

From Waste to Health: A Qualitative Case Study of the Punggawa Nusantara Social Innovation Program for Community-Based Tuberculosis Control in Jakarta's Urban Coastal Settlements

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Abstract. Tuberculosis (TB) remains one of the major public health challenges in Indonesia, particularly in densely populated urban coastal settlements where environmental degradation, poor sanitation, and socioeconomic vulnerability intersect. This study examines Punggawa Nusantara, a social innovation program implemented by PT PLN Nusantara Power Generation Unit (UP) Muara Karang in Pluit Subdistrict, Penjaringan District, North Jakarta, which positions TB control as a cross-sectoral issue connecting health, the environment, and the local economy. Using a qualitative research design with a single-case study approach, this study analyzes program documents, monitoring records, testimonials, and secondary literature to explore how the program's core innovations, namely Kit Peduli TB and wood-waste-based Bilik Skrining, BEBAS TB application, and four interconnected subprograms (Arjuna, Sadewa, Bima, and Nakula), generate systemic change for vulnerable groups. The findings indicate that the program represents a form of radical social innovation that empowers one problem to solve another (empowering problems to solve problems). By processing 3.3 tons of organic waste from wooden pallets and household waste into TB prevention and treatment tools, the program simultaneously addresses environmental concerns and treatment adherence. During the 2023–2025 period, the program reached 8,683 direct and indirect beneficiaries, recorded a 100% cure rate among cases that had completed treatment, and expanded from coverage in a single neighborhood unit (RW) to replication across provinces. The program also strengthened social cohesion, reduced TB-related stigma, and transformed the corporate social responsibility approach from conventional charitable assistance into a systemic social innovation model based on shared value creation. This study contributes to the literature on social innovation for infectious disease control in urban areas with limited carrying capacity and offers practical lessons for replicating community-based health interventions and circular economy initiatives in other settings.

Keywords: CSR, Social Innovation, Punggawa Nusantara.

A. INTRODUCTION

Tuberculosis (TB) remains one of the most persistent burdens of infectious disease worldwide. Globally, 10.7 million new TB cases and 1.23 million TB-related deaths were recorded in 2024, underscoring that biomedical treatment alone is insufficient to end the epidemic and that patient recovery is highly dependent on the surrounding social and environmental context (Kedthongma et al., 2026). Indonesia continues to bear one of the highest TB burdens in the world, with notifications of new cases increasing from approximately 724,000 cases in 2022 to 809,000 cases in 2023, well above the pre-pandemic average of fewer than 600,000 cases per year (Bajang Journal, 2026). This situation is particularly critical in

densely populated, low-income urban settlements, where poor sanitation, household crowding, and low health literacy reinforce one another and accelerate transmission.

In Pluit Subdistrict, Penjaringan District, North Jakarta, these dynamics are exacerbated by the area's characteristics as a densely populated coastal settlement located in close proximity to industrial and fisheries activities. Overcrowded housing, unmanaged organic waste, open defecation practices, and exposure to smoke from local livelihood activities such as green mussel processing create an environment conducive to the spread of *Mycobacterium tuberculosis*, while deeply rooted social stigma continues to hinder early detection and treatment adherence. Other research in Jakarta has likewise confirmed that community knowledge, perceptions, and stigma remain significant barriers to TB prevention efforts in urban areas (Rahmawati et al., 2024). During the 2023–2024 period alone, 125 new cases of pulmonary TB were identified in the area, indicating that the problem has both expanded substantially and become deeply socially embedded.

In response to this complexity, PT PLN Nusantara Power Unit Pembangkitan (UP) Muara Karang, a state-owned power generation company operating in the surrounding area, developed a social and environmental responsibility (CSR) initiative called Punggawa Nusantara (Kampung Siaga TB Paru Wujudkan Keluarga Aman, Sehat dan Sejahtera). Rather than viewing TB solely as a medical problem, the program integrates health, environmental, and economic interventions through a network of community groups, namely Srikandi Nusantara, Bank Tama (a waste bank), UMKM Kayu, Rumah Jahit Pewaris Negeri, and Kampung Si Dul. This configuration reflects a broader shift in the corporate approach to community empowerment, from conventional philanthropic assistance toward what Porter and Kramer (2011) describe as the creation of “shared value,” in which business and social progress are pursued simultaneously.

The originality of Punggawa Nusantara lies in its ability to transform environmental waste, namely organic wooden pallets generated by port and power-generation activities, as well as household organic waste, into functional TB prevention and treatment instruments: Kit Peduli TB, sputum and Mantoux screening booths, and a companion application called BEBAS TB (Bersama Bantu Sembuh dari Tuberkulosis). This innovation, which simultaneously reduces waste generation and strengthens treatment adherence, reflects what the social innovation literature describes as radical innovation, an innovation that reconfigures the relationship between a problem and its solution rather than merely improving existing services (Nicholls, Simon, & Gabriel, 2015; Mulgan, 2012).

Although academic research on community-based TB interventions continues to expand (Shafique et al., 2024; *Frontiers in Public Health*, 2025), and the literature on CSR-based corporate circular economy practices has also become increasingly extensive (Boukattaya et al., 2026; *Springer Circular Economy and Sustainability*, 2026), scholarly attention to cases in which a company's environmental waste-management strategy is deliberately and structurally integrated with community health interventions within a single social innovation architecture remains limited. This study addresses this gap by examining Punggawa Nusantara as an information-rich and bounded single case, guided by the following research questions: (1) how does the program identify and respond to the needs of vulnerable groups affected by TB; (2) what constitutes the novelty of the program's innovation compared with conventional TB control approaches; and (3) what systemic achievements, capabilities, and forms of sustainability has the program generated for the individuals, groups, and communities involved?.

B. METHOD

This study employs a qualitative approach with a case study design (Yin, 2018; Creswell & Poth, 2018). The case study approach was selected because it enables an in-depth and contextual understanding of a bounded real-world phenomenon, in this case, a corporate social innovation program, and is particularly appropriate for “how” and “why” research questions that require rich description (Yin, 2018; Ndade, 2023). Consistent with Stake’s (1995) view of the intrinsic value of a single case, the Punggawa Nusantara program is treated as an instrumental case, serving as a means to examine and enrich broader theoretical propositions concerning circular economy-based social innovation initiated by corporations for infectious disease control (Miller, Porter, & Barbagallo, 2023).

The case was selected because it represents a unique, information-rich, and theoretically relevant example of corporate social innovation that structurally integrates health, environmental, and economic interventions. This bounded case is spatially defined as the Punggawa Nusantara program operating in Pluit Subdistrict, Penjaringan District, North Jakarta, and temporally covers the period from the program’s initial implementation in 2023 through October 2025.

In line with qualitative case study practices that emphasize the triangulation of multiple sources of evidence to strengthen construct validity (Yin, 2018), the data for this study were collected from the following sources:

1. Program documentation, including corporate social innovation assessment reports, monitoring and evaluation records, and internal policy documents related to the company’s social and environmental responsibility (CSR) activities;
2. Field program records, including quantitative data on TB screening and treatment outcomes for the 2023–2025 period, as well as records of activities conducted by supported partner groups;
3. Documented key-informant testimonies, obtained from the company’s program documentation;
4. Secondary sources, including mass media coverage of the program and scholarly literature on social innovation, corporate social responsibility, and community-based TB control, which were used to contextualize and triangulate the program’s primary data.

The document- and record-based data collection strategy is consistent with the desk study method used in the source assessment report (Liando, 2016), which was subsequently reanalyzed for this study through a qualitative case study lens, following established practices in using organizational documents, records, and archival evidence as legitimate sources of evidence in case study research (Yin, 2018).

C. RESULTS AND DISCUSSION

1. Social Innovation in the Punggawa Nusantara CSR Program

Social innovation is generally defined as the creation and implementation of new ideas, products, services, or models that respond to unmet social needs more effectively than existing alternatives, while simultaneously creating new social relationships and forms of collaboration (Mulgan, Tucker, Ali, & Sanders, 2007; Nicholls & Murdock, 2012). Scholars generally distinguish social innovation according to the depth of its systemic impact. Nicholls, Simon, and Gabriel (2015) classify social innovation into incremental, institutional, and radical levels. Incremental innovation improves existing products or services to address unmet needs; institutional innovation restructures market relationships to create new social value; whereas radical innovation seeks to redistribute power relations and transform the underlying social structures. A program can be categorized as radical when it does not merely add a new service,

but instead reconfigures how a problem is understood and addressed, often by using one problem as an input for solving another (Nicholls & Murdock, 2012; Mulgan, 2012).

This framework becomes particularly important when social innovation is situated within the context of corporate social responsibility (CSR). Over time, CSR has no longer been understood solely as a peripheral philanthropic activity, but has increasingly been positioned as part of a strategy for creating both social and economic value. This shift suggests that companies can play a role not only as providers of assistance, but also as actors that identify social and environmental problems in and around their areas of operation and subsequently develop collaborative mechanisms to generate sustainable solutions. Accordingly, the social innovation dimension of CSR can be understood in terms of a company's ability to integrate community needs, corporate resources, and community networks into an intervention model that generates broader change.

This perspective is consistent with the concept of shared value developed by Porter and Kramer (2011), which positions the creation of social and economic value as two objectives that can be pursued simultaneously. Companies can obtain long-term benefits when their business strategies are designed to address societal needs rather than treating social responsibility merely as a business cost. This perspective is increasingly relevant in the context of the circular economy, in which waste is no longer viewed merely as a residue to be discarded, but as a resource that can be transformed into products, economic activities, and social benefits. Empirical studies indicate that collaborative CSR can generate benefits for communities. In addition, corporate support for social and environmental objectives can increase recycling activities and reduce the amount of waste generated (Springer Circular Economy and Sustainability, 2026; Boukattaya et al., 2026). This perspective provides a foundation for understanding how environmental challenges can be integrated with community issues within a single intervention design.

Within this context, the Punggawa Nusantara program demonstrates an effort to integrate community health, environmental, and economic issues through four interconnected subprograms: ARJUNA, SADEWA, BIMA, and NAKULA. These four subprograms are not implemented as stand-alone activities; rather, they form a continuum of interventions encompassing environmental promotion, prevention and early detection, curative and rehabilitative measures, and local economic strengthening. This structure indicates that tuberculosis control within Punggawa Nusantara is designed as an intervention ecosystem rather than merely as a health-related activity.

Table 1. Structure of the Punggawa Nusantara Subprograms

Subprogram	Strategic Focus	Key Activities
ARJUNA (Antisipasi Penyebaran, Jaga Kebersihan Lingkungan)	Environmental promotion	Obrolan Tentang TB Paru (OTP), communal septic tanks, rainwater harvesting, reusable diapers, organic pellets
SADEWA (Sadar Deteksi Waspada TB)	Prevention/early detection	Mass chest X-ray screening, Molecular Rapid Tests (TCM), Mantoux testing, and close-contact tracing
BIMA (Bangkitkan Imunitas, Basmi TB Bersama)	Curative and rehabilitative	Routine medication provision, Kit Peduli TB (Kit Pasien Sehat & Kit Keluarga Aman), natural disinfectants, BEBAS TB application
NAKULA (Nyalakan Kemandirian Tingkatkan Kualitas Ekonomi Lokal)	Local economic strengthening	Marketing of Kit Peduli TB and cloth masks, Health Service Alliance scheme

Source: PT PLN Nusantara Power Unit Pembangkitan Muara Karang (2025)

The interconnectedness of the four subprograms becomes increasingly evident through the actors responsible for their implementation. Punggawa Nusantara is implemented through a network of five community partner groups: Srikandi Nusantara, which serves as community health cadres as well as the program's primary facilitators; Bank Tama, which operates as a community waste bank; UMKM Kayu, a microenterprise engaged in wood processing; Rumah Jahit Pewaris Negeri, a sewing cooperative; and Kampung Si Dul, an environmental community group. The presence of groups with different functions enables local resources and capacities to be connected within a single value chain. Srikandi Nusantara contributes to the health dimension, Bank Tama and Kampung Si Dul to environmental management, while UMKM Kayu and Rumah Jahit Pewaris Negeri contribute to product development and economic activities. This pattern of relationships demonstrates that the Punggawa Nusantara intervention not only generates new activities but also establishes collaborative relationships among groups that previously served different functions. This characteristic is consistent with the social innovation perspective, which identifies the formation of new relationships and forms of collaboration as an important element in generating social change (Mulgan et al., 2007; Nicholls & Murdock, 2012).

Therefore, the structure of Punggawa Nusantara exhibits two main characteristics. First, the program integrates several interconnected dimensions of the problem, namely health, the environment, and the economy. Second, this integration is achieved through a community network in which different groups perform distinct roles within the intervention chain. These two characteristics provide the basis for further examining how a community-based approach is used in TB control and the extent to which this program architecture can be categorized as radical social innovation.

2. Community-Based Approach to Tuberculosis Control in the Punggawa Nusantara Program

A community-based approach is relevant to tuberculosis control because TB transmission and treatment success are influenced not only by clinical factors but also by the social and environmental conditions in which people live. Several studies have shown that community-based interventions (CBIs) are an important strategy for infectious disease control, including TB, particularly in urban settlements with limited social and economic resources. A systematic review of CBIs in informal urban settlements in low- and middle-income countries found that case detection, contact tracing, and education led by community health workers can improve case finding and treatment outcomes (Shafique et al., 2024). These findings indicate that the proximity of community health workers to the social environment of residents can serve as an important resource that complements formal health services.

The need for community involvement becomes even more pronounced when TB interventions extend beyond case detection to include treatment adherence. A meta-analysis found that technology-supported community-based TB interventions can help improve patients' adherence to treatment through completion (Kedthongma et al., 2026). This suggests that successful TB control depends not only on the availability of medication and medical services but also on social support that helps patients adhere to treatment in their everyday lives. At the same time, Trajman (2024) emphasizes that the social determinants of TB, such as poverty, household crowding, and stigma, need to be addressed alongside clinical treatment to ensure that TB elimination efforts can be sustained.

Stigma is an important social factor because it can influence people's behavior in seeking health services. Research on the effects of stigma and discrimination among people with TB indicates that stigma associated with limited public knowledge can constitute a barrier

to accessing appropriate services, making community education and support important components of TB control (Diana et al., 2024). In this context, community health workers serve not only as a bridge between communities and health services but also as actors who build trust, communicate information, and assist communities in addressing TB-related challenges. Empowering TB cadres has been shown to contribute to increased coverage of contact investigations and improved quality of TB services at the community level (Sadipun et al., 2025), while patient-association-based support can help reduce stigma through the dissemination of information and the sharing of experiences among patients (Aqilah et al., 2025).

These findings provide a framework for understanding the conditions of the communities targeted by Punggawa Nusantara. The vulnerable groups in this case study primarily comprise residents of Pluit Subdistrict who are directly or indirectly affected by TB, particularly households living in densely populated coastal settlements with low income levels. These conditions indicate that vulnerability to TB cannot be explained solely in biomedical terms. Poverty, overcrowded and substandard housing, poor sanitation, and inadequate management of organic waste and wooden pallets constitute part of the socio-ecological environment that shapes community vulnerability. These conditions are also associated with the characteristics of local livelihoods in areas surrounding the port and fisheries sectors.

These social and environmental conditions then interact with the issue of stigma. When communities live in densely populated environments with limited sanitation and access to services, while TB continues to be associated with social stigma, the barriers to detection and treatment become increasingly complex. Therefore, the TB problem in the context of Punggawa Nusantara can be understood as an issue situated at the intersection of health, environmental conditions, and social relations. This perspective is consistent with the literature identifying household crowding, sanitation, and socioeconomic deprivation as important determinants of TB transmission in urban areas (Kumar & Kaur, 2013; Trajman, 2024), while also demonstrating that stigma can intensify barriers to TB detection and treatment (AlSelwi, 2023).

An understanding of this vulnerability explains why Punggawa Nusantara does not rely solely on a medical approach to TB control. The ARJUNA subprogram focuses on environmental improvement and increasing community awareness; SADEWA strengthens early detection through screening and contact tracing; BIMA supports treatment continuity through patient assistance and supportive tools; while NAKULA connects health and environmental activities with the strengthening of the local economy. Thus, the program design can be understood as a response to the multidimensional nature of the TB problem. This approach also provides a basis for analyzing whether such integration merely represents an expansion of CSR activities or whether it fulfills the characteristics of social innovation at a more transformative level.

3. Punggawa Nusantara as Radical Social Innovation

Based on the framework developed by Nicholls, Simon, and Gabriel (2015), the characteristics of Punggawa Nusantara can be further analyzed through three main dimensions: changes in how the problem is understood, changes in relationships among actors, and the creation of shared value. This analysis is important because the label “radical social innovation” cannot be determined solely by the number of activities undertaken or the novelty of the technologies employed. An innovation can be categorized as radical when an intervention produces more fundamental changes in how a problem is understood, how actors relate to one another, and how value and resources are distributed.

The first dimension is evident in the way Punggawa Nusantara connects environmental and health problems that could previously have been viewed as two separate issues. Under conventional approaches, waste management and TB control tend to be positioned within separate areas of intervention. Punggawa Nusantara, by contrast, connects the two through the utilization of waste and community economic activities to support a TB control ecosystem. Within this framework, waste is not positioned merely as an environmental problem that must be reduced, but also as a resource that can generate economic activities and contribute to addressing social problems. This approach is consistent with the idea that radical innovation occurs when a problem is reconfigured so that it can become part of the solution to another problem (Mulgan, 2012). Thus, the radical character of Punggawa Nusantara lies primarily in its architecture of integration rather than merely in the existence of a single activity that is entirely new.

The second dimension concerns changes in relationships and the distribution of roles in health management. Before the program was implemented, information regarding treatment schedules and patients' adherence histories was primarily managed within medical services and by health cadres. The introduction of the BEBAS TB application gives patients and families greater control through reminder and self-monitoring features. This change indicates a shift from a support model that is entirely dependent on healthcare personnel toward greater patient and family involvement in treatment management. From a social innovation perspective, this change can be understood as a form of redistributing some control over information and the treatment process to beneficiaries (Nicholls & Murdock, 2012).

Changes in relationships also occur at the community level. The five partner groups, which have different functions, do not merely carry out their respective activities independently but are connected within a broader value chain. Srikandi Nusantara performs health and community facilitation functions; Bank Tama and Kampung Si Dul support environmental activities; while UMKM Kayu and Rumah Jahit Pewaris Negeri contribute to production and the development of economic activities. Thus, the program creates new relationships among groups, enabling different resources, skills, and functions to complement one another. The formation of new relationships and networks is an important characteristic of social innovation because novelty lies not only in products or services but also in how social actors collaborate to create value (Mulgan et al., 2007).

The third dimension is evident in the creation of shared value. Punggawa Nusantara does not merely provide assistance to the community but develops activities that enable supported groups to obtain economic benefits while simultaneously contributing to health and environmental objectives. The Health Service Alliance scheme and the marketing of program-derived products, such as reusable diapers, cloth masks, and organic pellets, generated a total economic benefit of IDR 1,573,268,400 for the participating groups and households. This pattern is consistent with Porter and Kramer's (2011) concept of shared value, namely the creation of social value alongside the creation of economic value. In the context of Punggawa Nusantara, economic activities are not positioned as additional activities undertaken after health interventions have been completed, but rather as one of the mechanisms for sustaining community participation.

Nevertheless, not all elements of Punggawa Nusantara can individually be categorized as radical innovations. Some activities, such as Obrolan Tentang TB Paru (OTP) within the ARJUNA subprogram, essentially have the characteristics of health education that have been widely used in other TB programs (Kumah, 2025). Similarly, screening, medication provision, and patient support are all established components of TB control practices. Therefore, the novelty of Punggawa Nusantara lies not primarily in each individual activity, but in the way

these activities are combined and connected with environmental management, economic empowerment, digital technology, and community networks.

Therefore, the radical nature of Punggawa Nusantara is more appropriately understood as a characteristic of the program's overall architecture. The program changes the way TB is understood, from a purely health-related problem into a socio-ecological issue requiring cross-sectoral intervention. At the same time, the program connects community groups with different functions, redistributes some control over treatment to patients and families, and creates economic value from activities related to health and environmental objectives. The combination of these three dimensions provides a stronger basis for positioning Punggawa Nusantara as a radical social innovation.

4. Capital Transformation and the Effectiveness of Punggawa Nusantara's Social Innovation

An analysis of the radical nature of social innovation needs to be extended by examining the changes generated by the program. While the previous section demonstrates how Punggawa Nusantara changes the way the problem is understood and how actors relate to one another, this section examines whether these changes result in transformations in individual, organizational, and community capacities, as well as in the economic and social value generated. In other words, the effectiveness of social innovation is assessed not merely by the existence of activities, but by the changes in capacity and benefits that emerge following the intervention.

At the individual level, the program generates changes in the knowledge, skills, and behavior of members of partner groups. Prior to the intervention, residents lacked adequate means to store medication safely, monitor treatment schedules, or obtain additional income from waste materials. The introduction of the Kit Peduli TB, BEBAS TB application, and various derivative products such as reusable diapers, organic pellets, reusable cloth masks, and natural disinfectants based on eco-enzymes has expanded the forms of community participation in the program. Community members are no longer positioned merely as beneficiaries of health services but also as active participants in health management, environmental management, and economic activities.

These changes subsequently extend to the organizational level. Groups such as Bank Tama and Srikandi Nusantara not only conduct community activities informally but also assume more clearly defined functions within the program's value chain. Similarly, business and environmental groups gain opportunities to connect their existing skills with the needs of the program. This process demonstrates the institutionalization of new functions within community groups, as health activities, environmental management, production, and marketing become interconnected within a more structured system.

At the economic level, the marketing of derivative products and the Health Service Alliance scheme provide mechanisms for sustaining the benefits of the program beyond direct corporate assistance. The recorded economic benefit of IDR 1,573,268,400 generated through the marketing and sale of products demonstrates that empowerment activities can generate economic value while simultaneously supporting social and environmental objectives. This finding reinforces Porter and Kramer's (2011) shared value perspective, which argues that social interventions can generate economic benefits that accrue to communities when they are designed through value-creation mechanisms rather than merely through the provision of assistance.

These changes can also be observed in the outcomes of TB control. Table 2 presents the development of the numbers of presumptive cases, positive cases, and treatment status during the period from 2023 to October 2025.

Table 2. TB Screening and Treatment Outcomes, Pluit Subdistrict, 2023–2025

Year	Presumptive Cases (people)	Positive Cases (people)	Cured (people)	Percentage
2023	238	54	54	100%
2024	517	71	71	100%
2025 (April)	303	117	117	100%
2025 (July)	307	90	Under treatment (estimated completion: January 2026)	In progress
2025 (October)	288	30	Under treatment (estimated completion: April 2026)	In progress

Source: PT PLN Nusantara Power Unit Pembangkitan Muara Karang (2025)

The data indicate that all TB cases that had completed their treatment cohorts from 2023 through April 2025 were recorded as cured, representing a 100% cure rate, while the July and October 2025 cohorts were still undergoing treatment. These outcomes indicate that the program not only succeeded in expanding detection activities but also maintained support through the treatment stage for cohorts that had completed treatment. Therefore, health outcomes should be understood as the result of a sequence of interventions encompassing detection, patient support, assistance, and monitoring, rather than as the outcome of a single activity or technology.

In addition to treatment outcomes, the program also demonstrated an expansion in intervention coverage. According to program documents, the number of community members who reported or were identified as presumptive TB cases increased from 517 in 2024 to 948 in 2025, representing an increase of 83.4%. The program documents interpret this increase as an indication of greater community willingness to undergo early screening and a possible reduction in stigma-related barriers. However, the increase in the number of presumptive cases should not be directly interpreted as evidence of reduced stigma, because the change may also have been influenced by expanded screening coverage and increased case-finding intensity. Therefore, the data are more appropriately used to demonstrate increased detection reach and participation in the screening process, while conclusions regarding reduced stigma require additional indicators.

From an Impact Compass perspective, the program recorded a value to society of 8,683 beneficiaries, consisting of 168 directly involved members of partner groups, 1,703 direct patients and contacts who underwent screening, and 8,515 people reached through close-contact investigations. These figures demonstrate that the benefits of the program extend beyond the groups directly involved in empowerment activities to communities reached through detection and contact investigation processes. Thus, the expansion of benefits serves as an indicator that community networks can function as a mechanism for extending the reach of health interventions.

This expansion is also evident in the program's scaling process. Punggawa Nusantara expanded from coverage of a single neighborhood unit (RW), namely RW 22, during 2023–2024 to coverage of the entire subdistrict in 2025. The program was subsequently disseminated to Penjarangan District and replicated across provinces in Tarumajaya, West Java. This pattern indicates that the innovation did not remain confined to its initial location but underwent a process of diffusion into other areas. In the social innovation literature, the capacity of a model to be adapted and replicated constitutes an important component of the innovation scaling process (Mulgan, 2012; Nicholls & Murdock, 2012). Nevertheless, replication must take into

account the social, institutional, and resource characteristics of the target area so that the innovation is not merely transferred mechanically.

Transformation also occurred at the community level. The involvement of members of partner groups strengthened technical skills in waste processing, product marketing, and health facilitation. At the organizational level, partner groups developed from relatively informal community activities into groups with more clearly defined functions within the program's value chain. At the community level, strengthened social cohesion was reflected in increased participation in environmental clean-up activities, the construction of communal septic tanks, and TB awareness dialogue forums through Obrolan Tentang TB Paru. These findings are consistent with the literature on community health cadres, which emphasizes the importance of trust and local proximity in reducing stigma-related barriers to treatment (Frontiers in Public Health, 2025; Sadipun et al., 2025).

These transformations in health and social dimensions are subsequently connected to the environmental dimension. Waste-processing activities within Punggawa Nusantara do not operate independently of the company's environmental agenda but are connected to efforts to reduce waste generation and strengthen environmental adaptation. Practices such as rainwater harvesting and the construction of communal sanitation infrastructure are intended to enhance community capacity to address environmental challenges, including vulnerability to tidal flooding in coastal areas. This relationship demonstrates how health interventions can simultaneously provide a space for incorporating environmental management objectives into community empowerment activities.

This integration is important because it demonstrates how the health, environmental, and economic dimensions are no longer implemented as parallel programs. Waste management provides materials and economic activities; business groups transform these materials into products; health groups support TB detection and patient assistance; while digital technology facilitates treatment monitoring. Thus, each component performs a distinct function while mutually reinforcing the others within a single program ecosystem. This pattern strengthens the argument that the value of the program derives not merely from the number of activities undertaken but from the relationships among its components, which enable one intervention to reinforce another.

Based on the overall findings, Punggawa Nusantara can be understood as a radical social innovation that integrates circular environmental management with community-based TB control. This integration addresses a gap in the literature, which has generally tended to discuss waste management, the circular economy, and TB control as separate domains. The Punggawa Nusantara case demonstrates that when corporate environmental responsibility is designed to directly address community health needs, environmental activities can simultaneously generate social and economic benefits. These findings are consistent with Porter and Kramer's (2011) shared value perspective, as well as the literature on the circular economy and CSR, which positions environmental management as part of broader value creation (Boukattaya et al., 2026; Springer Circular Economy and Sustainability, 2026).

At the same time, the effectiveness of Punggawa Nusantara cannot be separated from its community-based approach. Treatment outcomes, expanded detection, increased reach of contact investigations, and the program's expansion into other areas indicate that technology and infrastructure become more effective when embedded within a social ecosystem that includes community health cadres, community groups, and support mechanisms. This finding is consistent with the literature on community-based TB interventions, which emphasizes that treatment success does not depend solely on a single technology or clinical service but on a combination of community facilitation, access to detection, social support, and adherence monitoring (Shafique et al., 2024; Kedthongma et al., 2026).

Thus, the main contribution of Punggawa Nusantara lies not only in improving health indicators but also in establishing a mechanism that connects the transformation of individual capital, community institutions, economic value, and environmental improvement within a single intervention model. The program demonstrates that social innovation can serve as a mechanism for transforming resources previously perceived as problems, such as waste and social vulnerability, into resources that support the creation of new value. It is at this point that the radical character of Punggawa Nusantara becomes most apparent: change occurs not only in program outputs but also in the relationships among problems, actors, resources, and value-creation mechanisms.

As a qualitative case study, this research generates analytical generalization rather than statistical generalization (Yin, 2018). This means that the Punggawa Nusantara model can serve as a conceptual reference for developing similar social innovations, but its application in other regions or sectors remains dependent on local contextual characteristics. Replication will be influenced by the availability of usable waste streams, the capacity and networks of community groups, institutional support, and the characteristics of local public health challenges. Therefore, future comparative case studies are needed to examine how these configurations operate across different geographic, social, and industrial contexts.

D. CONCLUSION

This study examined Punggawa Nusantara, a corporate social innovation program implemented by PT PLN Nusantara Power UP Muara Karang in Pluit Subdistrict, North Jakarta, as a qualitative case study of community-based tuberculosis control. The findings indicate that the program constitutes a radical social innovation that reframes TB as a cross-sectoral issue connecting health, the environment, and the local economy, rather than merely a clinical concern. By processing organic wooden pallet waste and household waste into Kit Peduli TB, screening booths, and a digital support application, the program simultaneously reduces environmental waste and strengthens treatment adherence, achieves a 100% cure rate among treatment cohorts that have completed treatment, and reaches 8,683 direct and indirect beneficiaries during the 2023–2025 period, while expanding from coverage in a single RW to replication across provinces.

For corporate practice, this case demonstrates that CSR programs can achieve greater and more sustainable impacts when environmental and social objectives are designed as a single mutually reinforcing intervention rather than as parallel initiatives; when community partner groups are given genuine ownership and institutional roles within the program; and when digital tools are used to complement, rather than replace, community-based facilitation. For public policy, this case illustrates the potential of government–private sector–community collaboration, consistent with Presidential Regulation No. 67 of 2021 on Tuberculosis Control and the principles of ISO 26000 on social responsibility, as a model that can be replicated to address the burden of infectious diseases rooted in urban environmental and socio-economic vulnerabilities.

This study has limitations because it relies on a single case and secondary program documentation rather than direct field interviews or independent observation by the researcher, which may affect the depth of interpretive nuance that can be explored through primary qualitative fieldwork. Future research is recommended to (1) conduct comparative multi-case studies of similar corporate-sponsored waste-to-value-based health innovations across diverse urban contexts; (2) undertake primary qualitative fieldwork, including in-depth interviews with patients, family members, and community facilitators, to capture lived experiences and the dynamics of stigma more comprehensively; and (3) evaluate the long-term sustainability of the program's economic model after initial corporate funding support is reduced or discontinued.

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