Initiative for Environmentally Oriented Social Innovation Development in Wonogiri Through the Program Gajah Mungkur

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Abstract

The Wonogiri Regency area, as the upstream and primary buffer zone of the Bengawan Solo watershed, is highly dependent on the sustainability of the Waduk Gajah Mungkur ecosystem. However, challenges in the form of sedimentation rates, waste generation, and the declining productivity of the agriculture, forestry, and fisheries sectors have triggered environmental degradation while simultaneously increasing the socio-economic vulnerability of surrounding communities. To address these issues, PT PLN Indonesia Power PLTA Wonogiri initiated the Program Gajah Mungkur (Gerakan Ajak Pilah Sampah untuk Menjaga Lingkungan Konservasi dan Pertanian Subur) as a form of social innovation that integrates reservoir conservation with the strengthening of the local economy. This study employs a qualitative approach using the framework of six stages of social innovation (prompts, proposals, prototypes, sustaining, scaling, and systemic change) to analyze the dynamics of the program. The findings demonstrate that this social innovation program, focused in Pokoh Kidul Village and Wuryorejo Sub-District, has successfully empowered vulnerable groups gradually and inclusively through the strengthening of bank sampah institutions, the development of fish-based MSMEs, and integrated farming designed within a circular economy scheme. Furthermore, this initiative also supports food security through the Makan Bergizi Gratis (MBG) program and the Taman Asuh Sayang Anak (TAMASYA) program, thereby reinforcing the integration of environmental, economic, and social aspects of communities around the reservoir. The program outcomes indicate multidimensional impacts, including controlling the sedimentation rate, enhancing business diversification, increasing household income, and fostering collective community awareness in maintaining the ecological functions of the reservoir. With these achievements, the Program Gajah Mungkur can be regarded as a social innovation practice that bridges ecological and economic aspects while simultaneously opening opportunities for adaptive replication in other reservoir areas in Indonesia.

Keywords: *Social Innovation, Community Empowerment, Circular Economy.*

A. INTRODUCTION

Wonogiri Regency is one of the regions in Central Java Province located in the southeastern part, specifically between 7°45′–8°15′ South Latitude and 110°18′–110°45′ East Longitude. With a total area of 1,793.67 km², Wonogiri Regency is the fifth largest among 35 regencies/municipalities in Central Java, covering 5.47% of the province's total area (The Regional Government of Central Java Province, 2024). Administratively, the region is bordered by Karanganyar and Sukoharjo Regencies to the north, Magetan and Ponorogo Regencies to the east, the Indian Ocean to the south, and Gunung Kidul Regency to the west (Wonogiri Regency, 2024). Based on the 2022

Population Survey, the total population of Wonogiri Regency reached 1,057,087 people, with a density of 580 people/km² (Statistics Indonesia of Wonogiri Regency, 2024). Of this number, 717,294 people are of productive age, with a dependency ratio of 46.82% (Wonogiri Regency, 2024). These geographical, demographic, and administrative conditions position Wonogiri Regency as a strategic area with development potential while also presenting challenges in resource management, particularly in maintaining the balance between population growth and environmental carrying capacity.

Morphologically, Wonogiri Regency has a diversity of ecoregions that shape the area's strategic character for sustainable development planning. Referring to spatial data from the Information System for the Dissemination of Results and Geospatial Information of the Center for Environmental Development Control of Java Eco-Region (2024), the southern part of Wonogiri Regency is dominated by the Karst Mountains and Hills of Gunungsewu, functioning both as a geological protected area and a groundwater source. Meanwhile, structural hills and volcanic intrusions in the eastern and northern parts serve as water recharge zones. The combination of these two ecoregions results in Environmental Services for Clean Water Provision covering 899,28 km² in Wonogiri Regency (Regional Government of Central Java Province, 2024). The central to western areas are characterized by Fluvio-volcanic Plains and the Bengawan Solo Valley, combined with lava domes and the foothills of Mount Lawu in the north, forming the main food barn with fertile soils that support plantation and sustainable agroforestry development. This characteristic creates Environmental Services for Food Provision covering 1.282,81 km² (Regional Government of Central Java Province, 2024). In addition, Alluvial Plains around the Wonogiri Reservoir function as buffer zones that are crucial for controlling sedimentation while also supporting fisheries and aquatic ecotourism (Hermawan, 2019). Overall, this diversity of landscapes contributes to the formation of Environmental Services for Climate Regulation covering 1.633,23 km² in Wonogiri Regency (Regional Government of Central Java Province, 2024), making ecoregion-based management crucial for maintaining ecological, social, and economic balance in this region.

The Fluvio-volcanic Plains that dominate the morphology of Wonogiri Regency also influence the region's economic activities. During the period 2018–2022, the agriculture, forestry, and fisheries sectors contributed the highest share to the Gross Regional Domestic Product (GRDP), with an average of 26,16%, followed by the Manufacturing Industry sector with 18,61% (Regional Government of Central Java Province, 2024). Despite this high contribution, from 2017–2022, the GRDP share of agriculture, forestry, and fisheries in Wonogiri Regency decreased from 31,47% to 29,11% (Statistics Indonesia of Wonogiri Regency, 2021; Statistics Indonesia of Wonogiri Regency, 2024), although the sectoral GRDP value increased from Rp6,73 trillion to Rp9,81 trillion. This decline in contribution reflects a structural economic shift that has the potential to affect environmental carrying capacity and land-use patterns.

One reciprocal impact of the shifting economic structure in Wonogiri Regency can be seen in the decline of the region's ecological performance. The Environmental Quality Index (IKLH) of Wonogiri Regency decreased from 72,74 in 2020 to 69,33 in 2021, while the Water Quality Index (IKA) fell from 77,52 to 71,44 during the same period (Wonogiri Regency, 2024). The decline of these two indices clearly indicates degradation of natural resource quality. On the other hand, waste management has become the third most strategic issue in Wonogiri Regency (Regional Government of Central Java Province, 2024). Data from the Sistem Informasi Pengelolaan Sampah Nasional (SIPSN) recorded a waste generation of 347,72 tons/day or 126.917,85 tons/year in 2022, with 25% consisting of food waste as the dominant fraction (Ministry of Environment and Forestry, 2022). However, the percentage of managed waste actually decreased from 0,448 in 2020 to 0,372 in 2021 (Wonogiri Regency, 2024).

Amid the challenges of environmental degradation and increasing waste generation, the presence of Gajah Mungkur Reservoir has become a key component in maintaining ecological balance while supporting the socio-economic activities of the people of Wonogiri Regency. Beyond functioning as flood control, Gajah Mungkur Reservoir also serves around 23.600 hectares of irrigation areas and provides a raw water supply (Cantik et al., 2024). Socio-economically, the existence of Gajah Mungkur Reservoir supports livelihoods through floating net cage fisheries, aquatic tourism, and supporting services while also serving as a space for social interaction (Social and Extraordinary Consulting, 2022). In 2022, there were 63 fishing groups that depended on the reservoir as their main source of income, utilizing it to meet family needs and sustain their livelihoods (Putra et al., 2023). However, this contribution is challenged by the decline in water quality. A study by Astuti et al. (2024) revealed that the distribution of Total Suspended Solids (TSS) with high values (>100 mg/L) was found along the reservoir's edges. The Total Dissolved Solids (TDS) values ranged from 790–1050 mg/L, falling into the medium to high category (Rosyadi et al., 2024). This environmental degradation is caused by entropy inputs from the surrounding watershed areas, particularly originating from Wonogiri Regency.

The administrative area of Wonogiri Regency is located on the northern side of Waduk Gajah Mungkur. Covering an area of 82,92 km², in 2022, Wonogiri Regency was inhabited by 44.223 people, with an average population density ratio reaching 1.275,96 people per km² (Statistics Indonesia of Wonogiri Regency, 2023). This population density influences the potential volume of waste generated. Based on the 2022 SIPSN calculations, the estimated daily waste generation in Wonogiri Regency reached 291,66 tons, equivalent to 106,45 thousand tons per year. Of the total waste generated, food waste was the largest contributor, with an average of 726,15 tons per day or approximately 266,14 thousand tons per year (Ministry of Environment and Forestry, 2022). Two areas directly adjacent to the reservoir, namely Pokoh Kidul Village and Wuryorejo Sub-District, contributed 1,90 tons and 1,80 tons of waste per day, respectively, equivalent to 693,97 tons and 658,19 tons per year. Furthermore, food waste contributions from Pokoh Kidul Village were recorded at 47,53 tons per day (17.349,21 tons per year), while Wuryorejo contributed 45,08 tons per day

(16.454,74 tons per year), which proportionally accounted for 6,54% and 6,21% of the total food waste generation in Wonogiri Regency, respectively. Although the total volume was relatively small, the high proportion of organic waste from these two areas was a significant factor accelerating the accumulation of pollutant loads in the reservoir waters, thereby underscoring the urgency of community-based waste management in the reservoir buffer zone.

Several previous studies indicate that the inflow of domestic waste into the reservoir increases ecological pressure and diminishes the hydrological and socio-economic functions of the reservoir. Unmanaged domestic waste directly contributes to the decline in water quality through the accumulation of organic, inorganic, and microplastic pollutants (Shen et al., 2025). In addition to contaminating raw water, the deposition of solid material may accelerate sedimentation, thereby reducing the storage capacity of the reservoir and shortening its service life (Verstraeten & Poesen, 2000). This condition impacts the effectiveness of irrigation, raw water availability, and the performance of hydropower plants (Mellyanawaty et al., 2024). Furthermore, water quality degradation disrupts fishery ecosystems and decreases fishermen's productivity, as observed in various reservoirs across Southeast Asia (Baran & Myschowoda, 2009). Therefore, waste control is key to maintaining the sustainability of the ecological and socio-economic functions of Waduk Gajah Mungkur.

The problem of waste generation in rural areas is not only an environmental challenge but also holds potential to strengthen the socio-economic resilience of communities. In Pokoh Kidul Village, 636 residents (75,44%) are small-scale farmers and livestock breeders who are vulnerable to price fluctuations, while in Wuryorejo Sub-District, MSME groups still face limitations in capital and innovation (Social and Extraordinary Consulting, 2022). This condition creates a contradiction, since despite the potential for utilizing food cycles and developing MSMEs, the level of food and economic resilience of the community remains low, as reflected in the presence of landless farm laborers in Pokoh Kidul and the vulnerability of unemployment among fishermen in Wuryorejo. Nevertheless, both areas have begun to show initiatives in waste management integrated with strengthening the local economy, such as maggot cultivation in Pokoh Kidul and fish catch processing in Wuryorejo (Social and Extraordinary Consulting, 2022). Furthermore, food security strategies have been directed through organic farming and maggot-based poultry farming in Pokoh Kidul, as well as food diversification through ikan presto products in Wuryorejo. Therefore, the management of organic waste connected with circular economy strategies has the potential to transform structural vulnerabilities into opportunities for sustainable livelihood development while simultaneously maintaining ecological sustainability in the buffer areas of Waduk Gajah Mungkur.

Recognizing the circular economy potential of waste and food management, the Gajah Mungkur Program was implemented as a collaborative effort between reservoir conservation and strengthening community economic capacity. This intervention was carried out through the collaboration of PT PLN Indonesia Power PLTA Wonogiri, which gathered partner groups as the main collaborators. The

implementation of this program was realized through innovation based on four pillars of integrated farming, namely: humans, crops, livestock, and fisheries (Kasimin, 2013). In practice, in Pokoh Kidul Village, the Kelompok Wanita Tani (KWT) Lestari was established, focusing on sustainable agricultural practices through organic waste management processed into maggot feed, which was then used for poultry farming. Livestock waste was further utilized as fertilizer to support organic vegetable farming. Meanwhile, in Wuryorejo Village, the MSME Iwak Presto Oma Min developed by processing local fish into value-added products. Through this approach, reservoir conservation is not viewed merely as an ecological agenda, but also as an instrument to strengthen food security, create business opportunities, and enhance the economic capacity of communities in the buffer zone of Waduk Gajah Mungkur.

B. RESULTS AND DISCUSSION

As explained by OECD (2025), social innovation is the process of creating and implementing new ideas, whether in the form of products, services, or processes, that simultaneously foster new forms of social interaction and partnership patterns. This definition emphasizes that social innovation is not limited to technical inventions but also encompasses transformations in the ways communities collaborate to address complex social needs. In line with this, Westley and Antadze (2010) state that social innovation is a series of complex processes that introduce new products, processes, or programs which profoundly change core routines, resource and authority flows, or beliefs within the social system where the innovation takes place. Successful social innovation has resilience and wide-reaching impacts. In this context, the capacity of communities to manage programs is crucial in determining the success of innovation dynamics, particularly for vulnerable groups who often occupy the most affected positions (Caulier-Grice, 2012).

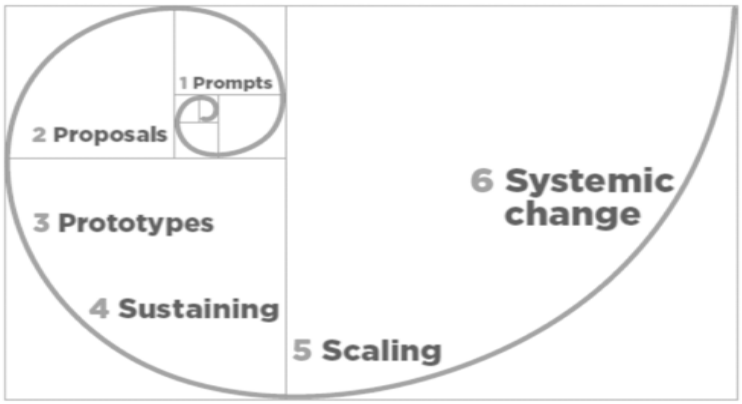

Figure 1. 1 Social Innovation Development Process

Source: Caulier-Grice, 2012

The process of social innovation as outlined by Caulier-Grice (2012) encompasses six main stages, namely: (1) identification of community needs and potentials (prompts); (2) formulation of innovation program development strategies (proposals); (3) implementation of prototypes/pilot projects (prototypes); (4) program sustainability (sustaining); (5) impact expansion and innovation model development

(scaling); and (6) transformation of the social system as a broader form of change (systemic change). Each of these stages carries significant meaning as they contain elements of novelty, are systematically designed, relevant to existing social problems, effective in implementation, and capable of enhancing community capacity.

Based on the description of the concept of social innovation above, PT PLN Indonesia Power PLTA Wonogiri, through its social and environmental responsibility practices, formulated a community empowerment program aimed at addressing two main agendas: improving the welfare of local communities and preserving the ecosystem of Waduk Gajah Mungkur. This program was realized in the form of the Gajah Mungkur Program (Gerakan Ajak Pilah Sampah untuk Menjaga Lingkungan Konservasi dan Pertanian Subur), positioned as a corporate social innovation initiative with an integrative approach: linking domestic waste management, reservoir resource conservation, and the strengthening of the local economy based on community potential. The following discussion elaborates in detail the implementation process of the Gajah Mungkur Program within the framework of social innovation. The analysis was conducted by interpreting data collected during the research. Data interpretation was carried out within the context of social innovation through the six-stage framework formulated by Caulier-Grice (2012), namely: prompts, proposals, prototypes, sustaining, scaling, and systemic change. Using this framework, the study examines how the processes of planning, piloting, sustaining, and developing the program were undertaken, ultimately resulting in social system transformation within the community. This six-stage framework thus serves as the analytical lens to understand the Gajah Mungkur Program as a social innovation for community empowerment by PT PLN Indonesia Power PLTA Wonogiri.

The prompts stage in the planning of the Gajah Mungkur Social Innovation Program for Community Empowerment began with social and environmental mapping conducted in villages surrounding Waduk Gajah Mungkur. This mapping served as the initial foundation for understanding the real conditions of the community, both in terms of potential and needs. Social mapping itself is routinely carried out by PT PLN Indonesia Power PLTA Wonogiri as part of database development for empowerment planning. The findings of the social study revealed that the main environmental issues in Waduk Gajah Mungkur are domestic waste generation and reservoir sedimentation. Based on data from the Sistem Informasi Pengelolaan Sampah Nasional (Ministry of Environment and Forestry, 2022), waste generation in Wonogiri Regency reached 347,72 tons/day, with a low level of management so that a portion ends up in the reservoir body. Meanwhile, data from Perum Jasa Tirta (PJT) I (2022) in Praditia (2023) recorded that sedimentation in Waduk Gajah Mungkur had reduced storage capacity from 560 million m^3 with an effective volume of 440 million m^3 at its construction (1980) to only around 365 million m^3 with an effective volume of 322 million m^3 in 2022. This condition indicates serious pressure on the reservoir's functions as a water buffer, irrigation source, and flood controller.

From a socio-economic perspective, the Social Mapping Document highlighted that the majority of communities around the reservoir work as seasonal farm laborers and small-scale fishermen, with fluctuating incomes vulnerable to weather conditions and market prices. At least 636 residents (75.44%) in Pokoh Kidul Village are small-scale farmers and livestock breeders at risk. The findings of Nissa & Suadi (2022) showed that the livelihood vulnerability index for small-scale floating net cage cultivators in Waduk Gajah Mungkur, Wonogiri Regency, reached 0.5, indicating a vulnerable category. The LVI-(IPCC) approach reinforced a similar conclusion, with an index value of 0.042, categorizing their livelihoods as vulnerable. Meanwhile, in Wuryorejo Sub-District, the vulnerable group structure is dominated by 288 poor households and 315 unemployed individuals, where limitations in training and capital further constrain these groups from improving their welfare (Social and Extraordinary Consulting, 2022). These findings underscore a contradiction: on one hand, there is great potential in organic waste for fertilizer, freshwater fisheries, and fish-based MSME opportunities, yet on the other, communities still face economic vulnerability and capacity constraints. This mapping fostered the awareness that empowerment strategies in the reservoir area cannot solely emphasize economic improvement but must also be integrated with environmental conservation efforts. Therefore, PT PLN Indonesia Power PLTA Wonogiri formulated the Gajah Mungkur Program as a collaboration-based social innovation, with the objective of mitigating environmental degradation through waste and sediment management, while simultaneously creating opportunities for strengthening the community economy based on local resources.

Moving on to the proposals stage, the Gajah Mungkur Program was then designed to address two fundamental issues in the Waduk Gajah Mungkur area: environmental degradation caused by waste and sedimentation, as well as the economic vulnerability of communities around the reservoir. Program planning emphasized the integration of reservoir conservation and economic strengthening based on local potential. As a response to these dynamics, the program proposed a socio-environmental strategy grounded in a circular economy approach through four main pillars: (1) Waste Management, (2) Child Nutrition Improvement, (3) Integration of Fishing Groups, and (4) Reservoir Conservation. This strategy was directed at reducing the rate of reservoir pollution while simultaneously generating added economic value. From a socio-economic perspective, communities in the two areas that became the focus of the program, namely Pokoh Kidul Village and Wuryorejo Sub-District, still face limitations in utilizing the potential of local resources. Data from Dinas Ketahanan Pangan Kelautan dan Perikanan Wonogiri (2023) in Praditia (2024) recorded that fish production from Waduk Gajah Mungkur in 2023 reached 10,471 tons/year or approximately 95% of the total fishery production in Wonogiri. Nevertheless, most of the production is still sold fresh at fluctuating prices. Therefore, the Gajah Mungkur Program proposed the development of fish-processing MSME. This development focused on: “Oma Min” MSME, Wuryorejo Sub-District, which

concentrates on diversifying fish-based processed products with longer shelf life and higher added value.

Program planning was carried out through a series of focus group discussions (FGDs) involving various stakeholders: village officials, farmer and fisher groups, local MSMEs, kelompok perempuan, and representatives of fishing communities. This process not only identified potentials that could be mobilized but also emphasized the importance of participatory mechanisms to ensure that communities became the main subjects of the program. This approach aligns with the perspective of Margayaningsih (2024), who emphasized that active community participation in development planning is an important factor in ensuring program relevance and guaranteeing the sustainability of its outcomes. Furthermore, the program design targeted not only environmental and economic aspects but also connected with public health issues. Nutritious processed fish products produced by these groups were projected as a source of animal protein that could support food security efforts by reducing stunting rates in Wonogiri Regency, which, according to data from Dinas Kesehatan Wonogiri Regency, as cited in the study by Widyowati and Utomo (2023), showed fluctuating prevalence during the period 2019–2022, namely 8,03% in 2019, increasing to 11,47% in 2020, then reaching 14,07% in 2021, and slightly decreasing to 12,12% in 2022. These figures indicate that although there are signs of improvement, the prevalence of stunting in Wonogiri remains relatively high and requires consistent and sustainable interventions. In the context of the Gajah Mungkur Program, this condition served as the basis for formulating an integrative strategy, in which the economic strengthening of communities through the development of fish-processing MSME and the utilization of local resources was not only aimed at increasing income but also directed toward providing additional nutritional intake to support food security in the reservoir area.

At the prototype stage, the Gajah Mungkur Program began to realize the program initiatives formulated at the proposals stage. The year 2023 marked the pioneering phase, characterized by the establishment of institutional foundations and field-testing of intervention models. The initial realization was carried out by providing intensive assistance to the Fish-Processing "Oma Min" MSME in Wuryorejo Sub-District. Support was given in the form of providing basic production facilities (pressure cookers and freezers), improving packaging quality, and developing product branding strategies. This step marked the concrete implementation of social innovation through the strengthening of local enterprises based on fish catches from Waduk Gajah Mungkur, while also paving the way for the establishment of a social entrepreneurship model that could be expanded in subsequent years. In addition, 2023 also marked the pioneering of a new institution in the form of Kelompok Wanita Tani (KWT) Lestari in Pokoh Kidul Village, projected as the manager of organic domestic waste through maggot cultivation. At this stage, activities were still focused on strengthening basic capacity through initial training and the provision of cultivation facilities and infrastructure. The presence of KWT Lestari became part of the integrative strategy to link the fisheries, agriculture, and household waste management sectors. Therefore, the prototype of the Gajah Mungkur Program was

not only a technical trial but also a process of internalizing the values of social innovation within the community. The year 2023 became a milestone in communities, particularly MSME actors and women's groups, who were no longer positioned as passive recipients of aid, but as the main actors in pioneering circular economy practices in the Waduk Gajah Mungkur area.

With the initial implementation at the prototype stage in 2023, the Gajah Mungkur Program emphasized the strengthening of institutional foundations and the realization of new products based on fish catches from the reservoir. Intensive assistance to the Fish-Processing MSME "Oma Min" in Wuryorejo Sub-District resulted in the diversification of processed fish products (such as ikan presto) with the support of production facilities, packaging, and branding. This step not only strengthened the competitiveness of local MSMEs but also fostered collective awareness that community economic improvement must go hand in hand with efforts to ensure the sustainability of Waduk Gajah Mungkur. The collaboration between the company as a facilitator and the community as the main actors became the foundation for the establishment of a circular economy chain around the reservoir. This chain is expected not only to strengthen economic independence but also to affirm that the sustainability of the reservoir ecosystem is an integral part of community welfare.

At the sustaining stage in 2024, the Gajah Mungkur Program was directed at ensuring the continuity of the initiatives previously undertaken, while also expanding the scope of their impact. Strengthening efforts focused on enhancing institutional capacity, diversifying activities, and expanding the circular economy chain. First, the sustainability of Oma Min MSME in Wuryorejo Sub-District was reinforced through improvements in production quality, the expansion of marketing networks, and assistance in business literacy. With this support, fish-based processed products not only became more diverse but also penetrated broader markets, thereby strengthening the community's economic competitiveness based on reservoir potential. Second, the establishment of Kelompok Wanita Tani (KWT) Lestari in Pokoh Kidul Village marked an important milestone in the expansion of social innovation practices. Through this group, maggot cultivation was developed as a solution for managing household organic waste while also providing alternative feed for the livestock sector. In addition, the program also promoted the utilization of sediment material from the reservoir as a medium for vegetable cultivation, thereby not only reducing environmental pressure but also creating added value for community food security. This program reflects sustainability through the integration of waste management, agriculture, and fisheries. Third, this stage also marked the pioneering of fishing groups as reservoir ecosystem partners. Their role was not limited to fishing activities but was also directed at supporting the MSME supply chain, maintaining reservoir ecosystem balance, including through fish restocking, and was projected to develop into an educational and ecotourism initiative in the coming years. Thus, the sustaining phase of 2024 demonstrated that the program did not end with product trials but rather developed into a more resilient system. Through institutional strengthening, business diversification, and network expansion, the Gajah Mungkur Program

reinforced its position as a sustainable initiative that unites community economic agendas with the conservation of Waduk Gajah Mungkur.

At the scaling stage, the Gajah Mungkur Program began to find broader development pathways through cross-sectoral integration and the creation of new sub-activities. Environmental issues in Waduk Gajah Mungkur, namely sedimentation caused by upstream erosion in the Bengawan Solo Watershed and pollution from domestic waste, require long-term management connected to community economic systems. Therefore, from the outset, this program was developed under the principles of a circular economy, in which every resource, including waste, is reprocessed to generate new added value. Valavanidis (2018), in Dahlan (2022), explains that the concept of a circular economy is not the same as the linear economy model, because it is cyclical through the 3R principles (Reduction, Reuse, and Recycling). Therefore, whereas the end point of production in a linear economy is disposal, the circular economy is designed through the stages of product, use, end of life, and remanufacture. This approach was manifested by utilizing every resource, including waste, to create new added value. Within this framework, every program output was reused as an input for other activities. For example, fish-processing waste from MSME "Oma Min" and residues from maggot and vegetable cultivation were repurposed as chicken feed, while chicken manure was reprocessed into organic fertilizer to support vegetable farming. This cycle not only improved resource efficiency but also strengthened the interconnection among sub-programs, thereby creating a sustainable value chain.

In addition, fishing groups formed in the previous phase began to be realized as ecotourism and educational platforms for reservoir conservation. This activity not only provided alternative sources of income for the community but also reinforced collective awareness regarding environmental conservation. Additional support in the form of planting media, vegetable seeds, waste bank installations, and egg-incubating machines further expanded cross-sectoral integration with social initiatives such as MBG (Makan Bergizi Gratis) and "TAMASYA" (Taman Asuh Sayang Anak). For example, chicken feed derived from maggot and vegetable waste was used to support children's nutrition in these initiatives, creating synergies between economic productivity and social impact. Benchmarking waste management and cultivation practices successfully implemented by other groups also became an important part of the scaling phase. This approach enabled Gajah Mungkur to adopt best practices while simultaneously enhancing the internal capacity of groups, ensuring that program development not only expanded in scale but also maintained the quality and sustainability of its activities. With the addition of sub-programs and cross-sectoral integration, the circular economy chain in Gajah Mungkur grew stronger. Each component, from fish-processing MSME, maggot cultivation, poultry, vegetables, to reservoir ecotourism, mutually supported one another, creating a cycle of productivity and sustainable social benefits.

The final stage in the framework of social innovation is systemic change, namely, when the old social system gradually shifts toward a new pattern that is more

adaptive, inclusive, and sustainable. In the context of the Gajah Mungkur Program, this systemic change is evident in the patterns of natural resource management and household economic practices in Pokoh Kidul Village and Wuryorejo Sub-District. On the environmental aspect, domestic waste problems have begun to be addressed through waste segregation schemes and the utilization of organic waste. On the other hand, maggot cultivation has demonstrated that organic waste once considered useless can now be processed into fish and poultry feed, while *kasgot* can be converted into organic fertilizer. This pattern marks an important shift from a linear "throwaway" system to a circular economy system oriented toward recycling. On the economic aspect, communities that previously only sold fresh fish at fluctuating prices now have new business opportunities through fish-processing MSMEs. Products such as ikan presto from Kelompok Oma Min opened up longer value chains with higher added value. This systemic shift illustrates that community economic resilience is no longer dependent on a single sector but is integrated with an entrepreneurial model based on product innovation. As a result, the household income of fishers and women entrepreneurs in MSMEs showed an increasing trend, contributing to the reduction of household economic vulnerability. On the social aspect, the program also created systemic change in food security by providing nutritious food products based on fish, layer chickens, and organic vegetables to support the MBG and TAMASYA programs in Wonogiri Regency. The integration of health issues into the economic empowerment model demonstrates that social innovation does not stop at increasing income but also extends to improving the quality of life for future generations.

In terms of welfare, systemic change is reflected in the strengthening of women's roles. Whereas previously women around Waduk Gajah Mungkur were positioned only as housewives or traditional fish processors, they now hold central roles in managing business groups. Kelompok Wanita Tani (KWT) Lestari in Pokoh Kidul Village and Oma Min MSME in Wuryorejo Sub-District illustrate how women are not only workers but also decision-makers and drivers of community economic activity. Therefore, systemic change within the Gajah Mungkur Program demonstrates a tangible shift in the social order of society: from old practices that were exploitative and linear toward a new system that is more participatory, sustainable, and grounded in a circular economy. This transformation not only impacts the environmental sustainability of the reservoir but also strengthens household economic resilience, improves community nutritional status, and broadens women's participation in community development.

C. CONCLUSION

Through the analysis of the stages of social innovation, the Program Gajah Mungkur initiated by PT PLN Indonesia Power PLTA Wonogiri has been confirmed to have effectively identified crucial issues, such as environmental degradation due to sedimentation and waste generation, as well as the socio-economic vulnerability of the community. This program has been able to design innovative solutions and implement them to the point of achieving systemic change impacts. The success of the

Program Gajah Mungkur is strongly influenced by its holistic approach, which integrates various pillars ranging from waste management, food security, to reservoir conservation. This model involves not only civil society but also women's groups through Kelompok Wanita Tani (KWT) Lestari, MSME actors, and fishing groups.

The outcomes of the Gajah Mungkur social innovation demonstrate transformative impacts in multiple dimensions. From the economic perspective, the program has succeeded in increasing community income through the development of value-added processed fishery products. From the environmental aspect, the program has encouraged a significant shift from a "dispose all" pattern toward a circular economy that utilizes organic waste. In addition, social and health impacts are evident in the strengthened role of women as drivers of the community economy and the program's contribution to supporting food security in Wonogiri Regency. Changes in community behavior toward waste management, combined with the strengthening of local food security, have yielded a systemic paradigm shift in addressing complex challenges in rural areas surrounding the reservoir. Accordingly, the Program Gajah Mungkur serves as an empowerment model that demonstrates how social innovation, supported by strategic collaboration and the utilization of local potential, can be the key to fostering more inclusive and sustainable development.

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