SUSTAINABLE FINANCE FOR RURAL SMEs: INTEGRATION OF CIRCULAR ECONOMY AND FINANCIAL DIGITALIZATION IN ECONOMIC CENTER VILLAGES

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Abstract

Village transformation towards economic sustainability requires an integrated strategy between financial digitalization and the circular economy. This research aims to examine how the synergy between the two concepts not only encourages the achievement of sustainable finance, but also strengthens the sustainability of Micro, Small, and Medium Enterprises (MSMEs) in economic center villages. The method used was in the form of literature studies on eleven national and international journals and several relevant sources. The results of the study show that financial digitalization plays a role in increasing the financial inclusion of village communities through wider access to financing, budget management efficiency, and village financial transparency. On the other hand, the implementation of the circular economy encourages the optimization of local resource management with the principles of reduce, reuse, and recycle which has an impact on community empowerment and environmental conservation. The integration of these two approaches is an important foundation for the formation of an inclusive, resilient, and sustainable village economic ecosystem. The sustainable finance resulting from this synergy has the potential to make villages the center of community-based local economic growth. This study recommends the implementation of Environmental, Social, and Governance (ESG)-based policies, strengthening digital literacy, green finance incentives, and multi-stakeholder collaboration to support the acceleration of village transformation into competitive economic center villages.

Keywords: financial digitalization, circular economy, sustainable finance, village MSMEs, economic center villages

INTRODUCTION

Economic development in rural areas that are economic centers is no longer only oriented towards increasing income, but must be directed towards long-term sustainability that includes social, environmental, and financial governance aspects (Ajeng, 2025; Arifin, 2021). Villages that play a role as economic centers have strategic potential in encouraging national economic transformation, especially through empowerment (MSMEs) (Asmara et al., 2025; Fauziah, 2023). However, global dynamics such as climate change, inequality of access to finance (Ghosh, 2016), and digital disruption (Charfeddine & Umlai, 2025) demand a new paradigm in designing village development strategies.

Sustainable finance is an integral approach that connects two major development agendas, namely financial inclusion and the circular economy (Taera & Lakner, 2025; Ozili, 2021). Sustainable finance not only functions in the financing of environmentally friendly projects, but also ensures financial access for vulnerable groups and rural communities to be actively involved in economic activities (Schinckus, 2021). In the context of the circular economy, this approach focuses on the principles of reduce, reuse, and recycle which are oriented towards optimizing local resources, reducing waste, and creating added value through environment-based innovation (Geissdoerfer et al., 2017; Ellen MacArthur Foundation, 2019).

Financial digitalization plays an important role in supporting the implementation of sustainable finance and the circular economy. Digitalization increases the financial inclusion of village communities through wider access to financing, efficiency of budget management (Irfan & Aam, 2024), and transparency of village financial governance (Fauziah, 2023; Leni et al., 2023). On the other hand, the implementation of a circular economy encourages more optimal management of local resources based on the principles of reduce, reuse, and recycle which has an impact on community empowerment and environmental preservation (Leni, 2024; Zahro & Herlina, 2024).

In the framework of sustainable finance, the concept of Environmental, Social, and Governance (ESG) is a framework that emphasizes the importance of integrating environmental, social, and governance aspects in village economic activities (Harymawan et al., 2022; Hartini & Nugroho, 2023). ESG is an important reference for financial institutions, business actors, and village governments in designing financing schemes that are not only profit-oriented, but also support long-term sustainability (Kumar et al., 2016).

Based on the complexity of the challenges and opportunities faced by economic center villages in the scope of sustainable development, this study is designed to answer three main questions. First, what is the role of financial digitalization in increasing access to financing and expanding financial inclusion for MSME actors in rural areas? Second, how does the application of circular economy principles contribute to increasing economic and environmental resilience in villages that are the center of production activities? Third, how can the simultaneous integration of financial digitalization and the circular economy strengthen sustainability and increase the competitiveness of MSMEs in economic center villages?

In line with this question, the main objective of this study is to analyze how the synergy between financial digitalization and the circular economy not only encourages the achievement of sustainable finance, but also strengthens the sustainability of MSMEs in economic center villages. This research also aims to identify the impact of the integration of the two approaches in building an inclusive, resilient, and sustainable village economic ecosystem.

Theoretically, this research is expected to contribute to enriching the literature on the linkages between financial digitalization, circular economy, and sustainable finance in the context of village development, especially in developing countries (Giudici et al., 2018; Widyaningsih & Widodo, 2024). Practically, this research provides strategic recommendations for the government, financial institutions, and village MSME actors in designing ESG-based policies, expanding digital literacy, providing green finance incentives, and encouraging multi-stakeholder collaboration to support the transformation of villages into competitive economic center villages.

The novelty of this research lies in the integrative approach that simultaneously combines two main concepts, namely financial digitalization and the circular economy, as an effort to encourage the realization of sustainable finance and make villages as community-based economic centers. So far, the two concepts tend to be discussed separately. The study also integrates national findings with relevant international studies, including blended finance and impact investing practices (Manninen et al., 2022).

The results of the literature review show that the success of the integration of financial digitalization and the circular economy is greatly influenced by the level of digital literacy of village communities (Leni et al., 2023), village institutional support, and multi-stakeholder collaboration (Hartini & Nugroho, 2023). Therefore, this study recommends the implementation of ESG-based policies, fiscal incentives for green finance, the development of ESG-based village digital platforms, and the involvement of village community organizations in the development of the green economy (Nurlinayanti et al., 2025). The practical implications of this study emphasize the importance of ESG and digital finance training for MSME actors, as well as strengthening synergy between stakeholders to support the realization of economic center villages as a locomotive for green and inclusive development towards a Golden Indonesia 2045.

LITERATURE REVIEW

An in-depth analysis in this study requires a review of various relevant literature related to the integration of the concepts of sustainable finance, circular economy, and financial digitalization. This study provides a theoretical foundation as well as a perspective from the results of previous research as the main reference in compiling a conceptual framework. Through the understanding of the literature, it is hoped that the relationship between sustainable finance, financial digitalization, circular economy, and the application of ESG principles in supporting the development of inclusive and sustainable economic center villages will be depicted. The following are the results of the literature review that is the basis for the analysis of this research.

Integration of Sustainable Finance as a Bridge to Inclusion and Circular Economy

The literature shows that sustainable finance has a strategic role in building bridges between financial inclusion and the circular economy. Taera and Lakner (2025) emphasized that in developing countries such as Indonesia, green bonds, impact investing, and microfinance are important instruments in supporting environment-based village projects. However, the implementation of the scheme requires strong ESG regulations and blended finance to reach vulnerable communities. The current village financing system still tends to be based on a conventional model without considering social and environmental values. Therefore, ESG is needed not only in the context of investment, but also in the recording and reporting of village finances to reflect the value of sustainability.

Circular Economy as a Local Economic Resilience Strategy

The circular economy approach has been proven to make a significant contribution to economic efficiency, waste reduction, and the creation of new opportunities based on local resources (Asmara et al., 2025; Bocken et al., 2016; Kirchherr et al., 2017). Through the principle of reduce, reuse, recycle, village communities are encouraged to innovate in waste management into products with economic value. The potential of the circular economy must be accompanied by the ability to conduct cost analysis, environmental cost accounting, and evaluation of social benefits through the Social Return on Investment (S-ROI) approach. The implementation of an integrated circular economy in village governance will strengthen the local economic ecosystem.

Financial Digitalization as a Motor of Budget Inclusion and Transparency

Prasetyaningtyas et al. (2023) and Irfan and Aam (2024) show that the digitalization of village finance encourages the efficiency of budget management and expands public access to formal financing. Digital systems such as Siskeudes and mobile banking platforms accelerate reporting, transparency, and participation of village communities. However, challenges still exist in terms of digital infrastructure readiness and village human resource capacity. The success of digitalization requires increasing digital literacy and accounting information system training for village officials so that digital transformation can be implemented optimally.

ESG Concept Framework in Village Financial Governance

In the framework of sustainable finance, ESG is the main guideline in village development that emphasizes the integration of environmental, social, and governance aspects (Harymawan et al., 2022; Hartini & Nugroho, 2023). ESG directs financial institutions, business actors, and village governments to design development programs that are not only oriented towards economic growth, but also pay attention to social and environmental impacts in a sustainable manner (Kumar et al., 2016). This approach aims to ensure that village development runs a balance between community welfare and environmental sustainability.

Theoretically, this study emphasizes Sustainable Development Theory (Geissdoerfer et al., 2017) as the main basis. This theory emphasizes the importance of development that is able to meet today's needs without sacrificing the potential of future generations. In the context of villages, this theory encourages the integration of sustainability between economic, social, and environmental aspects as a mutually supportive unit.

The framework used places Sustainable Development Theory as the foundation in realizing Digitalization of Finance and Circular Economy. Financial digitalization encourages village budget transparency and access to financing for MSMEs, while the Circular Economy optimizes local resources and community-based waste reduction. Both are strategic instruments to realize ESG-based Sustainable Finance. The integration of these three elements is directed at building an inclusive, competitive, and sustainable economic center village. With a literature review approach, this study provides an in-depth analysis of how the implementation of financial digitalization and circular economy can contribute to the realization of ESG-based sustainable finance at the village level.

Frame of Mind

Figure 1. Framework for Thinking towards an Economic Center Village
Source: Canva

RESEARCH METHODS

This research uses the literature review method (Literature Review) which is descriptive and analytical. This approach was chosen to explore and analyze the linkages between financial digitalization, circular economy, and the sustainability of MSMEs in economic center villages based on the latest scientific publications, both national and international.

Research Design

The research design used is Library Research qualitatively based with an exploratory approach. The main focus is to identify patterns and linkages between the concepts of financial digitalization and the circular economy in realizing sustainable finance (Sustainable Finance) and supporting the resilience of rural MSMEs. This design allows researchers to gather diverse theories, findings, and best practices from various village contexts in Indonesia and other developing countries.

Population and Sample (Study Target)

The research population includes all relevant scientific publications that discuss the topics of digital finance, circular economy, and the sustainability of MSMEs in villages. The research sample was selected purposively, namely the 11 main journals that have been mentioned in this article, plus some supporting literature published in the last 10 years, both from accredited national journals and reputable international journals such as Journal of Cleaner Production, World, Small Business Economics and others.

Data Collection Techniques and Instrument Development

The data in this study was collected through a literature study by browsing various scientific journals and articles, reports from international institutions such as the OECD and the Ellen MacArthur Foundation, and textbooks relevant to the research topic. To maintain the quality and relevance of the sources used, the data selection process is carried out using inclusion criteria, namely publications published within the last ten years, have a direct relationship with the issue of village MSMEs, and are related to the topic of digitalization, the application of ESG principles, or the development of the circular economy. In the data collection process, the researcher uses an instrument in the form of a literature synthesis matrix that is systematically developed to map the relationship between concepts, the method approach used in each source, and the conclusions or recommendations produced. The use of this synthesis matrix allows researchers to organize information in a more structured and in-depth manner, so that it can support the analysis process more critically and comprehensively. This approach was chosen so that the data collected is really relevant, up-to-date, and supports the research objectives in building strong arguments and based on scientific studies.

Data Analysis Techniques

Data was analyzed using content analysis and thematic coding approaches. Each article is classified based on the main topics, namely financial digitalization, financial inclusion and literacy, community-based circular economy, and ESG-based sustainable finance. The researcher used the source triangulation technique to test the consistency between the literature and to strengthen the validity of the arguments developed. The analysis is carried out inductively, from narrative patterns that appear in the literature to hypothesis formulation. This process follows systematic steps according to Charfeddine & Umlai (2025) and Lanouar & Umlai (2023) in the study of digital sustainability. The integrative model was developed based on a synthesis of key literature findings that bring together three main pillars, namely digitalization, sustainable finance, and circular economy.

Existence of Researchers and Validity of Results

Because this research is qualitative, based on literature studies, the researcher plays the role of the main instrument in interpreting the meaning of the various literature used. To maintain the validity of the results, this study applies triangulation of theories and sources, namely by testing and comparing findings through various relevant theoretical viewpoints and ensuring the suitability between the various references used. Theoretical triangulation is carried out so that the analysis is not fixed on one approach only, but is tested from various scientific perspectives to enrich the understanding of the phenomenon being studied. In addition, cross-checking between references is carried out to minimize the potential for bias in the conclusion making process. All studies in this study are also directly related to the local context of Indonesia, especially on the condition of village MSMEs post-pandemic and the dynamics of community-based green economic recovery efforts (Leni et al., 2023; Nurlinayanti et al., 2025). With this approach, the research results are expected to have high accuracy, strong relevance to real needs in the field, and be able to contribute to the development of academic discourse and policy at the local and national levels.

Location and Duration of Research

This research was carried out independently and collaboratively by a team of students by utilizing digital literature sources and scientific references available through academic portals such as Garuda, ScienceDirect, Taylor & Francis, Official Reports of International Institutions (EMF.org), Asian Development Bank (ADB), Springer, World (MDPI), OECD, Ellen MacArthur Foundation (EMF), and Sinta (Science and Technology Index). The research was not conducted in the field because it used a document-based literature study approach. The duration of the implementation is adjusted to the timeline of activities determined by the organizers, where the entire process of data collection, literature synthesis, and report writing is carried out in a structured and focused manner within an optimal period of time, which is about one month, including the stage of internal discussion and evaluation between authors.

Tool and Material Specifications

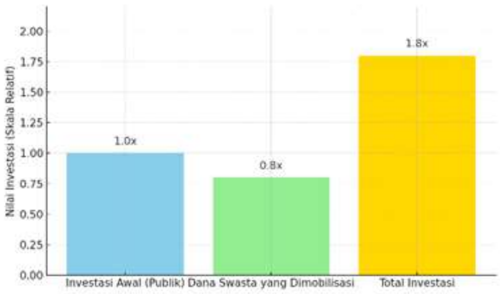
This research does not require laboratory equipment or physical materials, because it is carried out entirely through a library research approach based on literature review. In the implementation process, the researcher actively and directly analyzed a number of scientific journals that had been selected according to the main topic of the research, such as accredited national journals, reputable international journals, and scientific articles relevant to the theme of financial digitalization, circular economy, and sustainability of village MSMEs. To support the systematic management of references and citation recording, Mendeley software is used as a bibliographic tool, to ensure the conformity of citations with applicable scientific writing standards. On the other hand, in the stage of content analysis and thematic synthesis, the researcher also makes limited use of artificial intelligence (AI)-based supporting technologies, such as to help identify key themes, classification of topics, and validate narratives from various literature sources. However, all data interpretation, conclusion-making, and final writing are still carried out independently and critically by the researcher, as part of the academic responsibility and learning process. This approach represents a combination of the analytical skills of vocational students with the wise use of modern technology, to produce scientific works that are adaptive to the development of the times while still upholding scientific ethos, originality, and academic integrity.

RESULTS AND DISCUSSION

The results of the literature analysis show that the integration of sustainable finance, circular economy, and financial digitalization has a significant influence in strengthening the sustainability of MSMEs in economic center villages. There are five main findings derived from the synthesis of 11 major journals and supported by several other literature sources.

The Role of Sustainable Finance as a Bridge of Inclusion and Circular Economy

Sustainable finance plays a central role as a link between financial inclusion and the implementation of the circular economy in villages. Financial instruments such as green bonds, blended finance, and microfinance are bridges that allow village communities to gain access to financing to support various environment-based programs. Through this scheme, village development is not only oriented towards economic growth, but also pays attention to the preservation of natural resources and their social impact.



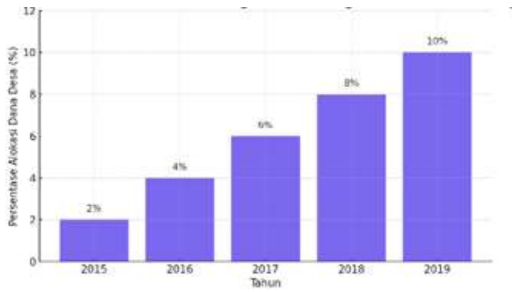


Diagram 1. Multiplier Effect of Blended Finance Scheme Diagram 2. Upward Trend in Village Fund Allocation

Source: Taera & Lakner (2025) Source: Wasudewa & Iskandar (2023)

Village economic transformation based on a circular economy is increasingly effective through synergy between fiscal policy and financing innovation. Diagram 1 shows that a blended finance scheme is able to create a multiplier effect of 1.8 times the value of the initial investment (Taera & Lakner, 2025). Public funds from the government or donors have succeeded in triggering private fund participation, so that the total financing of the project becomes much larger. This scheme has proven effective in supporting circular-based resource management projects. Meanwhile, Diagram 2 shows the upward trend in village fund allocation from 2015 to 2019 as a tangible form of the government's fiscal policy commitment to supporting digital inclusion and the circular economy (Wasudewa & Iskandar, 2023). Increasing the allocation of village funds supports the development of MSMEs, appropriate technology, and circular economy-based village business units. The integration between increasing village funds and blended finance schemes forms a complementary financing ecosystem. The synergy between the two magnifies the impact of development, accelerates village economic transformation, and encourages inclusive and sustainable growth.

Real evidence of the use of village funds is not only illustrated through the budget allocation, but also through the real results that have been achieved. One of these evidences is shown in the infographic of the output of the use of village funds during the period 2015 to 2017. In this period, village funds have contributed to the development of infrastructure and facilities to support the lives of the village community, including the construction of 123,858 km of village roads and the construction of 791,258 meters of bridges. In addition, village funds are also used for the construction of clean water facilities, irrigation, village polyclinics (polindes), integrated service posts (posyandu), and the development of Village-Owned Enterprises (BUMDes) business units which play an important role in strengthening the local economic ecosystem. These achievements are proof that village funds have a strategic role in supporting physical and social development in rural areas (Wasudewa & Iskandar, 2023).

Furthermore, empirical evidence from the comparison of economic growth indices between regions that receive and do not receive village funds further clarifies the benefits of the policy. The development graph of the economic growth index shows that the areas receiving village funds are experiencing a more stable and sustainable acceleration of economic growth compared to other regions. The trend of the development of the value of the growth index and economic development between districts/cities that received village funds (treatment group) and those that did not receive village funds (control group) during the period 2011 to 2019 showed significant differences. Based on the data, districts/cities in the control group experienced economic growth that tended to be slow. On the other hand, districts/cities in the treatment group showed a more stable growth acceleration since the implementation of the village fund program. These findings confirm that inclusion-based fiscal policies, such as village funds, are effective instruments to drive sustainable local economic growth. This visualization also strengthens the evidence that fiscal interventions through village funds are able to create more equitable and resilient economic growth at the local level (Wasudewa & Iskandar, 2023).

Through these findings, it can be concluded that sustainable finance is the main foundation in building an integration bridge between financial inclusion and the circular economy in villages. The integration between innovative financing schemes and community-friendly village fiscal policies has proven to be an effective strategy in supporting sustainable local economic transformation. Empirical evidence presented through various diagrams, infographics, and graphs confirms that resilient village development requires synergy between financial instruments, fiscal policies, and community-based sustainable economic strategies.

Circular Economy as a Strategy for Strengthening Local Economy and Community Recycling

After discussing how the role of sustainable finance is a bridge for the realization of financial inclusion integration and the circular economy, the next discussion focused on the real implementation of the circular economy concept as a strategy to strengthen the community-based local economy. Sustainable finance that has been successfully developed through schemes such as blended finance and inclusive fiscal policies provides a financial foundation for villages to implement concrete circular economy programs. This is where the relationship between the financing aspect and the development strategy begins to be fully established.

The circular economy exists as a model that not only focuses on waste reduction, but also as a holistic approach in building the economic independence of rural communities. This concept has been successfully translated into various community-based initiatives, ranging from waste bank management to the development of village green marketplaces. Empirical studies conducted in several villages show that community-based waste management is able to create a more efficient production cycle, reduce dependence on external raw materials, and open up local business opportunities based on the principle of reduce, reuse, recycle.

Table 1. Summary of Research Findings on Circular Economy Implementation in Rural Ecotourism

No	Tema	Temuan Utama	Implikasi
1	Pengelolaan Sampah	Infrastruktur yang tidak memadai menyebabkan pembakaran sampah, kerusakan lingkungan, dan upaya pengelolaan yang tidak efektif.	Investasi dalam infrastruktur dan kebijakan terpadu diperlukan untuk pengelolaan sampah berkelanjutan.
2	Keterlibatan Masyarakat dan Pendidikan Ekologi	Kegiatan bersih-bersih partisipatif dan pendidikan ekologi sudah ada tetapi membutuhkan upaya berkelanjutan.	Kampanye kesadaran dan program pendidikan yang berkelanjutan sangat penting untuk menjaga keterlibatan.
3	Keberlanjutan Ekonomi	Program daur ulang seperti bank sampah gagal karena hasil yang rendah; ada potensi untuk cendera mata ramah lingkungan dan bisnis hijau.	Dukungan keuangan dan insentif diperlukan untuk mendorong kewirausahaan lokal dan bisnis hijau.
4	Peran Pemerintah dan Dukungan Kebijakan	Kebijakan sudah ada tetapi kurang penegakan dan proses yang efisien; dukungan pemerintah dilaporkan terbatas.	Kebijakan harus konsisten, partisipatif, dan didukung oleh sumber daya agar berdampak nyata.
5	Keterbatasan Teknologi dan Inovasi	Infrastruktur digital yang buruk dan akses terbatas ke teknologi pariwisata pintar; ada eksplorasi energi surya dan minyak esensial.	Kolaborasi antara sektor publik dan swasta diperlukan untuk meningkatkan akses teknologi dan mendukung inovasi.
6	Integrasi CBT dan SES	CBT yang didukung oleh SES membantu menjaga integritas ekologi dan budaya, didukung oleh lembaga lokal.	Penguatan dukungan kelembagaan dan tata kelola diperlukan untuk keberhasilan jangka panjang.
7	Partisipasi Pengunjung	Pengunjung terlibat dalam aktivitas edukasi, berkontribusi pada kesadaran konservasi.	Perluasan aktivitas wisata edukatif dan imersif dapat memperkuat nilai-nilai keberlanjutan.

Source: Kusdibyo, L., Wiryawan, I. G. N. D., Rafdinal, W., & Septyandi, C. B. (2023).

In the table above, it summarizes various research findings regarding the implementation of the circular economy in the scope of village ecotourism. The findings cover various important aspects, such as integrated waste management, active involvement of local communities, village economic sustainability, and the role of local government policies in supporting program implementation. In addition, challenges related to technological infrastructure, the integration of the concepts of Community-Based Tourism (CBT) and Social-Ecological Systems (SES), as well as the level of tourist participation are also the main highlights. Each of the findings presented is followed by practical implications for improving implementation in the field. Thus, strengthening the local economy through a circular economy strategy requires full support, both from the community, government, and other supporting infrastructure so that the programs carried out are not partial, but integrated and sustainable.

The effectiveness of the implementation of the circular economy is further strengthened by the existence of digitalization based on a green marketplace. This can be seen from the findings that show an increase in transaction volume of up to 40% within the first six months of program implementation. This surge proves that digital-based initiatives are one of the effective strategies to expand the marketing reach of recycled products, while encouraging village MSMEs to upgrade independently. The increase in transaction volume not only reflects the growth of digital economic activities at the village level, but also has a positive impact on waste reduction. The integration of the circular economy concept in the green marketplace has proven to be able to support sustainable economic practices through the processing of waste into economically valuable resources. Furthermore, the trend of reducing waste generated from green marketplace activities shows a gradual decrease of up to 20% in the six-month period of implementation. These findings strengthen the argument that circular economy business models based on community collaboration and digital technology have a dual impact: encouraging local economic growth through the creation of new community-based business opportunities while reducing environmental impacts in a sustainable manner (Zahro & Herlina, 2024).

In addition, the synergy between the innovative financing schemes discussed earlier and the implementation of a community-based circular economy form a unified sustainable village development ecosystem. With the right financing support, consistent policies, as well as community-based strategies and digitalization, the implementation of the circular economy is no longer just a normative concept, but has proven to be one of the important pillars of village economic transformation towards a more independent and sustainable direction. The transition from financing to implementation creates harmonious sustainability, building a real bridge between financial inclusion and strengthening a community-based circular economy.

Financial Digitalization and Literacy as a Motor of Budget Inclusion and Transparency

Continuing the previous discussion on the role of sustainable finance as a bridge of inclusion and circular economy as well as strengthening the local economy through circular economy strategies, the findings in this section show how financial digitalization and digital literacy play a role as a catalyst that accelerates the achievement of the goals of inclusion and sustainability of the village economy. Financial digitalization functions not only as a recording or transaction tool, but also as a driving force for transparency in village and MSME financial management.

The effectiveness of the implementation of financial digitalization in supporting the growth of MSMEs can be seen from the development of MSME classification in Badung Regency during the period 2018 to 2023. Based on the data collected, there has been a significant increase in the scale of the MSME business, both in terms of assets and average turnover. This growth shows that digitalization plays an important role in accelerating the development of business capacity, supporting productivity increases, and expanding market reach for MSME players at the local level. These positive developments are also strengthened through visualizations in the form of diagrams that illustrate the growth trend in the number of MSMEs from 2008 to 2023, which shows that during the digital transformation period, the number of MSMEs in Badung Regency has increased steadily. These findings are proof that digitalization is not just a change in financial transaction tools or systems, but has become a key element in the growth strategy of business scale, especially in rural areas. In addition, the effectiveness of the implementation of financial digitalization in supporting the efficiency of MSME financial management is also proven through the results of statistical analysis that show a significant influence of the variables studied on improving financial efficiency (Asmara et al., 2025).

Digitalization makes a real contribution to strengthening financial records, accelerating the reporting process, and increasing the transparency of MSMEs' daily cash flows. Digital financial applications help MSME actors in compiling financial reports in a more orderly, accurate, and easy-to-understand manner. Thus, financial digitalization plays an important role in creating a better, transparent, and supportive financial governance system towards a more productive, inclusive, and sustainable direction (Asmara et al., 2025).

Diagram 3. Digital Transaction Surge Diagram 4. Increase in Average Customer Visits
Source: Data analysis, Putra et al. (2024) Source: Data analysis, Putra et al. (2024)

Digital transformation has been proven to have a real impact on the local economic growth of the village. Diagram 3 shows the surge in the number of digital transactions in village MSMEs after the implementation of the digital financial application system (Putra et al., 2024). This surge confirms the synergy between digitalization and the circular economy in expanding market access for local products, especially processed products from the community. In addition to the increase in transactions, Diagram 4 shows an increase in average customer visits by 25% in the same period (Putra et al., 2024). These findings show that digitalization not only encourages transaction activities, but also improves village economic activity in general through the growth of consumer interaction.

Furthermore, the growth trend of the village's digital economy was recorded to reach an average of 5% Compound Annual Growth Rate (CAGR) after the integration of digital marketplaces and e-wallet-based financial applications (Irfan & Aam, 2024). The findings emphasize that community-based digitalization makes a positive contribution to village economic growth, by strengthening the local business ecosystem, expanding the market, and increasing the productivity of MSME actors.

The development of MSME digitalization in Badung Regency is also increasingly clearly illustrated through data on the increase in the number of MSMEs that use digital applications from 2018 to 2023. Based on the findings of Asmara et al. (2025), MSMEs that have integrated digital financial applications not only experience increased access to formal financing, but also show significant improvements in daily cash turnover, which has a direct impact on productivity and business continuity.

These findings confirm that digitalization not only plays a role in accelerating financial inclusion, but also increases the transparency and operational efficiency of MSMEs. Increased access to formal financing sources shows a positive correlation between digital literacy, financial inclusion, and circular economy-based village economic growth. Thus, digitalization has become a strategic element in driving comprehensive, sustainable, and community-based village economic transformation. The integration of financial digitalization and digital literacy is the main foundation in strengthening the overall village financial inclusion system, as well as strengthening the previous argument regarding the role of sustainable finance as a bridge between financial inclusion and the circular economy. Digitalization is the main pillar in connecting these initiatives into a resilient, transparent, and sustainable village economic ecosystem.

The Influence of Sustainable Finance Lab and ESG Training on the Competitiveness of MSMEs

After discussing how financial digitalization plays a role in improving the efficiency and transparency of village and MSME financial management, the next step is to strengthen the competitiveness of MSMEs with sustainability literacy. Digitalization is an important foundation, but to encourage a comprehensive transformation towards a circular economy-based economy, sustainability literacy through structured training programs must also be improved.

ESG training within the framework of the Sustainable Finance Lab has been proven to make a real contribution to increasing the competitiveness of MSMEs. This training not only provides a theoretical understanding of sustainability, but also equips MSME actors with technical skills in sustainability accounting, social reporting, and green funding strategies. The lab-based learning approach allows participants to directly translate training materials into real products that can be applied in their daily business.

Table 2. Sustainable Finance Lab Indicators

Indikator Penilaian	Status
UMKM menyelesaikan strategy map berbasis keberlanjutan	Diselesaikan dengan VPD, EMD, dan BMC
UMKM menyusun dan menyelesaikan ESG Balanced Scorecard	Terselesaikan
UMKM melakukan analisis S-ROI (Social Return on Investment)	Terselesaikan
UMKM mampu menyusun pitch deck untuk business matching	Terselesaikan, ditampilkan ke investor

Source: Harymawan et al. (2022)

This achievement shows that the majority of MSME actors in the training already have the ability to develop sustainability-based business strategies as well as have business communication skills that support the search for investors. The achievements of the Sustainable Finance Lab program show interesting findings related to the success rate of various aspects tested to the trainees. Based on the data, the preparation of the strategy map occupies the highest achievement. This shows that aspects of long-term planning, especially those related to sustainable business strategies, are easier to understand and accept by MSME actors.

On the other hand, the achievement in the preparation of pitch decks is relatively lower. These findings indicate that although MSME actors have understood the concept of ESG in general, there is still a need for further assistance in improving business communication skills, especially in preparing effective and attractive business plan presentations for potential investors (Harymawan et al., 2022).

These findings support the conclusion that laboratory-based training contributes significantly to increasing the capacity of MSMEs in obtaining sustainable financing. Sustainability literacy expands MSME actors' access to new sources of financing, especially those based on the green economy and circular economy, thereby opening up greater opportunities for MSMEs to increase business scale and expand market networks. In addition, the emphasis on the preparation of strategy maps and pitch decks indicates that ESG integration has begun to be implemented by MSME actors, not just an administrative formality, but as a managerial tool in daily business decision-making. This reflects the internalization of sustainability values in the long-term orientation of their business. Thus, these findings reinforce the importance of developing laboratory-based ESG training models that can be replicated in various regions. This approach not only strengthens existing sustainability literacy theory, but also offers more applicative learning according to the characteristics of local MSMEs in Indonesia. Strengthening laboratory-based sustainability literacy complements the digital transformation discussed earlier, thus forming a resilient, inclusive, and sustainable village MSME development ecosystem. The integration of financial digitalization, sustainability literacy, and circular economy principles is a strategic step towards green economy-based village economic transformation that is relevant in the context of national and global development.

The Role of Digital Literacy and Village Institutions in the Success of Integration

Reinforcing the previous discussion, the success of the circular and digital economy integration program does not only depend on the aspects of digitalization and sustainability literacy, but is also highly determined by the role of local institutions and village communities. A field study in Ciputri Village provides a clear picture that synergy between village institutions and the community is able to encourage the implementation of circular economy-based programs more effectively.

The waste bank program managed by Karang Taruna in Ciputri Village is a clear example of the success of local institutions in supporting community-based economic transformation. Based on the results of the evaluation, this program shows a high level of effectiveness with the achievement of the following indicators:

Table 3. Data Interpretation Effectiveness >80%

Indikator	Capaian	Relevansi dengan Efektivitas >80%
Pemahaman peserta pelatihan soal 3R	>80%	Menunjukkan keberhasilan edukasi & transfer pengetahuan
Partisipasi warga (penyetor aktif)	65% KK	Kontribusi sosial langsung terhadap program daur ulang
Keterampilan teknis Karang Taruna	Naik drastis	Bukti pemberdayaan pemuda melalui pelatihan dan praktik
Struktur organisasi dan SOP terbentuk	Tersusun	Efisiensi & akuntabilitas meningkat dalam pengelolaan

Source: Nurlinayanti et al. (2025)

From the table above, it shows that the waste bank program managed by Karang Taruna has managed to achieve high effectiveness in most indicators. The trainees' understanding of the 3R (Reduce, Reuse, Recycle) principle reached above 80%, indicating that the educational aspect has succeeded in transferring knowledge well. The participation rate of residents as depositors reached 65% of the total heads of households, indicating a significant social contribution in the implementation of the program. The technical skills of Karang Taruna have also increased drastically, becoming clear evidence of the sustainable youth empowerment process. In addition, the organizational structure and SOPs of waste banks have been established, improving management efficiency and accountability. The effectiveness of the Ciputri Village Youth Waste Bank program is illustrated through the results of an evaluation that shows that almost all program indicators are above 80%, except for the indicator of citizen participation as depositors. Although citizen participation has not been fully optimal, this achievement has reflected the success of local institutions in building community awareness and involvement in community-based waste management (Nurlinayanti et al., 2025).

Furthermore, the economic potential of the Waste Bank program is shown through the processing of more than 2 tons of waste per month with an estimated additional income of IDR 2-3 million per month for the community (Leni et al., 2023). This fact confirms that community-based innovation not only provides social benefits in the form of increased environmental awareness, but also generates direct economic value that can strengthen the economic resilience of citizens.

These findings strengthen the argument that the success of circular economy-based village economic transformation cannot be separated from the important role of local institutions. The synergy between digital literacy, sustainability literacy, and village institutions such as Karang Taruna is a key factor in building an independent, sustainable, and inclusive village economic ecosystem. In this context, local institutions play a role not only as program implementers, but also as the main driving force in encouraging community participation and ensuring the continuity of economic and social benefits for villages.

Overall, these results support the idea that resilient village development in 2045 should be based on "Tripartite Integration of Village Development", i.e. the synergy between financial digitalization, circular economy implementation, and ESG-based sustainability literacy, is a strategic step in encouraging green economy-based village economic transformation that is relevant in the context of national and global development. This integration not only aims to strengthen the business capacity of MSME actors, but also to build a more independent, resilient, and sustainable village economic ecosystem. With the support of digitalization, village MSMEs can expand market access and financing through the implementation of the circular economy, villages are able to create added value from the processing of local resources, while ESG-based sustainability literacy equips business actors with a long-term orientation that is socially and environmentally responsible. The three pillars complement each other and form a complete unit, so that the transformation of the village economy is not only sectoral, but also community-based. Thus, strengthening the Tripartite Integration of Village Development must be a priority in the long-term development strategy so that villages are no longer only positioned as development objects, but as the main subjects leading the transformation process towards a just and sustainable green economy.

CONCLUSION

This study concludes that the integration between financial digitalization, the implementation of the circular economy, and strengthening ESG-based sustainability literacy is an effective strategy to realize the development of inclusive, resilient, and sustainable economic center villages. The synergy of the three pillars encourages village MSMEs to increase access to financing, expand the local product market, and internalize sustainability principles in business decision-making. Financial digitalization has proven to be a driving force for inclusion and transparency in village budgets, while the implementation of a community-based circular economy has a dual impact in the form of reducing waste as well as increasing community income. Strengthening sustainability literacy through a laboratory-based training model has also had a real impact on increasing the capacity of MSMEs in developing ESG-based business strategies.

In practical terms, the results of this study imply that villages in Indonesia need to develop a tripartite-based development ecosystem, supported by green-oriented fiscal policies, innovative ESG-based financing, and multi-stakeholder collaboration. Strengthening local institutions, such as Karang Taruna and BUMDes, must be a priority in encouraging the success of circular economy-based programs. In addition, a commitment from the village government is needed to encourage the massive use of digital applications in financial management and community-based digital market development.

However, this study has limitations in terms of the scope of empirical data because it is entirely based on a literature review. Therefore, generalization of research results still requires further field verification. In addition, not all village areas have adequate digital infrastructure readiness, so the implementation of this integrative model can face implementation challenges in the field.

Based on these limitations, it is recommended that further research be conducted through a field study approach or mixed-method to test the implementation of the tripartite model in more depth. Further research can also be focused on the development of ESG-based village digital platforms, analysis of the long-term economic impact of community-based circular economy, as well as evaluative studies on the effectiveness of ESG training models in increasing the competitiveness of MSMEs in various local scopes. With this step, the transformation of villages into globally competitive economic centers can be realized optimally towards a Golden Indonesia 2045.

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