVEX website as the primary medium for tourism management.

CONCLUSION AND RECOMMENDATION

Program Sustainable Mangrove Agroedutourism Through the MANGROVEX innovation, we have successfully provided strategic solutions to the challenges of managing the Patuguran Mangrove Tourism. The digitalization of MANGROVEX-based promotions and education strengthens the tourism identity as a sustainable agro-edutourism destination, while increasing its appeal through the interactive presentation of ecological information. Meanwhile, the implementation of the system MANG encourages transparency and professionalism of Pokdarwis in preparing sustainability reports.



FIGURE 8. Evaluation and Follow-up Meeting for the Sustainable Mangrove Agroedutourism Program

Recommendations for activities require program continuity in the form of routine digital marketing training, assistance in preparing...sustainability report, as well as cross-stakeholder collaboration between Pokdarwis, academics, government, and tourism industry players. Optimization of interactive content, partnerships with influencers, and the use of social media will strengthen destination branding and increase tourism competitiveness on the global stage. Thus, Patuguran Mangrove Tourism can become a model best practice development agroedutourism digital-based that is aligned with SDGs and regional sustainable development.

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