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Community Service Program for Developing Water Pool Attractions as a People's Economic Enterprise in Rural Community-Based Tourism Areas

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Abstract

This community service program was initiated to support rural economic development by creating a water pool attraction within a community-based tourism area. The initiative integrates technical planning, environmental consideration, and local participation to deliver sustainable infrastructure that benefits the community and the environment. The program began with a site accessibility assessment, highlighting the challenges and opportunities of remote development areas. Technical activities included topographic measurements and river flow assessments to ensure a reliable and sustainable water supply for the facility. These steps formed the foundation for an environmentally sound design that respects the hydrological characteristics of the region. The outcome is a fully functional water pool facility featuring recreational amenities, local cultural elements, and environmentally integrated construction. It serves as a tourism draw and a source of economic activity for the surrounding rural community. What distinguishes this program is its holistic, participatory approach, where community members are engaged not only in the planning and development phases but also in the long-term operation and management of the facility. This project demonstrates how academic collaboration, technical expertise, and local knowledge can combine to create a practical, sustainable, and replicable rural development model. The authors funded the entire program, reflecting a shared commitment to meaningful and responsible community engagement. The outcomes contribute to advancing the practice of inclusive and community-driven tourism infrastructure.

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1. Introduction

Rural tourism has emerged as a viable strategy for community-based economic development, especially in areas rich in natural and cultural resources but limited in industrial or urban infrastructure. Several studies have highlighted the role of tourism in promoting local livelihoods, improving social cohesion, and preserving traditional practices [1]–[4]. Water-based tourism attractions such as pools, springs, and rivers have proven effective in enhancing visitor appeal while offering low-impact, nature-integrated experiences [5]–[8]. However, developing tourism infrastructure in rural settings often faces challenges related to accessibility, technical capacity, funding, and sustainability. Without proper planning and community involvement, rural tourism projects may fail to deliver long-term benefits or risk environmental degradation [9]–[11]. Therefore, an integrated approach that combines scientific assessment, ecological stewardship, and active community engagement is essential for successful implementation.

This community service program addresses these challenges by focusing on creating a water pool attraction as an economic driver in a rural tourism village. Unlike conventional development projects, this initiative adopts a participatory and evidence-based model, beginning with access assessments and hydrological measurements to inform infrastructure planning. The method is consistent with best practices in sustainable tourism development, which recommend preliminary environmental diagnostics before construction [12]–[15]. River flow measurement in this program ensures the water supply system is grounded in the site's natural capacity, avoiding over-extraction or seasonal shortages. Eco-hydrological planning in community tourism contexts emphasises aligning natural resource use with ecological limits [16]–[19]. This program applies such findings through on-site river discharge analysis and water volume forecasting.

Moreover, community empowerment is a key component of the project, which aligns with community-based tourism (CBT) principles. Tourism initiatives in rural areas must prioritise community participation in planning, management, and benefit-sharing to ensure social equity and project continuity [20]–[23]. This project builds local capacity and ownership through training, collaborative planning sessions, and shared operational responsibilities. The final infrastructure, a culturally themed water pool, was developed for recreation and as a centre for local economic activity. It invites microenterprise development, such as food vendors, rental services, and cultural performances, as tourism facilities can trigger complementary income streams [24]–[27]. In this way, the intervention extends beyond physical construction into sustainable socio-economic transformation.

Another distinguishing feature of this program is the full funding by the authors themselves, without external sponsorship. This demonstrates ethical academic engagement where community impact precedes institutional recognition. It supports the idea of scholar-practitioners acting directly in service of the public good [28]–[30].

The first specific objective of this community service program is to develop an environmentally sustainable water pool attraction in a rural tourism area by applying scientific approaches in site assessment, hydrological measurement, and infrastructure planning. This includes evaluating access routes, measuring land topography, and analysing river flow capacity to ensure the water source can support pool operations without harming the local ecosystem. By integrating environmental data into the design process, the project aims to produce a functional, safe, and eco-friendly tourism facility that aligns with the site's natural conditions.

The second objective is to empower the local community through participatory development and economic activation. This involves engaging residents in planning, construction, and future management of the water attraction, while also creating opportunities for microenterprise such as food stalls, equipment rentals, and cultural activities. The program seeks to build local capacity in tourism-based entrepreneurship, foster community ownership, and ensure that the economic benefits of tourism are equitably distributed. Ultimately, this objective supports long-term sustainability by embedding the project within the social and economic fabric of the village.

2. Methodology

This community service program employed a participatory action research (PAR) approach, integrating technical field assessments, community engagement, and infrastructure development to enhance rural tourism. The methodology consisted of four main stages: site reconnaissance, technical analysis, participatory planning, and infrastructure implementation.

1) Site Reconnaissance and Accessibility Survey
   The first stage involved direct observation and photographic documentation to assess road access and geographic constraints. This initial assessment aimed to understand the logistical challenges in reaching the target location and to identify the potential for tourism development based on the natural landscape.
2) Technical Measurement and Hydrological Analysis
   In the second stage, field measurements were conducted using standard surveying tools such as measuring tape reels and manual depth rods. Topographic surveys were performed to map the site layout and dimensions. River flow measurements were carried out to determine water discharge volume and seasonal variability, ensuring the water source could sustainably support the pool facility. The data collected were used to guide the engineering design and water intake planning.
3) Community Engagement and Participatory Planning
   The third stage involved local stakeholders in decision-making through informal meetings and collaborative site visits. Feedback from residents was integrated into the design to ensure cultural relevance, social acceptance, and long-term community ownership. This stage was essential for building trust and ensuring sustainability beyond the project implementation.
4) Infrastructure Construction and Activation
   The final stage involved the construction of the water pool facility, integrating culturally themed elements and eco-friendly design principles. The completed infrastructure had recreational features, seating areas, and basic amenities. Once operational, the facility was handed over to the community, accompanied by management, maintenance, and tourism-based income generation guidance.

All activities were documented systematically using field notes, photographs, and interviews. The authors fully funded the program as a form of direct academic contribution, without external sponsorship, ensuring independence and complete alignment with community needs.

3. Result & Discussion

The implementation of this community service program yielded a series of structured outcomes that reflect the effectiveness of a participatory and environmentally grounded approach to rural tourism development. Each phase of the activity, from accessibility assessment to hydrological analysis and infrastructure development, produced tangible results that contributed to the initiative's overall success. Through a combination of technical planning, stakeholder involvement, and cultural integration, the program not only resulted in the construction of a functional and attractive water pool facility but also laid the foundation for sustainable economic activation within the local community. The following sections present a detailed discussion of these outcomes, supported by visual documentation and relevant theoretical perspectives.

Figure 1 illustrates the route leading to the location of the community service activity titled "Community Service Program for Developing Water Pool Attractions as a People's Economic Enterprise in Rural Community-Based Tourism Areas." The photograph, taken from inside a vehicle, captures a narrow rural road surrounded by dense vegetation and natural greenery. This setting emphasises the remote and undeveloped nature of the area, highlighting the challenges in accessibility and the richness of its ecological and tourism potential. The winding road, shaded by tall trees and lined with untrimmed roadside plants, suggests a serene and untouched environment, a key asset for eco-tourism development. The journey depicted in the image reflects the commitment of the community

service team to reaching out to isolated rural communities to empower residents through sustainable tourism-based economic initiatives. This visual documentation serves as a record of the geographical setting and underscores the importance of infrastructure and accessibility in developing rural tourism destinations. Enhancing such access can facilitate future economic activities and improve community engagement.

Figure 1: Access Road Leading to the Community-Based Tourism Development Site

Figure 2 presents a documentation of the site measurement and technical assessment activities carried out as part of the Community Service Program for Developing Water Pool Attractions as a People's Economic Enterprise in Rural Community-Based Tourism Areas. The image captures two team members wearing safety gear and utilising a measuring tape to survey the designated area for water pool development. This process represents a crucial initial stage in the planning and designing of tourism infrastructure. Accurate land measurement ensures that subsequent construction aligns with the site's physical constraints and environmental characteristics. The surrounding elements in the image, including existing facilities, decorative features, and visitor activity in the background, highlight the site's potential as a recreational space already partially active and integrated into the local tourism setting.

Figure 2: Site Measurement and Assessment for Water Pool Development Area

The activity exemplified in this image underscores the importance of technical preparation in community-based development projects. It reflects a participatory approach combining engineering assessments with local tourism enhancement, aiming to improve economic value and visitor experience through structured and sustainable design interventions. In addition to the technical aspect, this measurement activity facilitates coordination with local stakeholders, including community leaders and tourism managers. Through on-site engagement, the service team can gather input on community preferences, cultural considerations, and environmental sensitivities, which are essential for designing infrastructure that is functional and aligned with local identity and values. Such participatory efforts help build trust and a sense of ownership among residents, increasing the sustainability and success of the development initiative.

Furthermore, the image demonstrates the multidisciplinary collaboration involved in the program, where academic knowledge is directly applied to real-world challenges in rural development. Integrating engineering expertise with socio-economic objectives illustrates the broader mission of community service in higher education: to produce tangible, meaningful impacts for underserved areas. The program contributes to rural empowerment through inclusive and context-sensitive innovation by leveraging local potential and systematically enhancing tourism facilities.

Figure 3 shows the river flow measurement activity, which is critical in the sustainable water supply planning for developing a water pool attraction. One member of the community service team is seen standing in the river while measuring water depth and velocity using a manual measuring rod, while another records the data from the riverbank. This activity is part of a hydrological assessment that informs the technical feasibility and environmental sustainability of utilising natural river resources for tourism infrastructure. Accurate knowledge of river discharge is essential to ensure that the proposed water pool system can operate without disrupting the ecological balance or depriving downstream communities of water resources. The presence of large rocks and natural vegetation highlights the relatively undisturbed condition of the river, underscoring the importance of adopting environmentally sensitive development practices.

Figure 3: River Flow Measurement for Sustainable Water Supply Planning in Pool Attraction Development

This fieldwork also exemplifies the program's interdisciplinary nature, combining civil engineering, environmental science, and community development to achieve practical solutions. The collaboration between academic professionals and local stakeholders aims to promote rural economic growth through eco-friendly tourism infrastructure while preserving the integrity of natural water sources for future generations. In addition to ensuring technical feasibility, the data gathered from the river measurement contributes to the design of water intake structures, filtration systems, and water flow regulation mechanisms that will be integrated into the water pool attraction. The design must account for seasonal

fluctuations in water levels, sediment load, and flow velocity to guarantee uninterrupted and safe operation throughout the year. Such considerations are crucial in rural settings where engineered systems must be low-maintenance and resilient to natural variability.

The community's involvement in observing and sometimes participating in this field activity helps foster transparency and knowledge transfer. Residents gain exposure to the process of scientific data collection and become more aware of how their natural environment can be utilised responsibly to generate economic value. This participatory approach enhances local capacity to manage and maintain the developed infrastructure long after the completion of the initial project. Furthermore, the natural river landscape depicted in the image offers added value to the tourism appeal of the location. Beyond its functional role in supplying water, the river can be promoted as an ecotourism feature, supporting activities such as guided nature walks, educational tours, or family recreation. Thus, this image represents a technical operation and a vision of integrated, sustainable development that aligns ecological stewardship with economic opportunity.

Figure 4 captures the completed water pool facility, the centrepiece of the community-based tourism area developed under the Community Service Program for Developing Water Pool Attractions as a People's Economic Enterprise. The image showcases a vibrant, family-friendly recreational space with colourful slides, water play structures and supporting amenities such as shaded seating and nearby rest areas. The aesthetic design and natural surroundings highlight the integration local cultural and environmental elements into the infrastructure. This facility represents the tangible outcome of collaborative planning, community engagement, and technical implementation in previous stages, including site surveying and water resource assessment. It provides a recreational venue for local families and tourists and functions as a sustainable economic driver for the rural area. The surrounding traditional structures, vegetation, and landscape design promote a unique rural tourism experience that distinguishes the site from urban or commercial waterparks.

Figure 4: "Completed Water Pool Facility as a Community-Based Tourism Attraction

Moreover, the presence of visitors in the image signals the early success and attractiveness of the facility. Its operation is expected to generate employment opportunities, increase household income, and stimulate supporting micro-enterprises such as food stalls, souvenir shops, and local transportation services. In this way, the project aligns with the broader goals of community empowerment and sustainable rural development through tourism. Regarding environmental sustainability, the water pool facility demonstrates thoughtful integration with the surrounding ecosystem. Using natural contours and preserving existing vegetation helps minimise ecological disruption while enhancing the aesthetic and cooling effect of the site. Drainage and water circulation systems are likely designed to ensure efficient water use and quality maintenance, supporting both the infrastructure's longevity and the users' health.

From a social perspective, the development of this facility encourages greater community participation in tourism management. Residents can take on various roles such as operators, maintenance personnel, guides, and cultural performers. These roles create employment and promote a sense of ownership and pride among community members. In the long term, this participatory model can foster a more inclusive and self-sustaining local economy. Furthermore, the visual appeal of the water park, enhanced by colourful design and traditional elements, strengthens the village's branding as a rural tourism destination. This can attract domestic visitors and potentially regional and international tourists seeking authentic, nature-based recreational experiences. With proper promotion and governance, the facility in Figure 4 could become a key anchor attraction, driving continued interest and investment in the surrounding tourism ecosystem.

The novelty of this community service program lies in its integrated and multidisciplinary approach to rural tourism development, which combines technical, environmental, and socio-economic elements into a unified intervention. Unlike conventional community service projects focusing solely on infrastructure assistance or education, this initiative introduces a full-cycle development model from site access and hydrological analysis to facility construction and local economic activation, making it a replicable best practice for similar rural contexts. A key innovation is using natural resources for sustainable water pool operation, guided by scientific river flow measurement and environmental carrying capacity. By aligning water supply systems with the hydrological profile of the site, the program ensures ecological balance while minimising operational costs—an aspect often overlooked in rural tourism facility development. This environmentally informed design strengthens the long-term viability of the infrastructure.

In addition, the project promotes community ownership through participatory planning and capacity building. Local stakeholders are not merely recipients of development, but active collaborators who engage in technical surveys, contribute to decision-making, and benefit directly from the tourism economy. This bottom-up model enhances the sustainability and relevance of the program while empowering rural populations to become stewards of their development. The water pool facility's colourful, culturally inspired final design reflects both local identity and creative place-making, further reinforcing the uniqueness and attractiveness of the destination.

4. Conclusion

This community service program successfully demonstrates an effective, context-sensitive model for rural tourism development by creating a water pool attraction grounded in local potential and scientific planning. Beginning with the journey to a remote location (**Figure 1**), the program underscores the importance of accessibility as the foundation for broader socio-economic integration. Field measurements and site assessments (**Figures 2** and **3**) provided a technical basis for designing an environmentally sustainable and functional water facility, ensuring responsible use of natural river resources while respecting ecological boundaries. The culmination of this effort is evident in the completed water pool facility (**Figure 4**), which now serves as a vibrant, family-friendly tourism attraction managed by the local community. This initiative not only enhances the recreational appeal of the area but also generates new livelihood opportunities and fosters community pride. The program's novelty lies in its holistic approach, merging engineering, environmental stewardship, and community empowerment to create a replicable, sustainable rural tourism development model. Ultimately, the project contributes meaningfully to rural populations' economic resilience and the advancement of community-based tourism practices.

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