

Strategy for Optimizing the Potential of Local Resources Through Mapping the Potential of Mertelu Village & Hargomulyo Village and Hargomulyo Village, Gedangsari District, Gunungkidul DI Yogyakarta

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Abstract. The community service program conducted in Gedangsari District, Gunungkidul, Yogyakarta, aimed to optimize the potential of local resources in Mertelu and Hargomulyo Villages through comprehensive territorial mapping. The initiative was driven by the need to enhance the economic development of rural areas with abundant but underutilized natural resources. The methodology involved participatory mapping, GIS analysis, structured interviews, and direct observations to document the distribution of natural resources, MSMEs, and infrastructure. The results revealed significant opportunities for developing eco-tourism and agricultural industries, particularly in areas with underutilized land. Additionally, the program successfully increased community capacity by providing training in mapping technologies, leading to greater local involvement in planning processes. The conclusion underscores the effectiveness of territorial mapping as a tool for rural development, highlighting the potential for this approach to be replicated in other regions facing similar challenges. Future community empowerment efforts should focus on sustainable practices and continued capacity-building to ensure long-term economic and social benefits for the local population.

Keywords: Community Empowerment; GIS Mapping; Local Resource Optimization; Rural Development; Territorial Mapping

1. Introduction

Sustainable and inclusive economic development requires prudent management of resources, particularly in rural areas with abundant natural resources (Coleman et al., 2024; Kalyuzhin et al., 2024; Kohardinata et al., 2024). One practical approach to this management is through community empowerment and the development of Micro, Small, and Medium Enterprises (MSMEs), which play a strategic role in driving economic growth, creating jobs, and reducing socio-economic disparities (Tavra et al., 2024). Gedangsari District, located in Gunungkidul Regency, Yogyakarta Special Region, is one such area with significant potential for MSME development based on local resources but also faces considerable challenges in optimizing this potential. Geographically, Gedangsari District is

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situated in the northern part of Gunungkidul Regency, bordering Bayat and Gantiwarno sub-districts in Klaten Regency to the north, and Ngawen and Nglipar Sub-districts to the east (Andy Saputra et al., 2023; Nina Andriany Nasution & Arnita, 2023; Surjadi et al., 2023). The district spans an area of 68.145 km², accounting for 4.59% of Gunungkidul Regency's total land area. It comprises seven villages, with Ngalang Village being the largest at 14.82 km² and Sampang Village being the smallest at 5.55 km² (Aprianti et al., 2023; Badan Pusat Statistik, 2022). Despite its abundant natural resources, including agriculture, livestock, and natural tourism, many of these resources remain underutilized, hindering the improvement of local community welfare (Ighfirli Amanda Izzati et al., 2023; Kiswanto et al., 2023; Syarif et al., 2023).

Empowering communities in rural areas like Gedangsari is crucial and should be done through a comprehensive and sustainable approach (Dyah Utami et al., 2023; Eka, 2023; Ghafar, 2023). The concept of empowerment involves three main elements: creating an enabling environment that allows communities to develop their potential, strengthening the capacity and power of communities (empowering), and providing protection to ensure communities have the rights and access to manage their resources (Aprianti et al., 2023; Mawarsari, 2023). In this context, an approach based on local potential and active community participation is particularly relevant for addressing the developmental challenges faced by Gedangsari.

One of the main challenges faced by MSMEs in Gedangsari, as in many other areas, is limited access to markets and technology (Boggs et al., 2023; Disli et al., 2023). According to a 2021 report by the United Nations Development Programme (UNDP), MSMEs that successfully transitioned to digital platforms experienced significant profit increases, with 38.8% reporting higher profits (Alhamda & Wahyuningsih, 2023; Amelia Sugangga et al., 2023). However, in areas like Gedangsari, where digital infrastructure may not be fully developed, many MSME actors still struggle to leverage technology to expand their markets and enhance their product competitiveness. Data from the Ministry of Cooperatives and SMEs shows that MSMEs contribute significantly to Indonesia's national economy, accounting for 61.9% of the Gross Domestic Product (GDP) and employing 97% of the workforce in 2023. However, this success is not evenly distributed across all regions, particularly in areas with limited access like Gedangsari. Therefore, specific strategies are needed to overcome these barriers and enable MSMEs in Gedangsari to develop more effectively.

The community service program in the form of Community Service (KKN) by Gadjah Mada University (UGM) in Gedangsari District aims to address these challenges through an approach based on territorial mapping and the optimization of local resources. Territorial mapping is an essential tool in development planning as it provides a clear picture of the existing potential and how it can be optimally utilized. In this context, territorial mapping is not merely a technical activity but also involves active community participation to ensure that the mapping results can be effectively used to improve their welfare.

The primary objective of this community service program is to optimize the potential of local resources in Mertelu Village & Hargomulyo Village, Gedangsari District, through comprehensive territorial mapping activities. This mapping aims to identify and document the potentials in the village, including agriculture, livestock, tourism, and other natural resources that have not been fully utilized. Consequently, the results of this



mapping are expected to serve as the foundation for more targeted and needs-based community empowerment programs.

Moreover, this program seeks to enhance the capacity of the community in managing and utilizing their local resources. Through training and mentoring, the community will be taught how to use mapping technology and geographic information systems (GIS) in managing their territory. Thus, the community will not only benefit from this program but also become the main actors in their village's development process. In the long term, this program aims to promote a village development model based on local potential and community participation. This model is expected to serve as an example for other villages in Gedangsari District and beyond, demonstrating how local resource potential can be harnessed to improve community welfare.

This community service program holds great significance for the people of Mertelu Village & Hargomulyo Village, Gedangsari District, and the surrounding areas. Firstly, it offers the community a direct role in the planning and management of their territory. Through this involvement, they can better understand their potential and how it can be optimally utilized to enhance their welfare. Secondly, the program is expected to have a positive economic impact on the community. By leveraging mapping technology and geographic information systems, the community can identify previously untapped potentials, such as unoptimized agricultural land, natural resources that could be developed as tourist attractions, or livestock potential that can be enhanced. Therefore, the outcomes of this program are expected to open new economic opportunities for the community, ultimately increasing their income and well-being.

Thirdly, the program also carries social and cultural significance. By involving the community in the mapping and planning process, it strengthens the sense of togetherness and solidarity among village residents. Additionally, it helps preserve local wisdom and traditions by documenting and promoting the village's cultural potentials. Ultimately, this program is anticipated to serve as a model for community empowerment programs in other regions. With its approach based on local potential and community participation, this program can demonstrate how sustainable and inclusive development can be achieved at the village level.

2. Methods

The methodology employed in this study is designed to optimize the potential of local resources in Mertelu and Hargomulyo Villages, Gedangsari District, Gunungkidul, Yogyakarta, through comprehensive territorial mapping. The study utilizes both primary and secondary data collected during the community service program (Kuliah Kerja Nyata Pembelajaran Pemberdayaan Masyarakat, KKN-PPM) conducted by Gadjah Mada University (UGM) in the period from July to August 2023. The approach integrates various data collection techniques, including structured interviews, direct observation, Geographic Information System (GIS) mapping, and participatory methods such as Focus Group Discussions (FGDs), to ensure a thorough and participatory mapping process that reflects the local community's needs and potentials (Entaresmen & Chaniago, 2022; Mukhlis et al., 2022).

2.1. Primary Data

The primary data for this study were collected through structured interviews, direct observation, and GIS mapping (Evans, 2022; Warman & Ardila, 2022). Structured interviews were conducted with a range of stakeholders, including local villagers, village



officials, community leaders, and representatives from various local organizations (Ismanto et al., 2022). The structured interviews used a set of questionnaires designed to gather detailed information on the socio-economic conditions, resource utilization, and community needs in Mertelu and Hargomulyo Villages.

The data collection process also included geospatial data acquisition through the use of Global Positioning System (GPS) devices to record the coordinates of key locations within the villages. These coordinates were essential for creating accurate maps of the area, which highlight the distribution of natural resources, infrastructure, and other significant landmarks. Additionally, satellite imagery and drone technology were employed to capture high-resolution images of the landscape, providing a comprehensive overview of the village's geographical and environmental features.

Direct observation was another crucial method used in this study. Researchers and students involved in the KKN-PPM program conducted field observations to assess the current state of resource utilization, infrastructure, and community activities. These observations helped in validating the data obtained from interviews and in identifying areas where further data collection or investigation might be needed.

2.2. Secondary Data

Secondary data were obtained from various sources, including the Village Administration Service Information System (Sistem Informasi Pelayanan Administrasi Desa/Kelurahan, SIMPADEK) of Mertelu and Hargomulyo Villages. This system provided essential demographic and socio-economic data, such as population size, gender distribution, educational attainment, and employment statistics (Ernawati, 2021; Syamruddin et al., 2021). These data were used to complement the primary data and provide a broader context for the analysis.

Additionally, previous studies and official reports related to resource management, rural development, and community empowerment in similar contexts were reviewed and integrated into the analysis. This review helped to establish a theoretical framework for the study and to identify best practices that could be adapted to the specific conditions of Mertelu and Hargomulyo Villages.

2.3. Data Analysis

The data collected were analyzed using both qualitative and quantitative methods. Qualitative data from interviews and FGDs were transcribed and coded to identify recurring themes and patterns related to resource management, community needs, and potential development strategies. This thematic analysis allowed the researchers to gain insights into the community's perspectives and to identify key areas where interventions might be most effective. Quantitative data, particularly geospatial data, were processed and analyzed using GIS software, including ArcGIS and AutoCAD. These tools were used to create detailed maps that illustrate the spatial distribution of resources, infrastructure, and other important features within the villages. The maps served as a visual tool for identifying areas with high development potential and for planning future interventions.

The analysis also involved the application of statistical methods to assess the relationships between different variables, such as the correlation between resource distribution and socio-economic indicators. Microsoft Excel was used for data management and basic statistical analysis, allowing the researchers to identify trends and



patterns that could inform the development of targeted strategies for optimizing resource utilization.

2.4. GIS Mapping and Spatial Analysis

GIS mapping was a central component of this study, enabling the visualization and analysis of the spatial distribution of resources and infrastructure in Mertelu and Hargomulyo Villages. The use of GIS allowed for the integration of various data layers, including topography, land use, population density, and resource locations, to create comprehensive maps that reflect the current state of the villages.

The spatial analysis conducted through GIS also helped in identifying areas that are underutilized or that have significant development potential (Dadang Mashur et al., 2020; Ramavhoya et al., 2020). For example, the analysis of agricultural land use patterns revealed areas where crop diversification or improved irrigation could enhance productivity. Similarly, the mapping of tourism resources, such as scenic spots and cultural sites, provided insights into how these assets could be better integrated into local development plans. Furthermore, the spatial analysis was used to assess the accessibility of different areas within the villages. By analyzing the proximity of households to essential services such as markets, schools, and healthcare facilities, the researchers were able to identify areas where infrastructure improvements are needed. This information is crucial for ensuring that future development efforts are equitable and that all members of the community can benefit from the improvements.

2.5. Implementation and Monitoring

One of the key principles of this study was the active involvement of the local community in the mapping and data collection processes. Participatory mapping was employed as a method to engage community members in the identification and documentation of local resources (Sari, 2020). This approach not only helped to ensure that the mapping reflected the community's knowledge and priorities but also empowered the community by involving them directly in the planning process.

FGDs were conducted with various community groups, including village officials, local leaders, youth organizations, and women's groups, to gather input on the mapping process and to discuss potential strategies for resource optimization (Sedyastuti, 2018; Tarnoki & Puentes, 2019). The FGDs provided a platform for community members to share their knowledge and to collaborate in identifying challenges and opportunities for development.

The participatory approach also extended to the validation of the maps and data. Once the initial maps were created, they were presented to the community for review and feedback. This iterative process ensured that the final maps were accurate and that they reflected the community's perspectives. It also fostered a sense of ownership over the mapping outcomes, which is essential for the sustainability of the project.

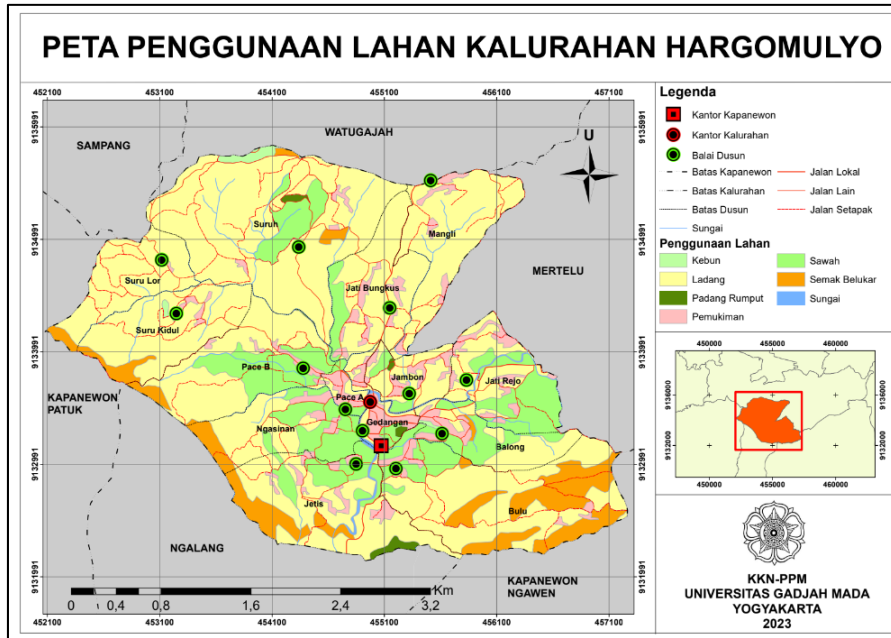
The research focused on optimizing the potential of local resources in Mertelu and Hargomulyo Villages, Gedangsari District, Gunungkidul, Yogyakarta, using a territorial mapping strategy. This section elaborates on the findings from the data collected and analyzes the effectiveness of the strategies employed, considering the socioeconomic, cultural, and environmental context of the area. The analysis is based on primary and secondary data, including geospatial data, survey responses, and observations.



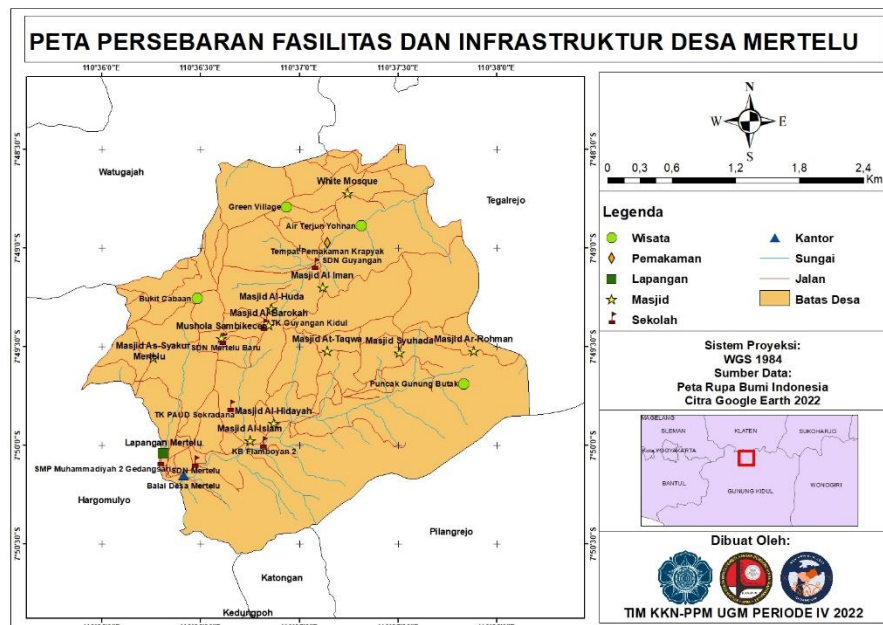
3. Results and Discussion

3.1. Map of Mertelu & Hargomulyo Village

The land use map of Hargomulyo Village provides a detailed overview of the various land categories, including agricultural land, forests, settlements, and other uses. This map is crucial for identifying areas with development potential and planning future land use that optimizes local resources. In addition, the administrative map and distribution of facilities in Mertelu village are also important for planning future village socio-economic development.



a.



b.



Figure 1 a) The land use map of Hargomulyo Village b) The administrative map and distribution of facilities in Mertelu

The map reveals that a significant portion of the land in Hargomulyo is dedicated to agriculture, which is vital for the village's economy. However, there are also areas of underutilized land that could be developed for tourism or other economic activities. For instance, forested areas and hills could be promoted as eco-tourism sites, which would not only preserve the environment but also generate income for the local community. The spatial distribution of land use also suggests the need for strategic planning in infrastructure development, such as roads and public facilities, to support economic activities, particularly in more remote areas. The integration of geospatial data into development planning allows for more informed decisions that consider the environmental and social impact of land use changes.

3.2. Distribution of MSMEs in Mertelu Village

The pie chart depicting the distribution of MSMEs in Mertelu Village indicates that most businesses are involved in crafts (kerajinan), followed by service industries (jasa), processed food production, and trade. This distribution reflects the village's strong cultural heritage in craftsmanship, particularly bamboo crafts, which are a significant economic activity.

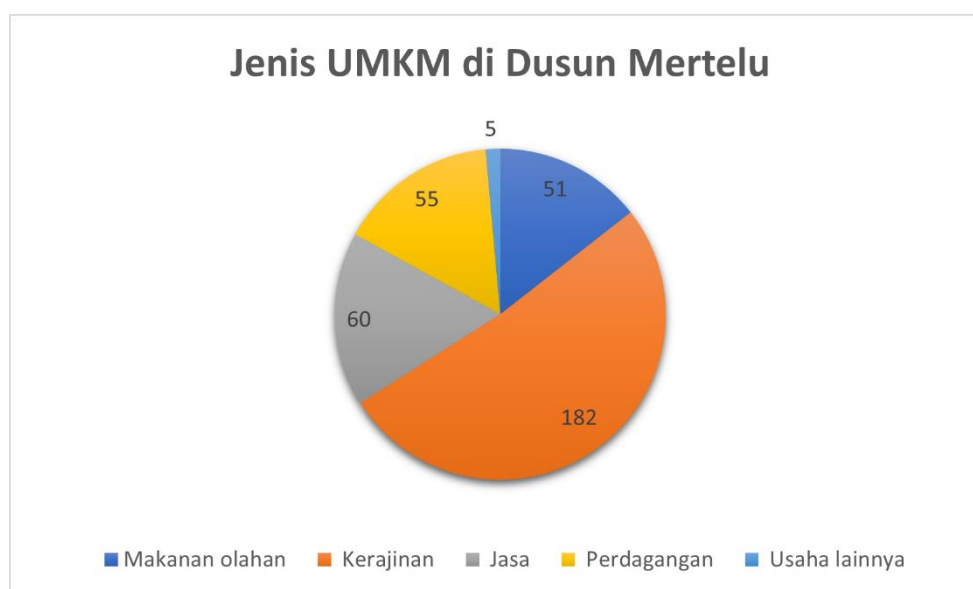


Figure 2 The distribution of MSMEs in Mertelu Village

The chart reveals an opportunity to diversify the types of Micro, Small, and Medium Enterprises (MSMEs) in the village, indicating untapped potential in sectors like processed food production. Although the village has access to abundant agricultural products, few businesses are currently engaged in processing these resources. By encouraging the development of food processing industries, local agricultural goods could be transformed into higher-value products, benefiting the community by creating new income streams and increasing profitability for farmers. This would not only add value to the raw



materials but also open up new markets, both locally and potentially beyond the village. Moreover, the data suggest that there are areas within the village’s economy, such as trade and services, where business activity is relatively low. By providing targeted support—such as training programs, financial assistance, and access to resources—entrepreneurs in these underrepresented sectors could be encouraged to establish new ventures. This support could help balance the economic landscape, reducing over-reliance on one sector, such as agriculture, and promoting a more resilient local economy. Diversifying into trade and services would also create more job opportunities, improve income distribution, and foster sustainable growth in the village. In essence, promoting the diversification of MSMEs not only builds on the village’s existing strengths, like agriculture, but also encourages innovation and entrepreneurship in less-developed areas, ultimately leading to a more dynamic and balanced local economy.

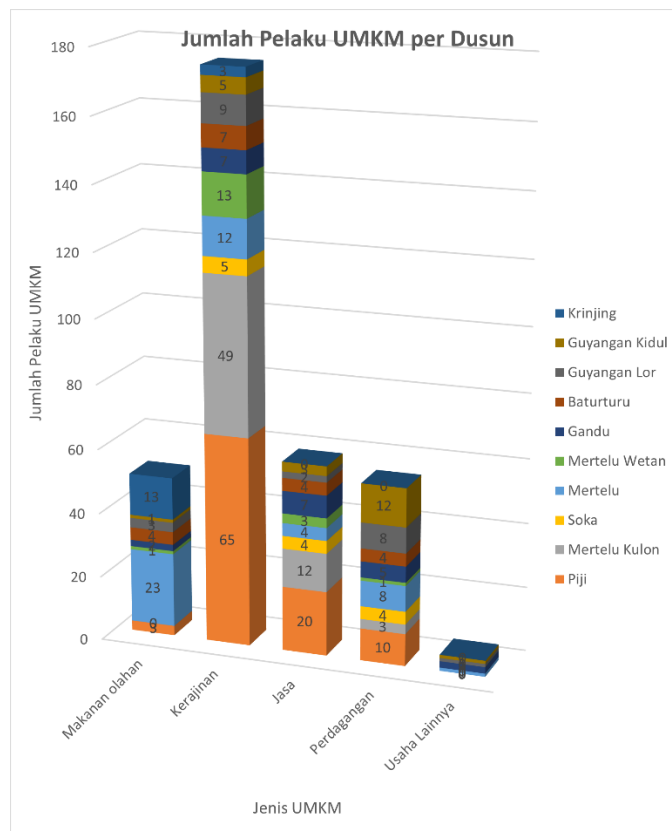


Figure 3 The number of MSME actors by hamlet

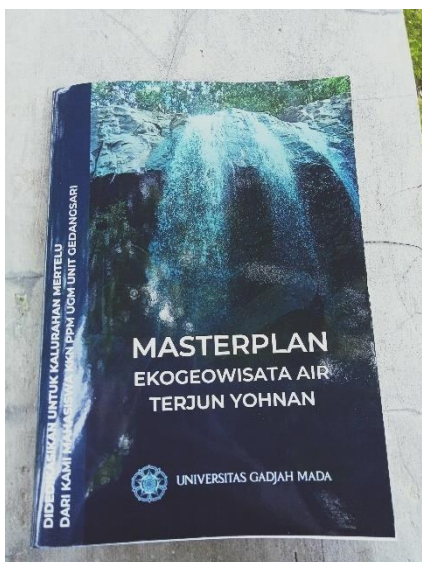
The bar chart showing the number of MSME actors by hamlet reveals significant variation in economic activity across different parts of Mertelu Village. Some hamlets, such as Krinjin and Piji, have a higher concentration of MSMEs, particularly in the craft sector. This concentration indicates areas of economic specialization, which could be further developed into clusters of industry-specific activity. The data suggest that these hamlets could benefit from targeted investment and infrastructure development to support their economic activities. For example, improving road access to these areas could facilitate the transport of goods and attract more visitors, thereby boosting the local economy



(Darmansah et al., 2016). Conversely, hamlets with fewer MSME actors may require different strategies, such as capacity-building programs to encourage entrepreneurship or the development of new industries. The variation in economic activity also underscores the importance of tailoring development strategies to the specific needs and potentials of each hamlet (Sedyastuti, 2018).

3.3. Master Plan and Proposal for New Tourism Object

The master plan for the Yohanan Waterfall Eco-Tourism project is a significant initiative aimed at developing the natural attractions in Hargomulyo Village. This project exemplifies how natural resources can be harnessed for sustainable tourism, which can provide long-term economic benefits to the local community while preserving the environment.



a.



b.

Figure 4 a) The Masterplan of Yohnan b) Submission of the Master Plan to the Pokdarwis and the Mertelu Government

The plan outlines various strategies for developing the area, including the construction of visitor facilities, the creation of hiking trails, and the promotion of local culture through community-based tourism. The involvement of residents in the planning and development process is crucial for ensuring that the benefits of tourism are equitably distributed and that the local culture is respected and preserved. Moreover, the master plan aligns with broader regional tourism strategies that aim to diversify the economy of Gunungkidul by promoting sustainable tourism. By focusing on eco-tourism, the plan supports environmental conservation while providing alternative livelihoods for residents, which is particularly important in areas with limited agricultural potential.

The proposal for the development of a new tourism object in Hargomulyo Village, particularly in the Gunung Jengger area, represents a forward-thinking strategy to diversify and enhance the village’s tourism sector. By transforming Gunung Jengger into a multi-attraction site, the village aims to attract a wider range of visitors with diverse interests. The development plan includes three key types of tourism: eco-tourism, adventure tourism, and cultural tourism, each catering to different aspects of visitor



experience. Eco-tourism in Gunung Jengger would focus on showcasing the area's natural beauty and biodiversity. This would likely involve activities like guided nature walks, bird watching, and environmental education, appealing to tourists who are interested in sustainable travel and connecting with nature. Such initiatives would not only boost tourism but also promote conservation efforts by highlighting the importance of preserving the natural environment.

Adventure tourism would target thrill-seekers and outdoor enthusiasts, offering activities such as hiking, mountain biking, rock climbing, or even camping. Gunung Jengger, with its rugged terrain and scenic landscapes, is an ideal location for such ventures. By developing adventure-based attractions, the village can tap into the growing demand for active and immersive travel experiences, attracting both local and international tourists who seek excitement and physical challenge. Cultural tourism, on the other hand, would focus on preserving and promoting the local culture and traditions of Hargomulyo Village. This could involve showcasing local arts, crafts, dances, and culinary traditions, as well as providing visitors with opportunities to participate in village life through homestays or workshops. Cultural tourism helps to preserve heritage while also providing economic benefits to local artisans and residents by giving them a platform to share their culture with a broader audience.

The combination of eco, adventure, and cultural tourism would allow Hargomulyo Village to cater to a broad spectrum of tourists, diversifying its tourism offerings and reducing the reliance on any single attraction or type of visitor. This strategic development could lead to increased tourist traffic, job creation, and improved infrastructure, benefiting the local economy while also preserving the environment and culture. Furthermore, it would make the village a more appealing destination, enhancing its competitive edge in the regional tourism market.

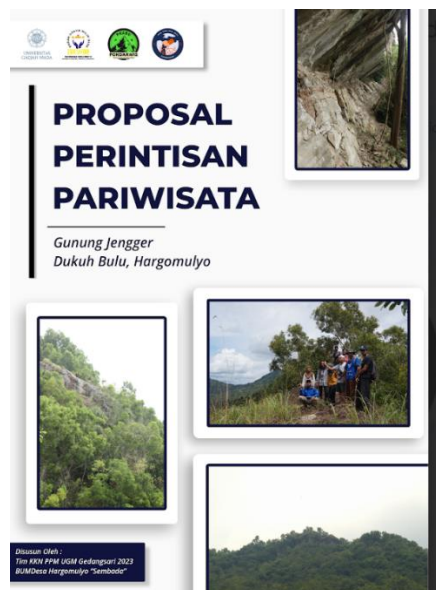


Figure 5 The proposal for the development of a new tourism object in Hargomulyo Village

The diversification of tourism products is essential for attracting a broader range of tourists and for extending their stay in the village. By offering a variety of activities, from



hiking and bird watching to cultural performances, the village can cater to different interests and enhance its appeal as a tourist destination. The proposal also emphasizes the importance of preserving the natural and cultural heritage of the area. Sustainable tourism practices, such as limiting visitor numbers and promoting eco-friendly activities, are crucial for ensuring that tourism development does not harm the environment or the local culture.

3.4. Database of MSME, Cultural, Tourism, and Agricultural Actors

The Excel database compiled as part of this research provides a comprehensive overview of the various economic activities in Mertelu Village. The database includes information on MSMEs, cultural sites, tourist attractions, and agricultural activities, providing a valuable resource for planning and development.

a. MSME Actors

b. Agricultural Actors

c. Cultural Actors

d. Tourism Actors

Figure 6 The Excel Database of MSME, Cultural, Tourism, and Agricultural Actors

The database reveals a diverse range of economic activities, with significant potential for growth in each sector. For instance, the data on cultural sites and events suggest opportunities for developing cultural tourism, which could attract visitors interested in local traditions and crafts. Similarly, the information on agricultural activities highlights the potential for value-added processing and marketing of local products. The integration of this database into local planning processes is crucial for ensuring that development strategies are data-driven and responsive to the actual needs and potentials of the community. The database also provides a baseline for monitoring the impact of development initiatives and for identifying areas where further support is needed.



3.5. Concrete Steps to Support Village Potential

The Instagram/FB account “Berkah Bambu Sidodadi” showcases the potential of bamboo craftsmanship in Mertelu Village. This account serves as a digital platform to market and promote locally crafted bamboo products. The initiative reflects the importance of digital marketing in enhancing the visibility and market reach of local MSMEs (Micro, Small, and Medium Enterprises). In the era of digitalization, MSMEs in rural areas like Mertelu can benefit significantly from social media to attract a broader customer base beyond the local market.

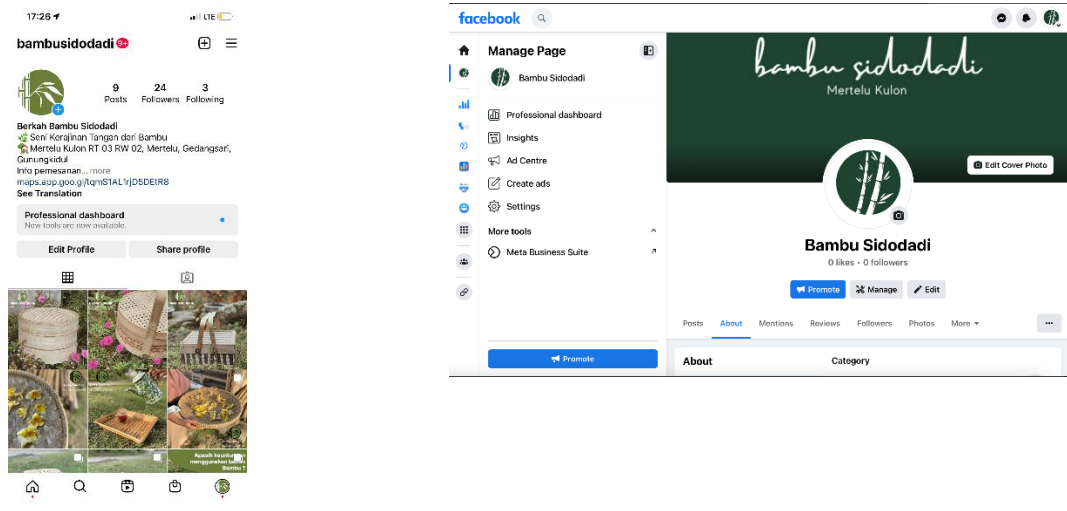


Figure 7 The Social Media account “Berkah Bambu Sidodadi”

The use of social media as a marketing tool aligns with the findings from the United Nations Development Programme (UNDP) that digital platforms can lead to substantial profit increases for MSMEs. The account's posts, which display various bamboo products, highlight the craftsmanship and cultural heritage of the village. The increased visibility of these products can potentially lead to higher demand, thus supporting local artisans and contributing to the village's economy.

The installation of directional signs for tourist attractions, such as Yohanan Waterfall and Puncak Clongop, is an essential step in developing the tourism potential of Hargomulyo Village. These signs improve accessibility to tourist sites, which is a critical factor in attracting visitors and enhancing their experience. Proper signage not only guides tourists but also serves as a promotional tool that highlights the existence of these attractions. The presence of such infrastructure can significantly impact the perception of the area as a tourist destination, making it more appealing to potential visitors.





Figure 8 The installation of directional signs and Informations Banner for tourist attractions

Moreover, the involvement of the local community in installing these signs helps to create a sense of ownership and responsibility for the maintenance and promotion of these sites. This participatory approach is vital for the long-term sustainability of tourism development in the area.

4. Conclusions

This community service program successfully demonstrated the potential of territorial mapping as a strategic tool for rural development in Mertelu and Hargomulyo Villages, Gedangsari District, Gunungkidul. By focusing on local resource optimization and involving the community in the mapping and planning processes, the program not only identified underutilized resources but also enhanced community capacity for self-sustained development. The participatory approach ensured that the program was closely aligned with the actual needs and potentials of the community, fostering a sense of ownership and empowerment among the residents. The insights gained from this program underscore the importance of combining technological tools like GIS with community-driven initiatives to achieve sustainable rural development. The findings suggest that similar approaches could be effectively replicated in other rural areas facing similar challenges. For future efforts, it is recommended to maintain the momentum by continuing capacity-building activities and developing strategic partnerships that can further enhance the economic resilience and social well-being of these communities.

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these efforts and collaborations not only drive change, but also serve as a real example of how community service can create sustainable positive change.

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