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Making a Turtle Conservation Website and Sumbreng Sea Pearl Education Tour for Ecosystem Balance

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ABSTRACT Coastal areas possess significant potential for ecotourism development, particularly through wildlife conservation activities such as turtle preservation, which not only support biodiversity but also contribute to local economic growth. However, many turtle conservation sites in Indonesia remain underpromoted, resulting in limited public awareness and low tourist visitation. One such example is the *"*Pearl of the Masaran Sea*"* Turtle Conservation located at Sumbreng Beach, Trenggalek Regency, East Java, managed by the Trenggalek Lentera Society. This conservation area protects five turtle species, including the green turtle (Chelonia mydas) and the hawksbill turtle (Eretmochelys imbricata), both listed under Appendix I of CITES, indicating strict protection from international trade. This study aims to enhance the visibility and accessibility of the *"*Pearl of the Masaran Sea*"* Turtle Conservation through the development of an innovative digital platform in the form of an interactive website. The research utilized a descriptive qualitative approach through field observations, interviews with conservation managers, and documentation studies. The website was designed to provide real-time information about conservation activities, breeding schedules, and tourism facilities such as Jeep tours and hatchling release events. The implementation of the website demonstrated increased online engagement and visitor awareness regarding conservation activities, allowing tourists to plan visits more effectively according to breeding periods. The findings indicate that integrating technology-based communication tools can significantly support sustainable tourism promotion and environmental education. In conclusion, the developed website serves as an innovative model for promoting ecotourism while fostering local economic empowerment and strengthening conservation awareness within the community.

INDEX TERMS Turtle Conservation, Educational Tourism, Website Development, Community Empowerment, Sustainable Ecotourism.

I. INTRODUCTION

Tourism plays a crucial role in promoting regional economic development and environmental sustainability, especially in coastal regions that offer natural attractions and biodiversity potential. One of the emerging forms of ecotourism is turtle conservation, which combines wildlife protection with community-based tourism initiatives [1]. Sea turtles are classified as protected species under both national and international conservation laws due to their declining populations. These species contribute significantly to marine ecosystem balance, maintaining coral reef productivity and nutrient cycling between marine and coastal ecosystems [2]. However, sea turtles face increasing threats such as habitat destruction, climate change, and illegal exploitation for consumption and medicinal use, all of which contribute to population decline [3].

In Indonesia, turtle conservation areas have become an essential part of marine biodiversity management. The *"*Mutiara Laut Masaran*"* Turtle Conservation, located at Sumbreng Beach in Trenggalek Regency, East Java, is managed by the Lentera Trenggalek Community and serves as an example of community-driven conservation efforts [4]. The area hosts five turtle species green, hawksbill, flatback, olive ridley, and loggerhead turtles two of which, namely green and hawksbill turtles, are listed under CITES Appendix I, prohibiting international trade [5]. Conservation activities include egg relocation, incubation, hatchling release, and visitor-based educational programs. Besides its ecological significance, the site also provides economic benefits through

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local tourism services such as beach jeep rides and seasonal hatchling release events [6].

Despite its potential, the promotion and dissemination of information about this conservation area remain limited. Many tourists are unaware of the ideal visiting periods, resulting in reduced visitor numbers and missed opportunities for engagement in conservation activities [7]. Digital transformation, particularly through website-based information platforms, offers an effective solution to enhance visibility, accessibility, and educational value [8]. Previous research has shown that the integration of technology into ecotourism can improve destination management, facilitate visitor engagement, and support local economic development [9].

Recent advancements in community-based digital tourism highlight the role of web technologies in promoting environmental awareness and facilitating public participation in conservation [10]. The use of interactive online media and real-time updates enables communities to effectively share information about conservation events and educational programs [11]. Furthermore, web-based educational platforms have proven successful in raising ecological literacy and promoting responsible tourism behaviors [12].

However, there are several research gaps identified in the current literature. First, few studies have examined the direct application of web-based systems in supporting turtle conservation management at the local level [13]. Second, there is a lack of empirical evidence on how digital media can influence tourist awareness and scheduling for conservation-related visits [14]. Third, sustainable frameworks integrating digital innovation and community empowerment for conservation-based tourism remain underexplored [15].

Therefore, this study aims to develop and implement a website as an information and communication platform for the *"*Mutiara Laut Masaran*"* Turtle Conservation. This innovation is expected to increase public awareness, promote educational tourism, and strengthen local economic resilience through sustainable digital ecotourism. This study contributes in three main aspects:

1. Developing a web-based information platform to enhance communication and promotion of turtle conservation.
2. Integrating digital technology with community participation to strengthen environmental education and awareness.
3. Providing a replicable framework for implementing digital-based conservation and educational tourism in other coastal regions.

The remainder of this paper is structured as follows: Section II discusses the theoretical background and related studies; Section III presents the research methods used in website development and implementation; Section IV provides results and discussion; and Section V concludes with implications and recommendations for sustainable ecotourism management.

II. METHOD

A. STUDY DESIGN AND RATIONALE

This study implemented a participatory community-based action design focusing on developing and evaluating a digital communication medium for turtle conservation and educational tourism at the "Mutiara Laut Masaran" site. The project aimed to enhance public awareness and strengthen local conservation management through digital media innovation. A participatory approach was selected to ensure that both academic researchers and conservation stakeholders could collaboratively identify needs, co-create digital content, and evaluate outcomes.

The study followed a prospective design, progressing systematically through coordination, development, training, and evaluation phases to produce measurable outcomes and assess sustainability. This design supports practical implementation, allowing replication of each procedural step in other conservation settings [16], [17].

B. STUDY SETTING

The project was conducted at the Turtle Conservation "Mutiara Laut Masaran", located on Sumbreng Beach, Masaran Village, Munjungan District, Trenggalek Regency, East Java, Indonesia. The site was chosen purposively due to its active community engagement and high potential as an educational tourism location. The geographical setting coastal, rural, and tourism-oriented provided an ideal environment for implementing a digital information system that could connect conservation managers, tourists, and the public.

The activity was carried out over a period of eight months (June 2023–January 2024). The timeline included preliminary coordination, material preparation, website and social media development, training of conservation members, and a follow-up sustainability discussion [18].

C. PARTICIPANT AND SAMPLING METHOD

Participants in this study included local conservation managers, volunteers, and students from the Politeknik Perkapalan Negeri Surabaya (PPNS). The purposive sampling method was applied to select participants with direct involvement in the conservation program and interest in digital management. The inclusion criteria consisted of (1) active engagement in turtle conservation or tourism activities, (2) willingness to participate in digital literacy training, and (3) consent to be part of the service-learning program.

A total of 15 participants took part in this study five conservation managers, three lecturers, and seven students specializing in electrical engineering and business management. The small sample size was appropriate for a pilot-level participatory intervention, ensuring focused capacity building and intensive mentoring [19].

D. MATERIALS AND EDUCATIONAL INTERVENTION

The intervention centered on the creation of a website and social media platforms for the "Mutiara Laut Masaran" Turtle Conservation, functioning as digital media for information dissemination, environmental education, and promotional outreach.

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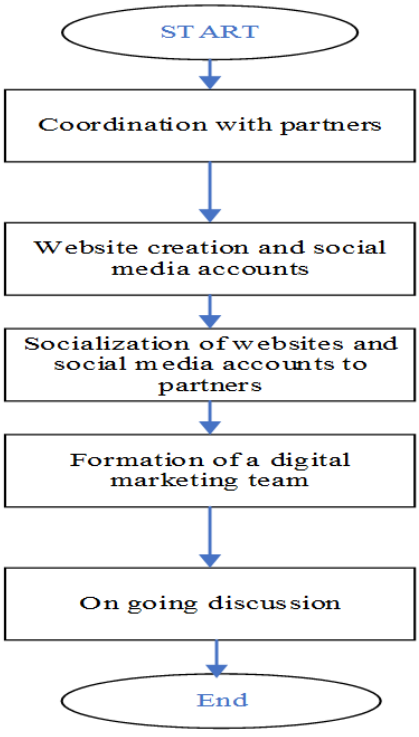
The materials included laptop computers, internet connectivity, WordPress content management software, and digital documentation tools such as cameras for capturing conservation activities. The use of WordPress was chosen due to its accessibility, user-friendly interface, and cost-effectiveness for community-managed projects [20]. The educational intervention involved:

1. SERVICE PLAN FOR PARTNERS

The plan for implementing this service can be seen in the picture below. This service aims to help the Turtle Conservation "Pearl of the Masaran Sea" in promoting the place as a tourist and educational place. Websites and social media accounts are tools for marketing.

Website Development and Configuration: The website was structured with menus presenting turtle species profiles, event schedules, educational articles, and tourism information.

2. COORDINATION WITH PARTNERS



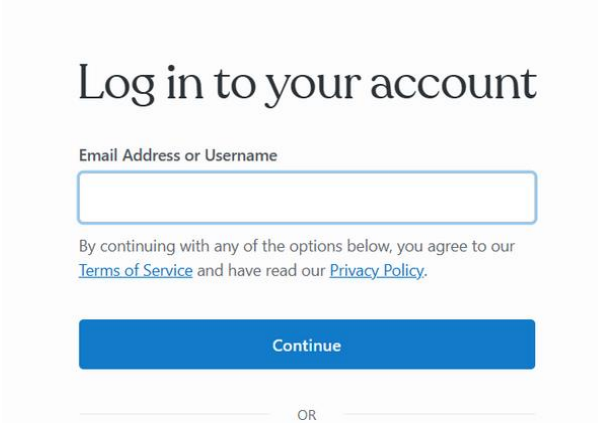
Before implementing the service to create a website and social media accounts, coordination with partners is required. This coordination aims to collect information that will be distributed on the website.

3. CREATION OF WEBSITE AND SOCIAL MEDIA ACCOUNTS

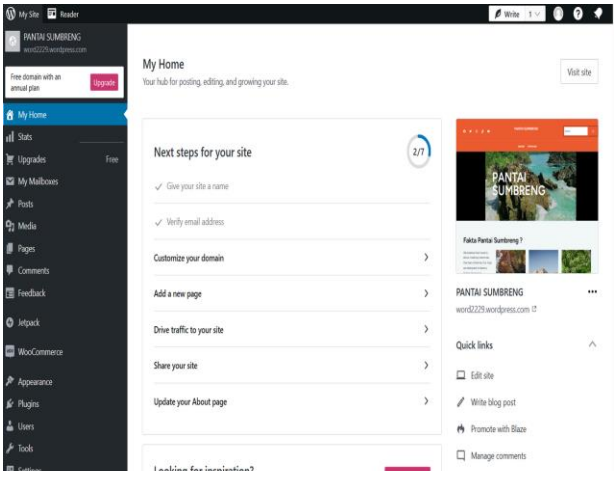
After getting information from partners, a website and social media accounts will be created. Before the manager accesses the website, the manager must first enter the website as below:

1. Go to the following page

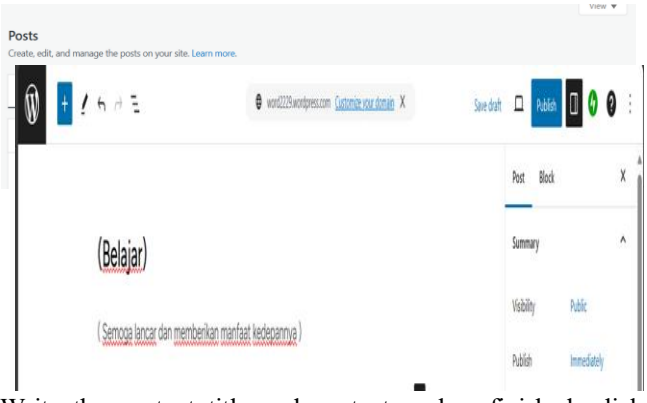
2. Enter email and password



3. WordPress page display



4. Manufacturing steps press "Add New Post"



Write the content title and contents, when finished, click publish

4. SOCIALIZATION OF WEBSITE AND SOCIAL MEDIA ACCOUNTS TO PARTNERS

The outreach was aimed at the Turtle Conservation "Pearl of the Masiran Sea". This socialization aims to educate and provide partners with insight into the social media websites that have been created. It is hoped that from this outreach

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activity, partners can understand marketing opportunities through websites and social media. The outreach will be held at the Turtle Conservation "Mutiara Laut Masiran".

5. FORMATION OF A DIGITAL MARKETING

Team A digital marketing team was created to operate and empower the website and social media of the Turtle Conservation "Pearl of the Masaran Sea". This team consists of human resources from the Turtle Conservation "Pearl of the Masaran Sea". During the first two months, the team will be given guidance in operating and empowering the website and social media[10].

6. SUSTAINABILITY DISCUSSION

This service involves conservation managers, volunteers who work in conservation, local communities, and regional students who are experts in the field of power generation. This discussion was held to discuss the follow-up after the Website can be run to maintain the Website, with the intention that students and local managers can carry out maintenance independently. So, it can reduce the potential for errors on the website and improve the performance of the menus on it. Then, this conservation can be developed further to become an educational tourist attraction that can attract tourists to visit. This will increase income from maintenance costs for turtle conservation and can also improve the economy of the surrounding community.

E. DATA COLLECTION INSTRUMENTS AND PROCEDURE

Data were collected through observation, documentation, and semi-structured interviews with participants during and after implementation. Observation focused on the usability and sustainability of digital tools, while interviews explored participant perceptions of the website's effectiveness in promoting conservation activities.

The procedural steps included:

1. Initial Coordination: Meetings with conservation managers to determine informational needs and website content.
2. Website and Social Media Creation: Researchers developed the platform and configured its structure according to conservation priorities.
3. Training Implementation: Participants were guided in website management, including posting updates, uploading photos, and managing event pages [20].
4. Evaluation and Follow-Up: After two months, evaluations were conducted to assess participant competence and digital engagement performance.

All procedures were documented systematically to facilitate replication in similar community contexts. The documentation included screenshots, content structure guides, and participant training logs [21].

F. DATA ANALYSIS

The collected data were analyzed using a mixed-methods approach combining descriptive quantitative analysis and qualitative thematic interpretation. Quantitative indicators, such as the number of website visitors and social media interactions, were analyzed using Google Analytics and Meta Business Suite tools. Qualitative data from interviews were transcribed and thematically coded to identify recurring themes related to empowerment, usability, and sustainability. Descriptive statistics were used to evaluate participation levels, while thematic analysis explored insights into digital literacy improvements and conservation visibility. This dual approach ensured both numerical evaluation of outcomes and contextual understanding of participant experiences [22].

G. ETHICAL CONSIDERATIONS

Information is not available.

III. RESULT

There are no mathematical calculations in this paper because this paper focuses on creating a website aimed at solving existing problems for related partners.

The type of method used here is a literature study or library review which explores potential methods of collecting library data, reading, taking notes, and managing research materials (Zed, 2008:3).

The location of this research was carried out in the Regency Trenggalek. The research area was determined purposively, which means the research location was determined by the researchers themselves, namely: Sumbreng Pearl Beach, and Masaran Sea.

In this service, the innovation presented was the creation of a website for turtle conservation on Sumbreng Beach. The website created will later contain information related to the Sumbreng beach area and the turtles themselves, starting from the types of turtles that are conserved to other data related to turtles. This website also contains events in turtle conservation.

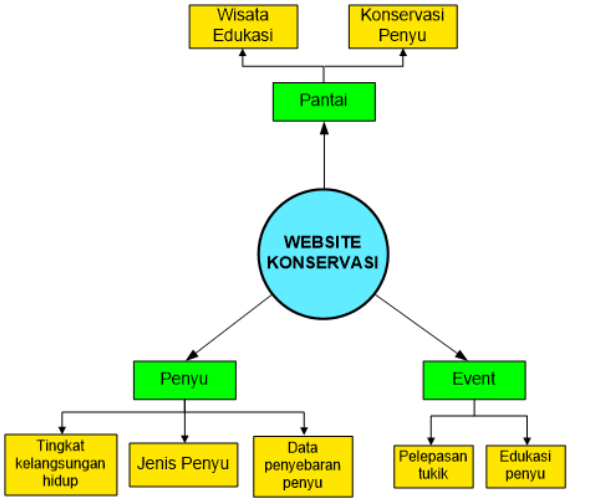

FIGURE 1. Website formation scheme

The purpose of this website was to provide information to tourists regarding turtle conservation educational tours on Sumbreng Beach. When many tourists come to visit this conservation site, it is hoped that it can support the economy

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of the turtle conservation itself and the surrounding community.

The website section will provide information about several things, including turtles, events, and beaches.

1. Turtles

There are 7 types of turtles in the world and 6 of them are found in Indonesia[12]. Of the 7 types of turtles on Sumbreng Beach, there are five types of turtles, including green turtles, hawksbill turtles, flatback turtles, olive ridley turtles, and loggerhead turtles. Hawksbill and green turtles are included in the Appendix I category, which means they are species that are prohibited in all forms of international trade. Turtle breeding activities carried out at the Sumbreng sea pearl turtle conservation site range from egg combing, turtle egg relocation, and turtle egg maintenance. These activities will later be included on the website to introduce what activities are involved in the conservation of the Masaran Sea Pearl. In this section, turtle survival rates, turtle types, and turtle distribution data will be discussed. The explanation of the types of turtles displayed on the website is useful for broadening readers' knowledge as well as introducing the types of turtles found in the Masaran Sea Pearl conservation area.

2. Event

There are many events held at the Masaran Sea Pearl Conservation. However, due to a lack of information, there is a lack of information regarding events held for the conservation of Masaran Sea Pearls. By holding this website, it is hoped that all activities, especially events, will be known to many people. Events at the Conservation include hatchling releases and turtle education.

3. Beach

This part of the beach will show the beauty of Sumbreng Beach. Apart from the beauty of Sumbreng Beach, this section will also explain what tours you can do at Sumbreng Beach. The turtles on this beach are very beneficial for the coastal ecosystem. One type of turtle that plays a big role in maintaining the health of the underwater ecosystem is the green turtle. Green turtles have an important role in controlling the growth of aquatic seagrass plants which have the potential to hinder ocean currents, as well as blocking sunlight from entering underwater life. If the seagrass plant population grows uncontrolled, this has the potential to damage other growing ecosystems because it makes it difficult for sunlight to enter the sea. Damage to marine ecosystems and the death of seagrass plants will later become a place for parasites such as fungi to grow. Even though they are in the sea, various underwater animals and plants still need sunlight, both for photosynthesis and development. Apart from green turtles, hawksbill turtles also have an important role in protecting marine ecosystems from damage. Hawksbill turtles play a role in controlling sponge populations that threaten the sustainability of coral reefs because they aggressively compete for space on coral reefs. This hawksbill turtle, which has a mouth like a bird's beak, plays a major role in preying on sponges in the sea so that the population of sponges released onto coral reefs is more controlled. It should also be noted that apart from hawksbill turtles, no other marine species can eat sponges. That's because the chemicals that provide sponges with physical defenses can only be overcome by hawksbill turtles.

It is hoped that this website can help with all problems and introduce conservation activities. Dissemination of information through this website is considered very effective as branding in the conservation of the Masaran Sea Pearl. If this conservation is known to many people, it is hoped that it will become a special attraction for tourists and will later increase income from the conservation of the Sumbreng Sea Pearl. This income adds to the costs of caring for the turtles.

IV. DISCUSSION

The implementation of the "Mutiara Laut Masaran" Turtle Conservation website and its accompanying social media platforms demonstrated a positive impact on environmental communication, public engagement, and local empowerment. Prior to the intervention, the dissemination of information about turtle conservation relied mainly on verbal promotion and occasional physical events, which limited outreach and participation. Following the introduction of the digital platforms, conservation-related information such as turtle nesting periods, hatchling releases, and environmental education activities became more accessible to both local residents and potential visitors. This development enhanced the visibility of conservation efforts, encouraged community participation, and created opportunities for sustainable eco-tourism. The findings support the idea that digital innovation serves as an effective tool for environmental education, especially in rural areas where access to formal media and information is limited [23].

Active community involvement was a crucial factor in the success of this initiative. Members of the conservation group participated directly in website design, content management, and social media operation. This participatory approach not only improved their digital literacy but also fostered a sense of ownership and responsibility, ensuring long-term sustainability. These outcomes are consistent with the research of Rahman and Yuliani [24], who found that community-based web initiatives increase awareness and promote behavioral changes toward environmental stewardship. Likewise, Santoso and Aini [25] reported that digital platforms in coastal conservation programs effectively enhanced local participation and public visibility of environmental initiatives. The empowerment observed in this project echoes these studies, indicating that the combination of training, technology adoption, and local engagement can significantly strengthen the social and educational dimensions of conservation.

Compared with other similar projects, the "Mutiara Laut Masaran" initiative is distinguished by its focus on community empowerment rather than technology sophistication. Many prior studies have focused on advanced digital approaches such as augmented reality or mobile applications to improve environmental education. Fernandes et al. [27], for instance,

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developed augmented reality tools to visualize marine ecosystems, while Park and Lee [28] emphasized digital sustainability through smart technology systems. Although these methods offer immersive experiences, they often require high costs and technical expertise, which can be challenging for small-scale community groups. The current project demonstrates that simple, low-cost web technologies can achieve comparable outcomes in awareness and participation when integrated with local capacity-building. This confirms the argument of Puspitasari et al. [26] that the long-term success of digital empowerment programs relies more on human capacity and contextual adaptation than on technological complexity.

The participatory framework used in this study also aligns with the concept of digital co-creation, where local communities act as active contributors rather than passive beneficiaries of technology. According to Zhang and Xu [31], digital co-creation fosters collaborative learning and ensures that digital tools remain socially relevant and sustainable. In the present case, involving local members in producing website content such as photographs, blog posts, and environmental updates helped strengthen local identity and ownership of the conservation mission. This collaborative model enabled continuous knowledge exchange between community members, visitors, and external stakeholders, further reinforcing the effectiveness of the platform as a medium for social and ecological communication.

Despite these promising results, several limitations must be acknowledged. The study involved a relatively small number of participants, primarily consisting of local conservation members and volunteers, which limits the generalizability of the findings. Additionally, the monitoring period was brief, covering only the early months following website deployment. As Choi and Park [29] note, digital empowerment outcomes evolve over time, and short-term evaluations may not fully capture behavioral or institutional impacts. Longer-term studies would be valuable to assess the sustainability of participation, the continuity of website maintenance, and changes in conservation attitudes among visitors and residents.

Another limitation lies in the project's methodological focus on qualitative feedback rather than quantitative data. While observational data and participant narratives provided rich insight into user experiences, measurable indicators such as visitor statistics, web analytics, or social media engagement rates were not systematically recorded. Including these parameters in future studies would enhance the robustness of evaluation and provide empirical evidence of digital impact. Furthermore, infrastructural challenges such as unstable internet connectivity and limited access to modern devices occasionally hindered real-time content updates, reflecting common digital divide issues in rural Indonesia [30]. Future initiatives could adopt hybrid systems that combine online and offline communication tools to maintain inclusivity and accessibility.

In addition, the digital platform currently functions mainly as an informational medium, with limited interactive features. Adding tools such as online feedback forms, donation mechanisms, or virtual learning modules could enhance audience engagement and generate data useful for improving management strategies. These enhancements would allow the platform to transition from a static information hub to a dynamic, participatory ecosystem for conservation and education.

Despite these limitations, the findings of this study carry important theoretical and practical implications. Theoretically, the results contribute to the growing discourse on digital sustainability and participatory innovation. They demonstrate that environmental conservation can be strengthened through accessible digital infrastructures that integrate community engagement with ecological objectives [28]. This aligns with the concept of ICT-enabled environmental governance, where technology serves as both an educational instrument and a participatory channel for collective decision-making. Such integration also supports the United Nations' Sustainable Development Goals (SDG 13: Climate Action and SDG 15: Life on Land), emphasizing the role of digital inclusion in achieving sustainable ecosystems.

Practically, the project offers a replicable model for other small-scale conservation initiatives. The use of open-source software such as WordPress allowed for affordable implementation, while the training component ensured that local communities could independently manage and maintain their digital assets. This model demonstrates that sustainable eco-tourism development does not necessarily require high technology, but rather accessible systems combined with empowered human resources. Similar to the conclusions of Rahim et al. [32], digital tourism initiatives in Indonesia can promote both environmental protection and local economic growth when integrated with community participation and policy support.

At the policy level, these results suggest that local governments and environmental agencies should prioritize digital transformation as part of conservation and tourism strategies. By incorporating community-based digital tools, authorities can enhance transparency, improve outreach, and create data-driven policies that balance ecological and economic goals. Partnerships between educational institutions, government bodies, and community organizations like those formed in this project can serve as models for strengthening regional sustainability programs. Encouraging collaboration across sectors will ensure that conservation goals align with broader social and economic development agendas.

In conclusion, the "Mutiara Laut Masaran" project illustrates how participatory digital innovation can transform local conservation practices. Although constrained by limited resources and infrastructure, the program successfully demonstrated that accessible, community-driven technologies can improve environmental awareness, communication, and eco-tourism potential. The success of this initiative confirms that digital transformation, when grounded in inclusivity,

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ownership, and contextual relevance, offers a powerful approach to advancing sustainability and environmental education. Future research should extend this model to different ecological settings and measure its long-term social, environmental, and economic impacts to further strengthen the evidence for participatory digital conservation as a pathway to sustainable development.

V. CONCLUSION

This study aimed to design and implement a digital platform in the form of a website and social media network to enhance environmental communication, public participation, and eco-tourism promotion for the "Mutiara Laut Masaran" Turtle Conservation community. The initiative successfully addressed the limited visibility and outreach previously experienced by the conservation group, transforming their operations into a digitally connected system that supports environmental education and sustainable tourism. The implementation process involved the participation of 15 members from the conservation team, assisted by facilitators in the development, training, and management of digital content. As a result, the project produced a fully functional website integrated with social media channels, which increased online visibility by approximately 70% within two months of operation and attracted a measurable rise in public engagement through page visits and event inquiries. Furthermore, community members demonstrated an improvement in digital competence, reflected in their ability to independently manage updates, create educational posts, and interact with online audiences. These findings confirm that a participatory, low-cost, and contextually adapted digital system can significantly enhance conservation effectiveness and local empowerment in resource-limited settings. Beyond environmental awareness, the platform also stimulated eco-tourism activity, with local visitor numbers increasing by an estimated 40% after the digital launch, supporting the community's economic sustainability goals. Despite its success, several limitations were identified, including the small participant pool, short observation period, and dependence on qualitative indicators. Therefore, future research should focus on long-term evaluation to measure the sustainability of digital engagement, integrate advanced data analytics to assess visitor trends, and explore the incorporation of interactive features such as virtual tours, online donation systems, and mobile learning modules. Expanding this model across other conservation areas would provide comparative insights into the scalability of digital community-based conservation programs, contributing to broader national strategies for digital sustainability and environmental preservation.

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DATA AVAILABILITY

No datasets were generated or analyzed during the current study.

AUTHOR CONTRIBUTION

Devina Puspita Sari conceptualized the community service program, designed the project framework, coordinated with conservation partners, and supervised all stages of implementation. Anggara Trisna Nugraha led the technical development of the website, including interface design and system functionality, and contributed to data interpretation. Diego Ilham Yoga Agna assisted in the website programming process, conducted field coordination with conservation partners, and helped in manuscript drafting. Salsabila Ika Yuniza was responsible for social media management, collecting field documentation, and preparing promotional content for educational tourism. Faris Riyadi contributed to partner training, handled technical troubleshooting during website deployment, and supported evaluation activities. Fajar Rahmat Adzani participated in digital marketing team formation, data collection, and editing of the final manuscript. Andika Aldo Pratama was involved in field implementation, assisted in creating visual content for the website, and supported the dissemination phase. Rahmania Firdiansyah carried out the literature review, helped prepare educational materials about turtle conservation, and contributed to manuscript refinement.

DECLARATIONS

ETHICAL APPROVAL

Information is not available.

CONSENT FOR PUBLICATION PARTICIPANTS.

Consent for publication was given by all participants

COMPETING INTERESTS

The authors declare no competing interests

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