

Antibacterial bio pores as a river flow filter for the development of “Taman Ndeso” water tourism

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ABSTRACT

The realization of the full potential of natural resources in each village for the benefit of the local community has been observed as a significant challenge. The national village-owned enterprises program encourages villages to optimize the utilization of their existing natural and human resources with the objective of fostering their economic independence. The program entails the optimization of the national village-owned enterprises program in the tourism sector, specifically in the context of Taman Ndeso. The objective of this community service activity is to provide technological assistance and address the issue of river water filtration as a pool water source. The impetus for this activity is the declining tourism activities at Taman Ndeso due to the presence of turbid water in the pool, which was deemed unsuitable for use. The activity is realized through the construction of a water purification filtration system to produce clean and healthy water. The antibacterial biopores are applied as filtration technology. This technology is designed to capture bacteria from river water that flow into the pond. This research adopted the direct exploration method, which was divided into a number of stages, including planning and preparation, implementation, evaluation, and reporting. The research outcome manifests into the restoration of the Taman Ndeso water tourism pool, which will be capable of attracting tourists and reviving village income to the maximum extent possible, with the management of the village-owned business entity.

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1. INTRODUCTION

Sumberpasir Village is situated within the administrative boundaries of Pakis District, Malang Regency, Indonesia. The village is renowned for its extensive rice fields, with nearly all areas of Sumberpasir comprising agricultural land. According to the traditional community tales, the name “Sumberpasir” is derived from the village’s location along a riverine area with a high sand content. This natural resource has historically provided a source of income for the community through sand mining activities. The village of Sumberpasir is comprised of four hamlets, namely Krajan, Ngrangin, Gagakasinan, and Botoputih. The village center is located in Krajan, where the Sumberpasir Village Office is situated.

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The village of Sumberpasir occupies a pivotal position in the region, as it is situated at the intersection of the Malang to Bromo Tengger Semeru route. This location attracts a considerable volume of tourists, underscoring the strategic importance of the village. Sumberpasir Village has the potential to evolve into a tourist destination. A tourism village represents a potential source of economic growth and community development (Priyanto et al., 2018; Silas et al., 2014). The approach to developing the tourism sector represents the effort to encourage regional development and improve people’s welfare. This suggests that tourism development with excellent management can make a significant contribution to regional development (Gautama et al., 2020; Wahid et al., 2021). However, this program requires the active participation of the community through the development of tourism villages.

One of the tours in Sumberpasir Village is managed by residents, while others are managed by the village through village-owned enterprises. One of the tourist attractions is Taman Ndeso. Taman Ndeso is a tourist attraction located adjacent to the Sumberpasir Village office. It encompasses a swimming pool with an array of rides, buildings for MSMEs, gazebos, and entertainment groups.

As indicated by the Head of Sumberpasir Village, Taman Ndeso tourism is currently inactive due to a dearth of tourist interest in visiting the place. This has resulted in the tourist spots in Taman Ndeso appearing desolate. Muliawanti & Susanti (2020) and Sudibya (2018) posited that the phenomenon of abandoned tourism has the effect of reducing the attractiveness of a village for tourists. There are several initiatives proposed by local village officials with the aim of revitalizing Taman Ndeso tourism, with the objective of reopening this tourist attraction.

One of the tourist attractions that invites a considerable number of tourists is the swimming pool (Silooy et al., 2020). In the Taman Ndeso, the swimming pool is utilized by the Sumberpasir Village community for water tourism. This swimming pool has dimensions of 20 x 16 meters. The water play pool was constructed with the assistance of village funds in 2019, with a budget of 75 million rupiah. In 2020, the village received 50 million rupiah in funding, which was allocated towards the addition of recreational facilities to the swimming pool. Following a year of operation, the pool encountered issues with water flow due to the accumulation of mud sedimentation and the proliferation of parasitic microbes. This resulted in the water becoming unfit for use due to its uncleanliness and potential harm to children’s skin. Additionally, the cost of maintaining the pool on a weekly basis is considerable.

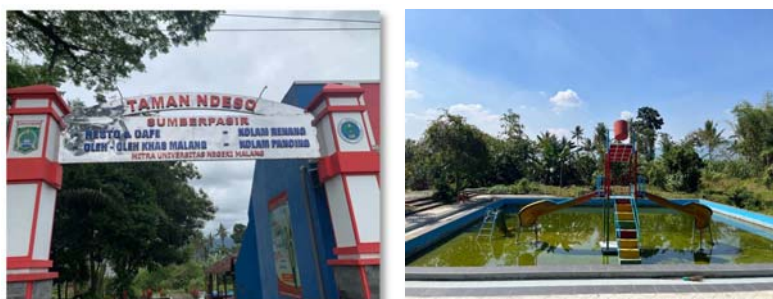


Figure 1. The gate of Taman Ndeso in Sumberpasir Village, Malang Regency
Figure 2. Existing condition of “Taman Ndeso” swimming pool

Following a further review of the condition of the swimming pool and the potential water sources, the State University of Malang Community Service Team identified a river located 100 meters from the Taman Ndeso swimming pool. This river is characterized by a fast flow and clear water, which is typically utilized by residents for rice field irrigation. Additionally, this river originates from a spring in the local village, ensuring a consistent and abundant supply of flowing water. Further, the community

service team recognized an opportunity to utilize natural resources in conjunction with technology to address the water source challenges faced by the local village government. This led to the decision to unite existing water sources with the village government's needs regarding the Taman Ndeso swimming pool. The objective was to provide an accessible and cost-effective solution that did not pose a risk to children's skin.

2. METHODS

The community service carried out by the State University of Malang team has the potential to significantly impact the improvement of Taman Ndeso as a village tourism destination. It aims to realize a tourism destination that is easily accessible to the surrounding community and serves as a successful attainment of village independence through a village-owned enterprises program (Mahadewi, 2018). In order to achieve the objectives of community service effectively, it is necessary to apply systematic and planned methods.

Location of Community Service

This community service is carried out in Sumberpasir Village, Pakis District, Malang, Indonesia. The rationale for selecting this location was twofold. Firstly, there was a village community playground, particularly river flows that can be transformed into swimming pool tourism in Taman Ndeso. Secondly, there was a village-owned enterprise responsible for the management of this initiative.

Partners

The partner engaged in this community service activity was the village-owned enterprises of Sumberpasir village, Pakis District, Malang Regency. The village-owned enterprises is an institution that has been established since 2010 and has considerable experience in managing the potential of natural resources in Sumbepasir Village.

Implementation Stages

In order to achieve the objectives of the community service, the application of antibacterial biopores as a river flow filter for the "Taman Ndeso" water tourism project was carried out in several stages. The stages include the planning and preparation stage, the implementation stage, and the evaluation and reporting stage.

Planning and Preparation Stage

In the initial planning phase, the community service research team conducted surveys and held discussions with the village government, specifically the village head and the manager of the Sumberpasir Village-owned enterprises program. Survey and discussion activities were conducted on numerous occasions between May and July 2023. It is of great significance to conduct surveys and engage in discussions pertaining to this activity, as it facilitates discussion between the involved parties concerning the projections of children's attractions and swimming pools using the technology offered by the community service team (Batubara et al., 2021). Furthermore, a review of the river flow was conducted by both parties as the primary source of irrigation for the children's pool. The survey and discussions revealed several issues related to the sustainability of Taman Ndeso, which was previously

the center of the tourism economy in the village. Further, the lack of functionality of Taman Ndeso negatively impacted the village's original revenue and the availability of an affordable tourism center for the village community.

Implementation Stage

The second stage was the implementation stage. At this juncture, the community service team devised a filtration system comprising Bio Clean Water, Local Bio Crystal, ECO Bio Block Filter, Bio Pristine Momogi Japan, and a 3/4 inch Clorinator filter, which was subsequently installed. Furthermore, a water filter was installed to enhance the quality of water from the river as it flows into the pond. The village government authorized the hiring of building construction experts to oversee the implementation of this initiative. The implementation stage was conducted over a period of approximately two months, from August to September 2023.

Evaluation and Reporting Stage

The evaluation and reporting stage was conducted subsequent to the completion of the implementation stage. At this juncture, the research team and the village government conducted a trial of the water flow in the swimming pool subsequent to the installation of the filter. This is of great consequence, as it guarantees the uninterrupted flow of water from the river to the pool. The subsequent phase was the reporting stage, which sought to collate the entirety of the activities and documentation conducted by the community service team and village officials as a record of the revitalization process. Moreover, it served as a supporting document and a means of improving the infrastructure of the village park, thereby facilitating the submission of a legal activity report between the two parties.

3. RESULTS AND DISCUSSION

Results

Sumberpasir Village is one of the villages in Pakis District, Malang, Indonesia. The village is renowned for its extensive rice fields, with nearly all areas of Sumberpasir comprising such agricultural land. According to the community tales, the name Sumberpasir was derived from the condition of the village land along the river, which is characterized by a high sand content. This has provided the community with a source of income through sand mining. In addition to its pristine natural environment, the village offers a range of other attractions, including ponds and waterfalls.

In order to establish an independent village, the government of Sumberpasir Village, Pakis District, Malang Regency, established Taman Ndeso, an environmentally friendly tourist destination managed directly by the village-owned enterprises. The Taman Ndeso is situated in the Botoputih hamlet of Sumberpasir Village, Pakis District, Malang, Indonesia. The Taman Ndeso was established with the objective of accelerating the development of the tourism industry in Sumberpasir Village in 2019. Taman Ndeso is situated behind the Sumberpasir Village Office, occupying an area of 625 m². The park was initially established with the village-owned enterprise funds in 2018, amounting to 350 million rupiah. It comprises a water playground for children and teenagers, as well as a restaurant serving traditional archipelago cuisine, offering parents the opportunity to dine while their children play. The Taman Ndeso also boasts beautiful scenery, with designated photography locations for capturing moments with family. However, the current condition of Taman Ndeso is experiencing a decline in functionality, necessitating strategic steps for revitalization.

The issue of the swimming pool's non-functionality can be attributed to the presence of murky water, which indicates that the currently available filters are still unable to effectively filter the water. Conversely, the absence of an efficacious irrigation system has resulted in a disruption to the water supply to the pool. This disruption impeded the functionality of the pool, necessitating the temporary closure of the arena. The manager recognized that the murky water, lack of a filtration system, and poor water circulation would have a detrimental impact on the skin health of the primary users of the pool, particularly children. In order to address these challenges, it is essential to implement technological solutions that can enhance the quality of life for the residents. One such solution is the adoption of antibacterial biopores as a river flow filter, which can be utilized as a source of water for the swimming pool. Additionally, the introduction of chlorine at levels consistent with standard practices can further improve the water quality.

The revitalization of Taman Ndeso in Sumberpasir Village was conducted in several stages, with each stage comprising activities designed to determine the appropriate course of action, with the approval from the village governing body as the manager of Taman Ndeso. The village head has mandated the management of all business activities to the village-owned enterprises of Sumberpasir, which consist of various activities. Based on the results of field observations, Taman Ndeso tourism is currently not operational due to the absence of tourist interest in visiting Taman Ndeso. This is attributed to the non-operation of several tourist attractions, which has resulted in the facilities in Taman Ndeso appearing abandoned, including the swimming pool.

Planning and Preparation Phase

The preliminary planning phase was undertaken with the objective of guaranteeing that the collaborative endeavor, centered on enhancing the filtration process from the river flow to the swimming pool, would be executed in an optimal manner. The discussion process was conducted with the Village Head, the Chairman of the village-owned enterprise, and the community service team. This activity resulted in the formulation of a solution that required two plots for the installation of water filters, with the objective of achieving a more clarified water output. The optimal location for the installation of the filtration system is in front of the village office, allowing for convenient monitoring and maintenance.

Following an analysis of the aforementioned conditions, an agreement was reached to prioritize the revitalization of water-based tourism, with a particular emphasis on ensuring a reliable and clean water supply. These two aspects are the fundamental prerequisite for the success of tourism activities. The water supply is facilitated through a series of processes, including water storage, filtration, and distribution to the swimming pool. Nevertheless, the primary challenge in this process is that the water in the pool rapidly becomes cloudy due to microbial contamination. This condition renders the water unfit for use, as it has the potential to cause irritation and dermatological issues. One potential solution is to enhance the filtration system for the swimming pool water, utilizing anti-bacterial filters and chlorinators, with the objective of achieving a clear and bacteria-free water supply. The implementation of this community service activity entails the application of appropriate technology for improving the water game park, which has significant potential for further development. Furthermore, the team devised a filtration system that was intended to enhance the water park. This filtration system technology is designed to address the specific conditions of Taman Ndeso, which is situated adjacent to the river and serves as the primary source of pool water. In the long term, this process aims to establish a water supply that is free from contamination and harmful microbes.

Following a discussion of the requisite specifications, the team conducted an assessment of the existing conditions of the swimming pool and the Taman Ndeso environment. This activity represents a

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critical juncture in the research process, as failure to complete it will preclude the team from developing a solution that addresses the existing problems. The review yielded the conclusion that it would be prudent to commence the revitalization process without delay, given the favorable yet inadequately maintained condition of the park.



Figure 3. Discussion between the community service team and the head of the village-owned enterprise of Sumberpasir

Figure 4. Survey on existing condition by community service team and sumberpasir government body

A further assessment is required to ascertain the adequacy of the river flow that will be employed for irrigation purposes, considering both the volume and the proximity of the source. This is a crucial consideration, given that the river water will serve as the primary water supply for the forthcoming swimming pool project. The team held discussions with the Chairman of a village-owned enterprise with the objective of designing an appropriate filtration scheme that meets the required capacity.



Figure 5. Survey on river water flow by the community service team and village-owned enterprise of Sumberpasir

The results of the survey demonstrate that the river flow designated for use as a source of water for the swimming pool meets the requisite standards. Specifically, the water is free from chemical contamination, and exhibits a clear and rapid flow, thereby meeting the necessary criteria. This is a promising indication that the water supply for the swimming pool will be adequate, given the fast flow rate and substantial volume of water. Furthermore, the survey and discussion have led to the formulation of a filtration system design that will be utilized by the community service team and village officials to inform the selection of the next filtration system development project, as illustrated in Figure 6.

The objective of this study is to develop a filtration system that can be implemented to enhance the quality of water at a water park. The system is designed to address the specific conditions of Taman Ndeso, which is situated adjacent to a river serving as the primary source of pool water. The goal is to create a clean water supply that is free of harmful microbes.

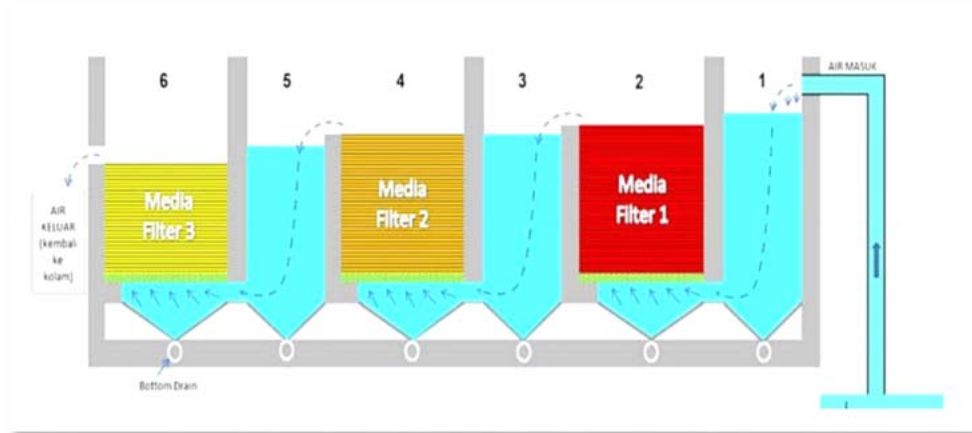


Figure 6. Design of anti-bacterial water filter system

Implementation Stage

The implementation stage was conducted between August and September 2023. Following the conclusion of the discussion, survey, and planning processes, this stage was initiated. The anti-bacterial water filter system was developed by the village in collaboration with third parties. It was anticipated that the system would be fully operational and undergo testing within the next two months. Additionally, management from village-owned enterprises provided support throughout the maintenance and future development phases.



Figure 7. Installation of anti-bacterial water filter system

The filtration system employs a conventional filtration process for pool water, augmented by an anti-bacterial biofilter that effectively traps microbes, preventing their migration beyond the filtration system. Microbes have the capacity to rapidly transform water into a cloudy solution due to their rapid proliferation in water media that exhibits optimal conditions and acid levels. Accordingly, the installation of an anti-bacterial water filter system aims to prevent the aforementioned phenomenon. It is anticipated that this system will be effective in reducing the proliferation of bacteria in the swimming pool, which represents a significant attraction at Taman Ndeso.

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Figure 8. Addition of filtration box by third party

In addition to installing the filter holder, the community service team also provided filtration materials utilized for the removal of bacteria from the river. These materials include the Bio Spiral Block, Ecobio-Blok, and Bio Purify Filter. These materials are derived from natural resources that are not detrimental to water and are capable of effectively filtering water.

The Bio Spiral Block Japan Media Filter is a biological filter media that functions as a bacterial habitat due to its expansive surface area (cavity). This allows for the proliferation of bacteria at a high rate. A multitude of bacteria are capable of metabolizing ammonia present in water, thereby rendering it not only as transparent but of superior quality. Furthermore, the filter is capable of expeditiously removing deleterious elements, including ammonia, nitrite, hydrogen sulfide, and heavy metals, from water. Additionally, the filter inhibits the growth of mold and algae. It also exhibits remarkable capabilities in absorbing visible impurities and maintaining pH equilibrium.



Figure 9. Bio spiral block

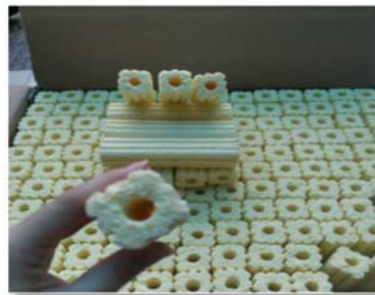


Figure 10. Eco-bio block

The utilization of Ecobio-Blocks in the filtration process is highly advantageous due to the proliferation of beneficial bacteria upon activation. These bacteria, infused within the blocks, disseminate throughout the water, maintaining elevated levels of good bacteria and a water source that is transparent, unsoiled, and conducive to optimal health. Ecobio Blocks are composed of a distinctive combination of volcanic rock, good bacteria, nutrients, and cement. These blocks facilitate the establishment of a balanced and healthy ecosystem, thereby reducing the necessity for frequent maintenance of aquariums or ponds. The dimensions of an Ecobio Block are 155mm x 35mm x 35mm.

The Bio Purify media serves as a home for ammonia-degrading bacteria. The presence of these bacteria is indicated by a change in color from clear to brown, which can be observed through clean water and healthy fish. This phenomenon is attributed to the breakdown of ammonia by decomposing bacteria.

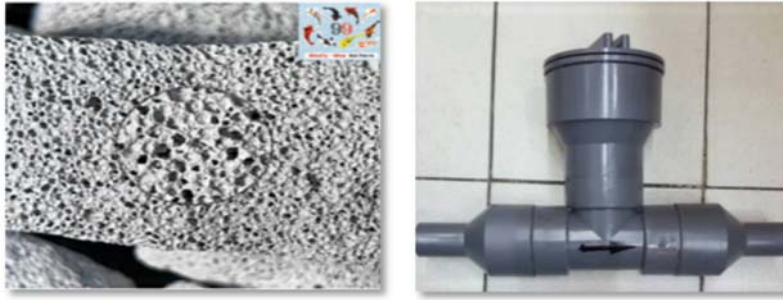


Figure 11. Bio purify filter
Figure 12. Chlorinator

The chlorinator is a relatively simple tool that functions to drain disinfectants such as chlorine (Cl) in order to reduce contaminants in the form of pathogenic microorganisms in water. It operates by being dissolved in water through a small hole in order to reach optimal levels, which are sufficient to kill pathogenic microorganisms. Furthermore, the chlorinator is safe to use.

Evaluation and Reporting Stage

The final stage of this process is the evaluation and subsequent reporting of the findings. Following the conclusion of the trial, there is a notable change in the volume of water entering the pond. Consequently, the water is now clearer and more readily amenable to cleansing. This facilitates the pool manager's ability to clean the pool and improve the water flow, which was previously obstructed. Furthermore, the utilization of river water is optimized, as evidenced by the fact that the swimming pool at Taman Ndeso in fact utilizes the river flow in Sumberpasir Village. This approach allows for the optimization of natural resources for the benefit of the village community. Furthermore, it enhances the functionality and purpose of Taman Deso by maximizing the natural potential within the village, thereby promoting village independence. Additionally, it stimulates economic growth and contributes to village-owned-source revenue.

Discussion

The establishment of a water pool tourism facility in Taman Ndeso has had a considerable impact on the growth of the village's income. The presence of a water pool tourism facility in the village of Taman Ndeso has proven to be a significant source of revenue, attracting numerous tourists who come to enjoy the facility and its surrounding amenities. The income originates from entrance tickets, swimming equipment rental, and food stalls, all of which contribute to the overall revenue generated by the tourism industry. A study conducted by [Donuisang et al. \(2018\)](#) revealed that the introduction of tourism facilities can lead to a notable increase in village income, with a potential growth of up to 25 percent compared to the pre-facility period.

Furthermore, water pool tourism facilities contribute to the creation of employment opportunities for the local community. The influx of visitors necessitates the provision of additional services, such as janitorial, security, and ticketing personnel, which directly result in job openings for villagers. Research conducted by [Nurhajati \(2018\)](#) demonstrated that the advancement of village tourism has the potential to reduce the local unemployment rate by up to 15 percent, thereby illustrating the beneficial impact of tourism in addressing labor-related challenges.

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Furthermore, water pool tourism facilities contribute to local economic development. Tourists who visit these facilities not only spend money on entrance tickets, but also on local products and services, including food, beverages, and souvenirs (Muliawanti & Susanti, 2020). This stimulates the growth of small and medium-sized enterprises in the surrounding area. According to Batubara et al. (2021) tourism activities that develop in villages can increase the income of local MSMEs by up to 20 percent.

Another advantage of this village tourism activity is the enhancement of village infrastructure (Islami et al., 2021). The revenue generated from water pool tourism facilities can be utilized to enhance and construct village infrastructure, including roads, bridges, and other public facilities (Rahmi, 2016). These infrastructure developments will not only facilitate accessibility and convenience for tourists but also for the local population. As posited by Huda (2020), infrastructure development financed by tourism revenue can elevate the overall quality of life in rural communities.

In addition to the economic and infrastructural benefits, the construction of water-pond tourism facilities has been shown to improve the quality of life of local residents through the provision of recreational facilities and opportunities for social interaction (Sari & De Fretes, 2021). The establishment of easily accessible recreational areas allows villagers to engage in leisure activities, which can positively impact their physical and mental health. A study by (Fadil, 2019) demonstrated that the presence of recreational facilities in villages can lead to an increase in the happiness and life satisfaction of local residents.

In order to achieve effective tourism management in the village-owned enterprise program, it is essential to adopt a structured approach that encompasses comprehensive planning, operational management, and marketing strategies (Putri et al., 2024). The identification of local tourism potential, such as natural beauty, culture, or history, stimulates interest among tourists and encourages them to visit (Atmojo et al., 2024). The development planning process should include the creation of attractions, the improvement of facilities, and the provision of activities that are attractive to tourists. Besides, it is essential to establish a competent management team and provide them with training in customer service standards and operational aspects. Marketing and promotion should also be prioritized as they serve as key strategies to attract tourists. It is essential to develop a robust brand identity and leverage social media and websites to disseminate information about the destination. Forming partnerships with travel agents and influencers can facilitate an expanded promotional reach. Furthermore, periodic evaluations are crucial for assessing performance, incorporating feedback from visitors, and analyzing financial and operational reports. The evaluation outcomes are instrumental for informing improvements and adjustments to the strategy, thereby ensuring the BUMDes tourism program's continued relevance and high quality (Andayani et al., 2024).

4. CONCLUSION AND RECOMMENDATIONS

The utilization of river water for the Taman Ndeso swimming pool, through the application of an antibacterial bio pore as a river flow filter, has been demonstrated to be an effective method for the maximization of natural resources in Sumberpasir Village, Pakis District, Malang, Indonesia. The installation of filtration systems comprising natural materials, including Bio Spiral Block, Bio Purify Filter, Multiple Water Filter, and a chlorinator, has resulted in a notable improvement in water clarity and a reduction in instances of skin irritation. With the optimal function of the swimming pool, Taman Ndeso, which was previously inoperable, can resume its intended operational functions and generate income for the village, as documented in the village-source revenue. This has the direct effect of developing the economic sector and supporting village independence through village-owned enterprises. Furthermore, the reactivation of the swimming pool has triggered the development of small businesses around the

Taman Ndeso area that are managed by the village community independently. This is undoubtedly a positive contribution of Taman Ndeso to local economic development in the village.

One limitation of this community service is the absence of scientific testing to assess the quality of the water in the Taman Ndeso's swimming pool, in Sumberpasir, Malang, Indonesia. The recommendations provided in this activity pertain to the testing of the existing water quality. Furthermore, the potential revenue generated from Sumberpasir village tourism on a regular basis, in addition to the management of village-owned enterprises-managed tourist attractions, is a key area of interest. Besides, the benefits derived from these attractions should be distributed equitably among the village institutions and the wider community.

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