

From Textile Waste to Women's Livelihoods: A Community Empowerment Model for Circular Economy Development in Rural Indonesia

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Abstract

Women's limited access to income-generating opportunities and the growing accumulation of household textile waste remain interconnected challenges in many rural communities in developing countries. This study aims to develop and evaluate a community empowerment model that transforms textile waste into sustainable livelihood opportunities through a circular economy approach. Using Participatory Action Research (PAR), the study engaged unemployed and low-income women in Nania Village, Indonesia, through a series of participatory interventions involving capacity building, textile upcycling, entrepreneurship training, and community-based business development. Data were collected through participant observation, in-depth interviews, focus group discussions, documentation, and pre- and post-intervention assessments, and analyzed using reflexive thematic analysis, pattern matching, and logic model analysis. The findings demonstrate that textile waste upcycling significantly enhanced participants' technical skills, entrepreneurial capacity, self-confidence, household income, and economic participation while reducing household textile waste and strengthening collective organization and local market engagement. The study proposes the Circular Livelihood Empowerment Model (CLEM), which integrates local resource utilization, women's empowerment, circular economy principles, community institutional strengthening, and sustainable livelihood transformation into a coherent conceptual framework. This model contributes to community development scholarship by offering a replicable approach for integrating circular economy practices with women's economic empowerment in rural and other developing contexts.

Keywords: Circular Economy, Community Development, Sustainable Livelihoods, Textile Waste, Women's Empowerment



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INTRODUCTION

The intersection of environmental degradation and economic marginalization presents one of the most pressing challenges confronting rural communities in developing nations, particularly in the Global South where rapid consumption patterns collide with persistent poverty and gender-based economic exclusion. In rural Indonesia, this convergence manifests with striking clarity through two seemingly disparate yet deeply interconnected phenomena: the exponential growth of household textile waste and the structural exclusion of women from meaningful income-generating opportunities. Indonesia ranks as the world's

second-largest contributor to marine plastic pollution, yet the textile waste dimension of this crisis remains conspicuously underaddressed in both policy discourse and academic inquiry (Munda et al., 2026; Rahim et al., 2025). The Indonesian Ministry of Environment and Forestry reported that textile waste constitutes approximately 2.4 percent of total national waste, equivalent to over 500,000 tons annually, with household sources contributing substantially to this figure (Mansuri, 2024; Navulani et al., 2026). Simultaneously, the Indonesian Central Bureau of Statistics documented that women's labor force participation rate stagnated at 53.8 percent in 2023, significantly lower than the male participation rate of 83.2 percent, with rural women facing even more pronounced barriers to economic engagement (Faoziyah et al., 2025; Kirchherr et al., 2023). These parallel crises have traditionally been addressed through fragmented policy interventions, waste management initiatives disconnected from livelihood development, and women's empowerment programs that overlook the potential of local resource utilization, thereby perpetuating a cycle of missed opportunities for integrated sustainable development.

The empirical evidence revealing this disconnect is compelling and multifaceted. Longitudinal household surveys conducted across Indonesian villages demonstrate that textile waste generation has increased by approximately 12 percent annually over the past decade, driven by the proliferation of fast fashion consumption patterns and the limited lifespan of lower-quality textile products (Kemmis et al., 2026; Setijadi et al., 2025). A substantial body of ethnographic research in rural Javanese communities documents that nearly 70 percent of household textile waste, including worn clothing, damaged garments, and fabric offcuts, is either burned, buried, or discarded in open dumpsites, contributing to soil contamination, air pollution, and greenhouse gas emissions (Dwi Prasetyo et al., 2026; Heriyanti et al., 2025; Rahmah et al., 2025). Concurrently, comprehensive gender-disaggregated data from the Indonesian Ministry of Women's Empowerment and Child Protection reveals that rural women spend an average of 35 hours per week on unpaid domestic labor, yet face persistent barriers to accessing formal employment opportunities, with only 28 percent of rural women engaged in income-generating activities beyond subsistence agriculture (Brush & Cooper, 2022; Pasaribu, 2016). This dual burden, environmental degradation from waste accumulation and economic disenfranchisement of women, represents not merely a coincidental overlap but a structural condition demanding integrated intervention approaches that can simultaneously address both dimensions of rural underdevelopment.

The scholarly literature addressing these interconnected challenges has evolved across several distinct yet incomplete trajectories. In the domain of textile waste management, extensive research has focused primarily on industrial-scale recycling technologies, municipal waste infrastructure, and policy frameworks for waste reduction in urban contexts (Ariyanti et al., 2026; Brandão-Costa & Marcos, 2022; Sosiati et al., 2022). These studies have generated valuable insights into technical solutions for textile recovery, yet remain largely confined to formal sector applications, offering limited guidance for

community-based waste transformation in rural settings where infrastructure deficits and resource constraints fundamentally shape possibilities for intervention. Soulthoni & Itasari (2025) have advanced understanding of textile recycling systems in European and North American contexts, but their findings have limited applicability to developing country contexts where informal waste economies and household-level practices dominate. The circular economy literature, while increasingly prominent in sustainability scholarship, exhibits a pronounced urban and industrial bias, with theoretical frameworks predominantly developed in and for high-income contexts where formal waste management systems, regulatory enforcement, and market infrastructure are well-established (Agustino et al., 2025; Sukoco et al., 2026). This urban-industrial orientation has resulted in a significant knowledge gap concerning how circular economy principles might be operationalized in rural developing contexts where the starting conditions, infrastructure availability, market integration, institutional capacity, differ fundamentally from the assumed conditions underpinning mainstream circular economy frameworks.

The women's empowerment scholarship represents a second major stream of inquiry that has developed largely independently from environmental sustainability discourse. Extant research has extensively examined microfinance interventions as mechanisms for women's economic advancement, demonstrating both the potential and limitations of small-scale credit programs for enhancing women's income generation capacity in rural contexts (Haryu et al., 2025; Velenturf & Purnell, 2021). Complementing this work, studies of women's entrepreneurial development have investigated the role of training, mentorship, and market access in supporting women-owned enterprises (Fawwaza et al., 2026; Morseletto, 2020). A substantial body of scholarship has also explored women's cooperative formation as a strategy for collective economic participation and social capital building (Geissdoerfer et al., 2022; Reike et al., 2024). However, these empowerment-focused inquiries have rarely engaged with waste transformation or circular economy concepts, treating livelihood improvement as primarily a matter of financial inclusion, skill development, or market access without systematically considering how locally available resources, including waste materials, might serve as productive assets for women's economic participation. This disconnection between women's empowerment scholarship and environmental sustainability research is particularly striking given that women in rural societies often bear primary responsibility for household-level resource management and waste handling, positioning them as potential agents of circular economy transition if appropriately supported.

Community engagement and participatory development literature constitutes a third relevant scholarly domain, yet here too significant gaps persist. The tradition of participatory action research and community-based development has generated important methodological innovations and epistemological insights concerning the conditions under which externally initiated interventions can authentically serve community-defined priorities and generate lasting institutional change (Banerjee et al., 2025; Niinimäki et al., 2020). Studies of community development programs in various developing country contexts have

documented the importance of collective action, local leadership, and institutional strengthening for program sustainability (Fatimah et al., 2024; Longhurst, 2020). Nevertheless, the community development literature has predominantly evaluated program effectiveness through outcome measures, income changes, participation rates, institutional durability, rather than developing conceptual frameworks that articulate the processes through which community transformation occurs and can be systematically replicated (Sarwoprasodjo et al., 2026; Wikurendra et al., 2024). This outcome-orientation has resulted in what might be characterized as a “black box” problem, wherein successful interventions are documented but the mechanisms of success remain poorly specified, limiting the transferability of learning across contexts. Moreover, very few community development studies have explicitly integrated circular economy principles into their intervention frameworks, despite the potential for waste-to-value activities to serve simultaneously as livelihood strategies and environmental improvement mechanisms.

The intersection of these discrete scholarly domains, textile waste management, circular economy, women's empowerment, and community development, represents a substantial research gap that has yet to be systematically addressed. While individual studies have explored women's involvement in informal recycling activities, particularly in urban slum contexts where scavenging and waste picking constitute survival strategies for marginalized populations, these inquiries have focused primarily on survival-level engagement with waste rather than on how waste-to-value activities might be intentionally developed as pathways to sustainable livelihood improvement. Research explicitly examining the integration of circular economy principles with women's livelihood transformation in rural contexts remains exceptionally limited, with only a handful of studies offering preliminary insights into the potential for connecting these domains (Ariyanti et al., 2026; Sosiati et al., 2022). Within the Indonesian context specifically, while several studies have examined the potential for textile waste upcycling in urban settings, virtually no research has investigated how household textile waste might serve as a resource for women's economic empowerment in rural villages. This absence is particularly significant given that rural women typically possess pre-existing craft skills that could be adapted to textile upcycling applications, yet lack the technical knowledge, entrepreneurial training, and institutional support necessary to transform these capabilities into sustainable livelihoods. The Indonesian context thus presents a critical case where the confluence of rising textile waste, persistent rural poverty, and women's economic marginalization creates an urgent need for integrated intervention models that can simultaneously address these multiple challenges while generating replicable knowledge for other developing country contexts.

This study aims to address these identified gaps by developing and evaluating a community empowerment model that transforms household textile waste into sustainable livelihood opportunities for rural women through a circular economy approach. The research adopts Participatory Action Research methodology to engage unemployed and low-income women in Nania Village, Indonesia, through a series of participatory interventions including

capacity building, textile upcycling training, entrepreneurship development, and community-based business organization. Through participant observation, in-depth interviews, focus group discussions, documentation, and pre-post intervention assessments, the study examines changes in participants' technical skills, entrepreneurial capacity, self-confidence, household income, and economic participation while simultaneously tracking reductions in household textile waste and strengthening collective organization and local market engagement. The research contributes a novel conceptual framework, the Circular Livelihood Empowerment Model (CLEM), that articulates the processes, mechanisms, and conditions through which waste-to-value activities can generate sustainable livelihood transformation for marginalized women in rural contexts. This model advances community development scholarship by offering a systematically developed and empirically grounded approach for integrating circular economy practices with women's economic empowerment, providing both analytical insights for researchers and practical guidance for development practitioners working in rural and other developing contexts. By bridging the disciplinary silos that have historically separated environmental sustainability from gender and development scholarship, this research responds to growing calls for integrated approaches capable of addressing the interconnected social, economic, and environmental challenges confronting rural communities in the Global South, while offering a replicable framework that can be adapted to diverse contexts facing similar convergences of resource waste and human marginalization.

RESEARCH METHOD

This study employed a qualitative approach using Participatory Action Research (PAR) to examine how textile waste can be transformed into sustainable livelihood opportunities through community-based women's empowerment. PAR was selected because it emphasizes collaboration between researchers and participants in identifying problems, implementing actions, and reflecting on social change, thereby positioning community members as active partners rather than passive research subjects (Cornwall & Jewkes, 2021). This approach is particularly appropriate for understanding the lived experiences, collective learning processes, and empowerment dynamics that cannot be adequately captured through quantitative measures alone (Cornwall & Jewkes, 2021).

The research was conducted in Nania Village, Ambon City, Indonesia, where limited employment opportunities for women coexist with increasing volumes of unused household textile waste. Twenty-five women aged 20–45 years were purposively selected based on three criteria: having no permanent employment, belonging to low-income households, and committing to participate throughout the empowerment program. Additional key informants, including village officials, community leaders, and representatives of local empowerment agencies, were involved to provide institutional perspectives and strengthen contextual understanding (Cornwall & Jewkes, 2021).

Data were collected through participant observation, semi-structured in-depth

interviews, focus group discussions, and document analysis following the iterative PAR cycle of planning, action, observation, and reflection (Cornwall & Jewkes, 2021). The data were analyzed using reflexive thematic analysis to identify patterns of individual capacity development, collective action, and livelihood transformation (Cornwall & Jewkes, 2021). To enhance the trustworthiness of the findings, the study applied methodological, source, investigator, and time triangulation, following established qualitative research standards (Cornwall & Jewkes, 2021).

RESULTS AND DISCUSSION

Women's Socioeconomic Vulnerability and Untapped Textile Waste as Community Assets

The initial condition of the community before any intervention was characterized by a paradoxical convergence of scarcity and abundance; a scarcity of economic opportunities for women juxtaposed against an abundance of underutilized resources in the form of household textile waste. The socioeconomic reality of the women in Nania Village was defined by a pervasive dependency on male income, a structural condition rooted in limited access to formal employment and a persistent undervaluation of women's economic potential. Most participants, who were married or heads of households, described their roles primarily within the domestic sphere, with their economic contributions frequently confined to unpaid care work. This dependency rendered their households highly vulnerable to economic shocks, given that their husbands' incomes, often derived from the informal sector, were both irregular and insufficient to cover education, health, and basic consumption needs. This pattern of economic marginalization is not unique to Nania but reflects a broader challenge in rural Indonesia, where women's labor force participation remains significantly lower than men's, and access to income-generating activities is constrained by limited formal sector employment and patriarchal norms that prioritize men's participation in the paid workforce. Consequently, the women's economic agency was not merely constrained but systematically curtailed by the absence of structured opportunities, a lack of entrepreneurial confidence, and minimal access to financial capital to initiate home-based enterprises, even when they possessed latent skills that could be directed toward productive activities.

Parallel to this economic deprivation was the growing accumulation of textile waste, used clothing, damaged garments, and fabric scraps, that was perceived not as a potential asset but merely as household clutter requiring disposal. Observations and interviews during the participatory mapping phase revealed that these materials were predominantly either incinerated, contributing to local air pollution, or discarded in open dumpsites, exacerbating the environmental burden on the village. The community's perspective on these items was shaped by a linear consumption mindset, where the end of a garment's life cycle signified its complete loss of value, leading to practices that were environmentally detrimental and economically irrational. This practice is consistent with global patterns where textile waste, which constitutes a significant portion of municipal solid waste in many developing countries, is often mishandled due to limited awareness of its potential for upcycling or reuse, as well as

an absence of infrastructure for collection and processing . However, the irony was palpable; amidst the daily struggle for economic survival, a resource was being discarded that held the potential for transformation into income-generating products, representing what could be characterized as a dormant economic asset. This latent potential remained unrealized not due to a lack of need, but because of an absence of awareness, technical skills, and institutional support to convert this waste into valuable commodities, a challenge identified across various community-based circular economy initiatives .



Figure 1. Community Socialization Session on Textile Waste Mat Production for Women in Nania Village

Source: Authors' documentation, 2026

The concept of a community-based circular economy offers a powerful lens through which to understand this situation, suggesting that the value of a waste material is not intrinsic to its physical composition but is socially constructed and activated by the community's collective capacity to utilize it productively. In the case of Nania, textile waste was “worthless” because the social and technical infrastructure required to transform it, the knowledge of upcycling techniques, the organizational structure for collective production, and the market linkages for sales, was absent. This perspective reframes the challenge from one of simple waste disposal to one of capacity building; the problem was not the material itself but the social system's inability to recognize and harness it as a resource. International literature on circular economy interventions in developing contexts increasingly emphasizes that the socio-economic imperative for poverty alleviation and job creation is often a more powerful driver for circularity than purely environmental concerns, which are more dominant in the Global North . In this light, the initial challenge for the community was not how to “manage waste” but how to build the social, human, and organizational capital necessary to transform a perceived liability into a productive community asset, thereby creating a model where environmental sustainability and women's empowerment are intrinsically linked. The

textile waste, therefore, represented not just a material reality but a potential fulcrum for community-based development, awaiting activation through capacity building and participatory action.

Participatory Capacity Building as the Entry Point of Women's Empowerment

The process of empowerment in Nania Village did not commence with a predetermined training module on textile upcycling, but rather through a series of participatory capacity building activities that fundamentally challenged the conventional top-down approach to community development. The underlying premise was that sustainable transformation could not be achieved by simply transferring technical skills; it required a deeper engagement with the women's existing knowledge, aspirations, and social dynamics, positioning them not as passive recipients of external expertise but as active co-producers of knowledge and agents of their own change. This participatory ethos, which lies at the heart of Participatory Action Research (PAR), guided every stage of the intervention, from the initial problem identification through to the design and implementation of the upcycling program. The initial sessions were therefore designed not as lectures but as open dialogues where women were invited to share their experiences with textile waste, their economic challenges, and their visions for a better future, creating a shared understanding of the problems they faced and the potential solutions that could be generated from within their community.

A critical component of this participatory process was the skill transfer and confidence building, which occurred through iterative cycles of learning by doing, peer observation, and collective reflection rather than through passive instruction. The women were introduced to basic upcycling techniques, starting with simple fabric cutting, sewing, and assembly to create floor mats, an accessible entry point that required minimal initial capital and built on existing domestic skills. However, the training extended far beyond technical proficiency; it was intentionally structured to foster peer learning, where more skilled participants were encouraged to assist those who were slower to learn, creating a collaborative environment that strengthened social bonds and built collective efficacy. This approach proved particularly effective because it acknowledged the women's existing competencies, their familiarity with sewing, their dexterity, and their resourcefulness, and built upon these foundations rather than treating them as *tabula rasa*. The pre-post test assessments, which measured both technical knowledge and entrepreneurial confidence, revealed significant improvements across all participants, with the most notable gains observed not in the technical domain but in the participants' self-reported confidence to initiate independent income-generating activities. One participant's reflection during an in-depth interview captured this transformation eloquently: "Before the program, I never thought I could make something valuable out of old clothes. Now I know I can create a product, sell it, and earn my own money. This is the first time I feel I have a contribution to make." Such narratives were recurrent across the focus group discussions, where women spoke not only of their newfound skills but of a profound shift in their self-perception, moving from a position of economic dependency and resignation to one of agency and hope, a transformation that is often cited as the most

significant outcome of participatory development interventions .



Figure 2. A mat crafted by a participant from fabric offcuts and discarded garments
Source: Authors' documentation, 2026

The dynamism of the focus group discussions revealed the emergence of informal leadership and the gradual strengthening of collective organization, processes that were nurtured by the participatory nature of the intervention. As the women worked together in small groups, patterns of collaboration and mutual support emerged organically; some participants naturally assumed the role of mentors, sharing tips and encouraging others, while others demonstrated particular aptitude for quality control or design innovation. These emergent leadership dynamics were not imposed by the research team but were recognized and supported through facilitated reflections that helped the group acknowledge and formalize these roles. One focus group discussion, for instance, revealed how a participant who had initially been quiet and hesitant became one of the group's most effective motivators after successfully creating her first batch of marketable floor mats, stating: "I used to think I had nothing to offer. Now I see that when we work together, every single one of us has something valuable to contribute." This process of peer learning and collective confidence building illustrates a core principle of PAR: that knowledge is not simply transmitted from experts to communities but is co-constructed through dialogue, action, and reflection, enabling participants to reinterpret their experiences and generate locally appropriate solutions . The women thus transitioned from being perceived, and perceiving themselves, as beneficiaries of an external development intervention to becoming co-researchers and co-creators of a community-based enterprise.

The significance of this shift cannot be overstated; it represents the transformation from a deficit-based model of development, which views communities as lacking resources

and requiring external assistance, to an asset-based approach that recognizes and cultivates existing capabilities and social capital. Through this participatory capacity building process, the women in Nania not only acquired technical skills in textile upcycling but developed a collective identity as entrepreneurs, problem-solvers, and leaders within their community. The emergence of this new identity, supported by the acquisition of tangible skills and the formation of supportive social networks, is what distinguishes a sustainable empowerment process from a training program; it creates the conditions for continued initiative and collective action beyond the intervention period. The post-intervention discussions indicated that the women had begun to independently explore new product designs, identify their own market opportunities, and even mentor other women who had not initially participated in the program, suggesting that the participatory approach had successfully internalized the values of collaboration and self-reliance. This evidence aligns with the broader literature on participatory development, which consistently argues that sustainable community change requires not just technical inputs but the cultivation of local agency, collective action, and the capacity for ongoing learning and adaptation, a process that is fundamentally enabled by participatory methodologies that treat community members as equal partners in development.

Textile Upcycling and the Transformation of Household Waste into Livelihood Resources

The core of the circular economy intervention lay in the transformation of household textile waste, materials that had been perceived as worthless and destined for disposal, into tangible livelihood resources through a process of upcycling that simultaneously generated economic value and reduced environmental burden. The production process began with the collection and sorting of textile waste from participants' own households, supplemented by contributions from neighbors and relatives who, upon learning of the initiative, began donating their used clothing and fabric scraps rather than discarding them. This initial mobilization of raw materials was itself significant, as it represented a shift in community perception from viewing textiles as waste to recognizing them as potential inputs for productive activity. The women learned to sort materials by fabric type, color, and condition, developing a practical understanding of which textiles were suitable for different upcycling applications, a skill that proved essential for maintaining product quality and consistency. Through iterative cycles of hands-on practice and facilitated reflection, the women progressively improved their technical proficiency, moving from basic products such as simple floor mats to more complex items including bags, cushion covers, and decorative accessories, each iteration building on the lessons learned from previous attempts.

The quality of the upcycled products improved markedly over the course of the intervention, a transformation driven by the women's growing mastery of sewing techniques, their developing aesthetic sensibilities, and their responsiveness to feedback from peers and potential customers. Early products, while functional, exhibited uneven stitching and inconsistent finishing, reflecting the participants' initial lack of confidence and technical precision. However, as the women continued to practice and receive constructive feedback

during regular group sessions, their craftsmanship improved significantly, with products increasingly characterized by neat seams, balanced proportions, and thoughtful color combinations that enhanced their market appeal. This quality improvement was not merely a technical achievement but a reflection of the women's growing pride in their work and their evolving identity as artisans rather than simply as trainees. One participant captured this transformation during a focus group discussion: "At first, I just wanted to make something usable. Now I want to make something beautiful, something people will be proud to buy and use." This shift from a survival-oriented mindset to one focused on quality and marketability was crucial for the economic sustainability of the initiative, as it enabled the group to command higher prices and build a reputation for reliable product quality within the local market.

Efficiency in waste utilization emerged as a critical dimension of the upcycling process, with the women developing increasingly sophisticated approaches to minimizing material waste and maximizing the value extracted from each textile input. The production of floor mats, which served as the entry-level product, utilized larger fabric pieces and required relatively straightforward cutting and assembly techniques. However, as the women gained confidence and skill, they began experimenting with more complex products that made use of smaller fabric remnants that would previously have been discarded, thereby increasing the overall efficiency of the transformation process. The group developed systematic approaches to fabric sorting, color coordination, and pattern design that ensured even small scraps could be incorporated into products, creating a patchwork aesthetic that became a distinctive feature of their creations. This efficiency was not only environmentally significant, reducing the volume of textile waste requiring disposal, but also economically important, as it increased the yield from available materials and reduced the need for external inputs. The women's collective learning about material efficiency exemplifies a key principle of circular economy: that resource circulation is maximized when waste is treated not as an endpoint but as a resource for further value creation. The process of upcycling thus became increasingly refined, with each stage of production, from sorting and cutting to assembling and finishing, optimized to extract maximum value from the available textile resources.

The economic value generated through this transformation was both immediate and tangible, providing participants with income that, while modest, represented a significant supplement to household earnings and a source of economic autonomy previously unavailable to them. The floor mats, which became the group's signature product, were priced competitively in the local market, with sales occurring through direct transactions at village events, through word-of-mouth referrals, and increasingly through participation in local markets and bazaars where the unique, handmade quality of the products distinguished them from mass-produced alternatives. The income generated varied depending on the time each woman could commit to production, a flexibility that was itself an important feature of the model, as it accommodated the competing demands of domestic responsibilities, but even those who participated most minimally reported a meaningful increase in their personal

income and, more importantly, in their sense of economic agency. Beyond the immediate financial benefits, the upcycling initiative created livelihood assets in the form of skills, social networks, and organizational capacity that positioned participants for continued economic engagement beyond the intervention period. The women developed not only technical competencies but also entrepreneurial capabilities, pricing, quality control, customer relations, and inventory management, that constituted a durable livelihood resource independent of the specific products they currently produced. This comprehensive transformation, from textile waste to economic value to sustainable livelihood, represents the essence of community-based circular economy, wherein resource circulation occurs at the household level, generating benefits that are simultaneously environmental, social, and economic .

Strengthening Women's Agency through Collective Entrepreneurship

The most profound transformation observed in Nania Village was not the income generated from textile upcycling, but the fundamental shift in women's agency, their capacity to make strategic life choices, exercise voice in household and community decisions, and act collectively to shape their economic and social realities. While income generation provided an immediate and measurable outcome, the deeper significance of the intervention lay in how it reconfigured women's sense of self, their relationships within households and communities, and their participation in public life in ways that transcended narrow economic metrics. The women who participated in the program began to exhibit marked increases in self-confidence, evident not only in their willingness to speak during focus group discussions but also in their growing assertiveness in family settings, where they increasingly voiced opinions about household spending, children's education, and other decisions that had previously been the exclusive domain of their husbands. One participant reflected on this transformation during an interview: "Before, I would never have dared to speak in a meeting or suggest an idea to my husband. Now, I know I have skills and a contribution to make. People listen to me." This newfound confidence was not merely a personal psychological shift but a socially mediated transformation, reinforced by the collective nature of the entrepreneurship program and the mutual encouragement that characterized the women's interactions.

The collective entrepreneurship model was instrumental in building women's agency, as it provided a structured yet flexible space for practicing decision-making, leadership, and collaborative problem-solving within a supportive peer environment. The women organized themselves into small production groups, each responsible for specific tasks in the upcycling process, sorting, cutting, sewing, quality control, and packaging, and in doing so, they developed practical skills in division of labor, coordination, and collective accountability. Through this process, informal leaders emerged organically, with certain women demonstrating particular aptitude for organizing tasks, motivating peers, or representing the group in external negotiations, roles that provided opportunities for leadership development that extended beyond the immediate production context. The focus group discussions revealed that these leadership experiences had ripple effects in other domains of the

women's lives; several participants reported that their experience managing group production had given them the confidence to take on leadership roles in their religious study groups, school committees, and other community organizations, thereby expanding their influence and visibility within the broader village structure. This expansion of women's public participation illustrates a core dynamic of sustainable livelihoods, wherein human capital development in one domain can catalyze social capital formation and institutional engagement in others .

The decision-making processes within the group were characterized by deliberation and consensus-building, with participants actively debating production priorities, pricing strategies, and market approaches, thereby developing their analytical and negotiation capacities. These discussions were not always smooth, with disagreements arising over product quality standards, work allocation, and the distribution of proceeds, yet the facilitated process of navigating these conflicts proved to be an important learning opportunity, teaching the women how to assert their positions, listen to others, and arrive at collective decisions that balanced individual needs with group sustainability. One focus group discussion captured this dynamic vividly when a participant stated: "We don't always agree, but we have learned to talk until we find a solution. This is not how we used to behave; we would have just kept quiet or gossiped about each other." This shift from avoidance to constructive dialogue represents a significant enhancement of social capital, as the women developed the relational skills and trust necessary for ongoing collective action, a foundation that is critical for the long-term sustainability of community-based enterprises . The group's ability to self-manage, resolve conflicts, and adapt to challenges without external facilitation became increasingly evident as the program progressed, suggesting that the participatory approach had successfully internalized organizational capacities that would persist beyond the formal intervention period.

Connecting these observations to the Sustainable Livelihood Framework provides a valuable analytical lens for understanding the holistic nature of the transformation. The framework emphasizes that livelihoods are built on multiple forms of capital, human, social, natural, physical, and financial, and that sustainable development occurs when these capitals are strengthened in mutually reinforcing ways. In the Nania case, the upcycling program simultaneously enhanced human capital through skill development, knowledge acquisition, and improved health and well-being; social capital through network building, trust, and collective organization; and financial capital through income generation and asset accumulation. Importantly, these forms of capital did not develop in isolation but were dynamically interconnected; the human capital gains in technical skills and confidence enabled the women to participate more effectively in collective decision-making, which in turn strengthened social capital, and this enhanced social capital facilitated more efficient production and marketing, thereby increasing financial returns. One participant's reflection during a post-intervention assessment illustrates this interconnectedness: "The money is important, but what matters more is that we now know how to work together, how to solve

problems, and how to support each other. That is something no one can take away from us.” This statement captures the essence of the sustainable livelihood approach: that the most durable development outcomes are those that build the underlying capacities, human and social capital, that enable communities to adapt, innovate, and sustain their progress over time .

The strengthening of women's agency through collective entrepreneurship thus represents a form of empowerment that extends well beyond economic participation to encompass psychological empowerment, social inclusion, and political voice. The women in Nania did not simply gain a source of income; they gained a new identity as economic actors, a new role in household decision-making, a new position in community networks, and a new sense of efficacy and hope for their futures. This multidimensional transformation aligns with the broader literature on women's empowerment, which conceptualizes empowerment as a process of expanding women's ability to make strategic life choices, a capacity that is shaped by both individual attributes and the social, economic, and political structures within which they live . The collective entrepreneurship model created a supportive counter-structure that provided the women with the resources, knowledge, skills, social support, and economic opportunities, necessary to exercise greater agency, while also working to transform the gendered norms and expectations that had constrained their participation in economic and public life. In doing so, it offers a powerful example of how community-based circular economy initiatives can serve as vehicles for broad-based social transformation, demonstrating that environmental sustainability and women's empowerment are not competing priorities but mutually reinforcing objectives that can be advanced through integrated, participatory approaches .

CONCLUSION

This study has demonstrated that the integration of textile waste upcycling with women's empowerment through a participatory action research approach offers a viable and replicable pathway for addressing the interconnected challenges of environmental degradation and economic marginalization in rural Indonesian communities. The findings confirm that household textile waste, previously perceived as valueless and destined for disposal, can be effectively transformed into productive livelihood assets through capacity building, collective entrepreneurship, and sustained institutional support, thereby generating economic benefits while simultaneously reducing environmental burden. More fundamentally, the research has established that the value of such waste materials is not intrinsic to their physical composition but is socially constructed through the development of human and social capital that enables communities to recognize and activate latent resources. The Circular Livelihood Empowerment Model (CLEM) developed through this study articulates the processes and mechanisms through which this transformation occurs, offering a conceptual framework that integrates circular economy principles with women's economic empowerment, community institutional strengthening, and sustainable livelihood

development. This model contributes to the scholarly literature by bridging disciplinary silos that have historically separated environmental sustainability research from gender and development scholarship, while providing practical guidance for development practitioners working in similar rural contexts.

ETHICAL STATEMENT AND DISCLOSURE

This study was conducted in accordance with established ethical principles, including informed consent, protection of informants' confidentiality, and respect for local cultural values. Special consideration was given to participants from vulnerable groups to ensure their safety, comfort, and equal rights to participate. No external funding was received, and the authors declare no conflict of interest. All data and information presented were collected through valid research methods and have been verified to ensure their accuracy and reliability. The use of artificial intelligence (AI) was limited to technical assistance for writing and language editing, without influencing the scientific substance of the work. The authors express their gratitude to the informants for their valuable insights, and to the anonymous reviewers for their constructive feedback on an earlier version of this manuscript. The authors take full responsibility for the content and conclusions of this article.

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