

Sustainable Innovation in Community Service as an Effort to Build an Adaptive and Resilient Social Ecosystem

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Abstract

This study aims to enrich the body of knowledge related to community service, particularly in the context of sustainable innovation as an effort to develop an adaptive and resilient social ecosystem. The research employs a qualitative approach using a literature review method analyzed descriptively. Data were obtained from Google Scholar and various credible websites with a publication range from 1984 to 2026. Of the 50 articles identified in the initial stage, a rigorous selection process was conducted based on relevance, quality, and methodological suitability, resulting in 37 articles for further analysis. The findings indicate that sustainable innovation in community service plays a strategic role in enhancing individual and community capacities, strengthening social resilience, and fostering the development of adaptive social ecosystems. Innovative approaches that integrate technology, community participation, and multi-stakeholder collaboration have proven effective in improving program effectiveness and sustainability. Furthermore, the findings reveal that successful implementation is significantly influenced by policy support, access to resources, and the community's ability to adapt to change. However, several challenges remain, including limited innovation literacy, lack of synergy among stakeholders, and financial constraints. Therefore, more integrated and sustainable strategies are required to optimize the role of innovation in community service.

Keywords: Community Service, Sustainable Innovation, Social Ecosystem, Adaptive, Resilient

Inovasi Berkelanjutan dalam Pengabdian Masyarakat sebagai Upaya Mewujudkan Ekosistem Sosial yang Adaptif dan Resilien

Abstrak

Penelitian ini bertujuan untuk menambah referensi terkait pengabdian masyarakat, khususnya dalam konteks inovasi berkelanjutan sebagai upaya mewujudkan ekosistem sosial yang adaptif dan resilien. Penelitian menggunakan pendekatan kualitatif dengan metode tinjauan pustaka yang dianalisis secara deskriptif. Data diperoleh dari Google Scholar dan berbagai website kredibel dengan rentang publikasi tahun 1984–2026. Dari 50 artikel yang teridentifikasi pada tahap awal, dilakukan proses seleksi secara ketat berdasarkan relevansi, kualitas, dan kesesuaian metodologi, sehingga diperoleh 37 artikel yang dianalisis lebih lanjut. Hasil penelitian menunjukkan bahwa inovasi berkelanjutan dalam pengabdian masyarakat memiliki peran strategis dalam meningkatkan kapasitas individu dan komunitas, memperkuat ketahanan sosial, serta mendorong terbentuknya ekosistem sosial yang adaptif. Pendekatan inovatif yang mengintegrasikan teknologi, partisipasi masyarakat, dan kolaborasi multipihak terbukti mampu meningkatkan efektivitas dan keberlanjutan program. Selain itu, temuan juga menunjukkan bahwa keberhasilan implementasi sangat dipengaruhi oleh dukungan kebijakan, akses terhadap sumber daya, serta kemampuan adaptasi masyarakat terhadap perubahan. Meskipun demikian, masih terdapat berbagai tantangan, seperti keterbatasan literasi inovasi, kurangnya sinergi antar pemangku kepentingan, dan keterbatasan pembiayaan. Oleh karena itu, diperlukan strategi yang lebih terintegrasi dan berkelanjutan untuk mengoptimalkan peran inovasi dalam pengabdian masyarakat.

Kata kunci: Pengabdian Masyarakat, Inovasi Berkelanjutan, Ekosistem Sosial, Adaptif, Resilien

INTRODUCTION

Sustainable innovation in community service has become a strategic approach to addressing increasingly complex social development challenges in the modern era (Sirolli et al., 2025). Global environmental changes, socio-economic dynamics, and rising uncertainty demand intervention models capable of generating sustainable impacts. In this context, community service is viewed as a process of social transformation grounded in innovation and sustainability. The development of innovation within community service is crucial for fostering more adaptive and resilient social systems.

The concept of sustainable innovation refers to the development of ideas, products, or processes that consider long-term social and environmental impacts (Hermundsdottir & Aspelund, 2021). Within this framework, innovation is oriented toward sustainability and inclusivity. Community service that integrates sustainable innovation principles has significant potential to create solutions that are relevant to local community needs while strengthening their adaptive capacity to change. Sustainable innovation thus serves as a key foundation in building robust social ecosystems.

Furthermore, the concept of an adaptive and resilient social ecosystem refers to the ability of a community to respond, adapt, and recover from various pressures or disruptions, whether economic, social, or environmental in nature. Social resilience theory emphasizes the importance of collective capacity, social networks, and access to resources in dealing with uncertainty (Wen & Shaw, 2025). In this regard, community service based on sustainable innovation can act as a catalyst in strengthening social structures and enhancing the capacity of communities to survive and thrive amid change.

However, in practice, community service often faces several limitations, such as a lack of innovation in approaches, low program sustainability, and minimal active community involvement. Many programs are still top-down in nature and do not fully consider local needs and potentials, resulting in impacts that are not sustainable. This condition indicates a gap between the ideal concept of community service and its implementation in the field, necessitating more innovative and participatory approaches.

Previous studies have shown that integrating innovation into community service can enhance program effectiveness and sustainability. Annan-Diab and Molinari (2017) emphasize that sustainable innovation integrating social, economic, and environmental aspects contributes to improving the quality of social interventions. Additionally, Carayannis and Campbell (2012), through the quadruple helix model, demonstrate that multi-stakeholder collaboration strengthens the impact of innovation in community development. From a participation perspective, Pretty (1995) found that active community involvement is a key factor in the success and sustainability of community-based programs. Meanwhile, Hassan (2025) and Heeks (2018) highlight the role of technology in improving the efficiency and reach of empowerment programs. Furthermore, Kolb (1984) shows that innovation in experiential learning-based training methods is more effective in enhancing individual capacity, which is reinforced by Laverack (2001) regarding the importance of participatory empowerment in increasing

socio-economic independence. Collectively, these findings confirm that innovation is a key element in enhancing the effectiveness and sustainability of community service.

In the context of social development, innovative community service also contributes to creating inclusive and sustainable ecosystems. Through collaborative approaches involving various stakeholders—such as government, academia, the private sector, and communities—community service programs can generate synergies that strengthen intervention impacts (Astuti et al., 2025). This collaboration enables the exchange of knowledge, resources, and experiences, resulting in more comprehensive and contextual solutions. Sustainable innovation in community service thus has a systemic impact on the overall social structure.

Nevertheless, the implementation of sustainable innovation in community service still faces several challenges, including limited resources, resistance to change, and insufficient policy support. Moreover, the absence of standardized models for integrating innovation and sustainability into community service programs poses challenges for replication and scalability. More systematic efforts are required to develop frameworks that can accommodate these aspects in an integrated manner.

Based on the above discussion, it can be concluded that sustainable innovation in community service plays a crucial role in realizing adaptive and resilient social ecosystems. The integration of innovation, sustainability, and community empowerment is expected to create stronger social systems capable of addressing various global challenges. Therefore, this study is important to further examine the role and implementation of sustainable innovation in community service, as well as its contribution to building sustainable social ecosystems.

Community Service

Community service is one of the main pillars of the Tri Dharma of Higher Education, focusing on the application of knowledge, technology, and research outcomes to provide direct benefits to society (Lutfiyah, 2025). This activity encompasses empowerment processes aimed at enhancing community capacity, independence, and welfare. In the context of social development, community service functions as a bridge between academia and real societal needs, enabling the generation of contextual, applicable, and sustainable solutions to various socio-economic challenges.

Sustainable Innovation

Sustainable innovation refers to the process of developing and implementing new ideas, methods, or technologies that consider long-term social and environmental impacts (Keränen et al., 2023). This concept emphasizes the importance of integrating efficiency, sustainability, and inclusivity in every innovation activity. In practice, sustainable innovation may take the form of environmentally friendly technologies, the development of social business models, or empowerment approaches that are adaptive to change. Sustainable innovation is key to creating solutions that can endure over time.

Social Ecosystem

A social ecosystem is a system consisting of individuals, groups, institutions, and networks of social relationships that interact and influence one another within a community (Jasrotia et al., 2025). This ecosystem includes various elements such as social norms, cultural values, access to resources, and institutional structures that shape the dynamics of community life. In the context of development, a strong social ecosystem is characterized by collaboration, trust, and collective capacity that enable communities to work together in achieving common goals. Strengthening the social ecosystem is essential for creating resilient and sustainable societies.

Adaptive

Adaptive refers to the ability of individuals or groups to adjust to changing environmental conditions, whether social, economic, or technological (Nepal et al., 2025). In the context of social ecosystems, adaptability reflects the flexibility and readiness of communities to respond to challenges and seize emerging opportunities. This adaptive capacity is crucial in addressing rapid changes, such as globalization and technological advancement. Adaptive communities are more likely to survive and thrive as they possess the ability to learn, innovate, and adjust strategies in uncertain situations.

Resilience

Resilience, or social resilience, refers to the ability of individuals or communities to withstand, recover from, and even grow after experiencing pressures or disruptions, whether economic, social, or environmental (Rashidfarokhi et al., 2026). This concept includes the capacity to transform for the better following crises. In the context of development, resilience is an important indicator in assessing the strength of a social ecosystem in dealing with uncertainty. Strengthening community resilience through innovation and empowerment is a strategic step toward achieving sustainable development.

METHOD

This study employs a qualitative approach using a literature review method, specifically aimed at enriching references related to community service, particularly in the context of sustainable innovation as an effort to build adaptive and resilient social ecosystems. This approach is chosen because it provides a deep and comprehensive understanding of various concepts, theories, and empirical findings developed in previous studies. Accordingly, this research does not focus on primary data collection but rather on the synthesis and critical analysis of relevant literature to strengthen the conceptual foundation and expand the scope of scholarly discussion on community service.

The data sources in this study were obtained from various scientific publications accessed through Google Scholar and other credible websites, including accredited national journals and reputable international journals. The literature was limited to publications from 1984 to 2026 to ensure that the analyzed data remain current and relevant to recent developments in the fields of community service and sustainable

innovation. The search process was conducted using keywords related to community service, sustainable innovation, social resilience, and adaptive social ecosystems, in both Indonesian and English.

In the initial stage, a total of 50 articles related to the research topic were identified. Subsequently, a rigorous selection process was carried out using inclusion and exclusion criteria, including thematic relevance, publication quality, methodological clarity, and alignment with the research objectives. After this screening process, 37 articles were selected as the primary sources for further analysis. Data analysis was conducted using descriptive analysis techniques, involving the identification, classification, comparison, and synthesis of findings from the literature to generate a more structured and in-depth understanding. Through this method, the study is expected to contribute to enriching scientific references and strengthening both theoretical and empirical studies related to sustainable innovation-based community service.



Figure 1. Research Methodology Flowchart

FINDING AND DISCUSSION

The discussion of sustainable innovation in community service needs to be positioned within the framework of sustainable development theory, which conceptually emphasizes

the synergistic integration of economic, social, and environmental dimensions as the primary foundation for long-term development. From this perspective, community service is no longer viewed as a linear knowledge transfer activity, but rather as a strategic instrument capable of driving systemic and sustainable social transformation (Moldavska & Welo, 2019). This approach requires interventions that build community capacity to face future challenges. This concept is reinforced by the triple bottom line theory introduced by Elkington (1998), which highlights the importance of balancing profit, people, and planet in every development activity. Innovation in community service must therefore be designed holistically, strengthening social cohesion while ensuring environmental sustainability as an integral part of a unified development ecosystem.

Furthermore, the concept of sustainable innovation serves as an important theoretical foundation in explaining how community service programs can generate significant long-term impacts. In this context, innovation includes the development of methods, approaches, and empowerment models that are adaptive to community needs and characteristics. From the perspective of social innovation theory, innovation is considered effective when it produces new solutions that are more efficient, inclusive, and sustainable compared to conventional approaches (Buck et al., 2025). Innovative community service must be able to respond flexibly to dynamic social changes by considering local contexts and community potential. Moreover, sustainable innovation requires continuous learning processes that enable communities to adapt and enhance their capacities in facing evolving challenges.

In addition, social resilience theory provides deeper insight into how communities can survive and adapt in the face of various pressures and changes. This theory emphasizes that resilience is determined by the strength of social networks, trust, and collective capacity to manage risks and uncertainties (Alizadeh & Sharifi, 2021). In this regard, community service acts as a catalyst that strengthens internal community capacity through the enhancement of knowledge, skills, and access to strategic resources. Sustainable innovation in community service programs enables the development of more systematic and effective adaptive mechanisms, allowing communities to transform toward better conditions. Innovation-based community service thus becomes a crucial instrument in building sustainable social resilience.

Moreover, the diffusion of innovation theory proposed by Rogers et al. (2019) provides a comprehensive analytical framework for understanding the process of innovation adoption in society. The diffusion process involves several stages, including awareness, interest, evaluation, trial, and adoption, each influenced by social, cultural, and psychological factors. In the context of community service, the success of innovation implementation largely depends on effective communication and the level of public trust in the change agents involved. Therefore, community service programs must incorporate participatory and contextual communication strategies to bridge the gap between new knowledge and existing practices. Additionally, the presence of opinion leaders within communities plays a crucial role in accelerating innovation adoption, as they significantly influence social behavior.

Previous studies consistently demonstrate that innovation in community service significantly contributes to improving program effectiveness and sustainability. Various studies reveal that digital technology-based approaches, such as the use of online platforms for training, marketing, and communication, can expand program reach while enhancing operational efficiency (Prasetyo et al., 2026; Verhoef et al., 2021). Furthermore, research indicates that multi-stakeholder collaboration through the quadruple helix model— involving government, academia, the private sector, and communities—can strengthen innovation capacity and accelerate program implementation more systematically (Pratiwi et al., 2025; Roman et al., 2020). This collaborative approach enables the integration of resources, knowledge, and broader networks, resulting in more comprehensive and sustainable solutions. Innovation thus improves the quality of community service programs and significantly expands their social impact.

Other studies also emphasize that active community participation is a key factor in determining the success and sustainability of community service programs. A participatory approach allows communities to be directly involved in all program stages, from planning to evaluation, thereby increasing their sense of ownership and responsibility for outcomes (Eelderink et al., 2025; Syamsiyah et al., 2025). In addition, innovation in training methods, such as experiential learning approaches, has proven to be more effective in enhancing individual capacity compared to conventional one-way learning methods (Gustomo et al., 2025; Huang, 2025). This approach enables participants to learn through direct practice, reflection, and social interaction, leading to deeper and more applicable understanding. Innovation in community service thus lies in the development of learning approaches that enhance the overall effectiveness of empowerment processes.

From an empirical perspective, the first case is the Digital Village program in West Java, which integrates information technology into community service activities to enhance the economic and social capacity of rural communities (Desa Digital, 2026). This program can be analyzed through the lens of digital transformation theory and technology-driven development, which emphasize that access to information technology can reduce information gaps and expand economic opportunities (Muhammad et al., 2025). Through digital platforms, communities are able to develop more efficient and competitive online marketing strategies. Moreover, the improvement in digital literacy resulting from this program contributes to changes in community mindsets regarding the productive use of technology. The Digital Village program drives structural transformation in the rural social ecosystem toward a more adaptive and knowledge-based system.

The second case is the Waste Bank program in Malang City, which adopts circular economy principles in community-based waste management (Kelurahan Tlogomas, 2026). Within this framework, waste is no longer viewed as residual material to be discarded but as a resource with economic value when properly managed. This program actively involves the community in waste collection, sorting, and processing, thereby creating a participatory and sustainable management system. Additionally, economic

incentives in the form of savings or income from waste processing encourage behavioral changes in environmental management. The resulting impacts include increased ecological awareness and economic independence. This social innovation demonstrates that integrating environmental and economic aspects can produce effective and sustainable solutions.

The third case is a community-based renewable energy program in West Nusa Tenggara, which utilizes solar energy as an alternative power source to meet community electricity needs (Nasir, 2025). From the perspective of sustainable development theory and the resource-based view, the use of renewable energy represents an environmentally sustainable strategy (Ang et al., 2022). This program significantly improves energy access, which in turn supports local economic activities such as micro-enterprises and agriculture. Furthermore, the use of solar energy reduces dependence on conventional energy sources that are limited and volatile. Socially, this program increases awareness of the importance of clean energy and encourages more environmentally friendly practices. It illustrates how technology-based innovation can strengthen community resilience in the face of resource constraints.

Despite these achievements, the implementation of sustainable innovation in community service still faces multidimensional challenges. One major obstacle is the low adaptive capacity of communities, particularly in adopting new technologies that are often perceived as complex and risky. From the perspective of the theory of planned behavior, this condition is associated with low perceived behavioral control and limited confidence in the benefits of innovation (Ajzen, 1991). In addition, limited resources—both financial capital and supporting infrastructure—pose significant barriers to program implementation. Inequality in access to technology further exacerbates this condition, particularly in rural or underdeveloped areas. This indicates that innovation requires systemic support encompassing education, infrastructure, and policy to ensure sustainable implementation.

Another critical issue is the lack of integration among stakeholders in implementing community service programs. In many cases, programs carried out by different actors—such as government, academia, and the private sector—remain sectoral and insufficiently coordinated. From the perspective of collaborative governance theory, this reflects weak coordination and collaboration mechanisms that should serve as the foundation for community-based development program management (Setiyawana et al., 2025). Furthermore, the lack of specific policies supporting innovation also hinders the adoption of more sustainable practices. Existing policies often fail to provide sufficient incentives for communities and program implementers to innovate. Therefore, a more systematic and integrated approach is needed to effectively align interests and resources.

To address these challenges, comprehensive and integrated strategies are required in developing sustainable innovation within community service. First, strengthening community capacity through innovative and locally relevant education and training programs is fundamental. From the perspective of adult learning theory (andragogy), relevant and practical approaches are more effective in improving community

understanding and skills (Knapke et al., 2024; Monib et al., 2025). Second, adequate policy and financial support are essential to reduce barriers to innovation implementation, whether through subsidies, incentives, or access to inclusive financing sources. Third, strengthening collaboration among stakeholders through the quadruple helix approach is key to creating a sustainable innovation ecosystem. Synergy among government, academia, the private sector, and communities enables more effective integration of resources and knowledge to support program success.

In conclusion, this discussion confirms that sustainable innovation in community service plays a strategic role in fostering adaptive and resilient social ecosystems. The integration of theoretical frameworks, previous research findings, and empirical case studies demonstrates that this approach not only has strong conceptual relevance but also proven practical effectiveness. Contextual and participatory innovation enhances community capacity to face change while strengthening collective social resilience. Therefore, the success of sustainable innovation implementation depends on the collective commitment of all stakeholders to continuously develop, evaluate, and replicate best practices. Through an integrated and sustainable approach, innovation-based community service can become a key instrument in promoting inclusive, adaptive, and resilient social development.

Table 1. Key Findings on Sustainable Innovation in Community Service

No	Key Aspect	Main Findings	Implications
1	Theoretical Framework	Sustainable innovation is grounded in the integration of economic, social, and environmental dimensions (sustainable development & triple bottom line).	Programs must adopt a holistic approach to ensure long-term impact.
2	Role of Innovation	Innovation includes adaptive and sustainable methods, approaches, and empowerment models.	Programs become more effective when aligned with local needs and social dynamics.
3	Social Resilience	Resilience is shaped by social networks, trust, and collective capacity.	Community service acts as a catalyst for strengthening internal community capacity.
4	Innovation Diffusion	Innovation adoption follows stages from awareness to adoption, influenced by communication and trust.	Participatory communication strategies and opinion leaders are crucial.
5	Digital Technology	Digital-based approaches enhance program reach, efficiency, and competitiveness.	Digital transformation is key to strengthening community economies.
6	Collaboration (Quadruple Helix)	Synergy among government, academia, private sector, and communities enhances innovation capacity.	Collaboration improves resource integration and program sustainability.
7	Community Participation	Active participation increases ownership and program sustainability.	Participatory approaches must be applied at all stages of the program.
8	Learning Innovation	Experiential learning is more effective than conventional methods.	Practice-based learning significantly improves individual capacity.

9	Digital Case	Village	Digitalization improves digital literacy and economic opportunities.	Technology drives socio-economic transformation toward a knowledge-based system.
10	Waste Case	Bank	Circular economy transforms waste into economic value.	Enhances environmental awareness and community economic independence.
11	Renewable Energy Case		Solar energy improves energy access and local economic activities.	Reduces dependence on conventional energy and supports sustainability.
12	Key Challenges		Low adaptive capacity, limited resources, and digital inequality.	Requires systemic support: education, infrastructure, and policy.
13	Coordination Issues		Weak stakeholder integration and lack of supportive policies.	Stronger collaborative governance is needed.
14	Strategic Solutions		Capacity building, policy & financial support, and multi-stakeholder collaboration.	Builds a sustainable and inclusive innovation ecosystem.
15	Overall Conclusion		Sustainable innovation enhances effectiveness, social impact, and community resilience.	Becomes a strategic instrument for adaptive and inclusive development.

CONCLUSION

Based on the discussion, it can be concluded that sustainable innovation in community service plays a strategic role in fostering adaptive and resilient social ecosystems. The integration of innovative approaches, community empowerment, and sustainability principles has been proven to enhance the capacity of individuals and communities in responding to dynamic social, economic, and environmental changes. Innovative community service not only functions as a means of knowledge transfer but also as a mechanism for social transformation that promotes independence, resilience, and sustainability in community life. Furthermore, the results of the literature review indicate that the successful implementation of sustainable innovation is strongly influenced by active community participation, technological support, and collaboration among stakeholders. The analyzed case studies demonstrate that innovation-based approaches can generate tangible impacts, both in improving community welfare and strengthening social resilience. Therefore, sustainable innovation-based community service represents a relevant and effective strategy for supporting inclusive and sustainable social development.

From a theoretical perspective, this study contributes to enriching the literature on community service by emphasizing the importance of integrating sustainable innovation in building adaptive and resilient social ecosystems. It also reinforces the relevance of various theories, such as sustainable development, social innovation, and social resilience, in explaining the dynamics of societal change. Thus, the findings of this study can serve as a foundation for developing more comprehensive conceptual models related to innovation-based community service. From a practical perspective, this study provides implications for governments, academics, and practitioners in designing and implementing more innovative and sustainable community service programs. Such

programs should integrate technology, participatory approaches, and multi-stakeholder collaboration to enhance effectiveness and impact. In addition, policy support that encourages innovation, along with efforts to strengthen community capacity to adapt to change, is essential.

This study has several limitations that should be acknowledged. First, the study employs a literature review method and does not involve primary data collected directly from communities or community service practitioners. As a result, the findings are more conceptual and descriptive, and may not fully reflect specific empirical conditions in the field. Second, the data sources are limited to literature available on Google Scholar and several credible websites within the 1984–2026 period, which may result in the exclusion of other relevant studies. Moreover, although a rigorous article selection process was conducted, there remains potential subjectivity in determining the relevance and quality of sources. The limited number of analyzed articles (37 articles) may also affect the breadth and depth of the discussion. Therefore, the findings of this study should be interpreted as a general overview that requires further validation through more comprehensive research.

Based on these limitations, future research is recommended to adopt empirical approaches, including quantitative, qualitative field studies, or mixed methods, in order to provide a more comprehensive understanding of the implementation of sustainable innovation in community service. Future studies may also expand the scope of regions, sectors, and types of innovation examined to produce more representative and in-depth findings. Additionally, policymakers and practitioners are encouraged to improve the quality of community service programs through strengthened innovation, collaboration, and sustainability. The development of technology-based models, increased community participation, and the provision of policy and financial support are critical factors that need to be addressed. Sustainable innovation-based community service can be optimized as a strategic instrument in building adaptive, resilient, and sustainable social ecosystems.

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