ENGAGEMENT
Jurnal Pengabdian kepada Masyarakat
Vol. 8, No. 1, May, 2024, pp. 248 -269

Community Empowerment through Eco-Crowdinvesting in Green Business for Sustainable and Eco-Friendly MSMEs

Kurnianingsih[1], Totok Prasetyo[2], Dwiana Hendrawati[2], Muttabik Fathul Lathief[1], Wyati Saddewisasi[3], Sahid[2]

[1.] Department of Electrical Engineering, Politeknik Negeri Semarang
[2.] Department of Mechanical Engineering, Politeknik Negeri Semarang
[3.] Department of Management, Universitas Semarang

Email: kurnianingsih@polines.ac.id, totok.prasetyo@polines.ac.id, dwiana.h@polines.ac.id, muttabik.fathul@polines.ac.id, wyatis@yahoo.com, sahid.polines@gmail.com

Article History:
Received: Jan 6th 2024
Revised: Mar 5th 2024
Accepted: May 30th 2024

Abstract: *The COVID-19 pandemic, coupled with climate change repercussions, has gravely impacted global economies, notably the MSMEs in Kelurahan Meteseh. These MSMEs, which play key roles in local tourism and cuisine, struggle with energy and capital issues. This community service program addresses these challenges by implementing a green economic ecosystem for these SMEs, leveraging digital platforms, and promoting environmentally friendly business operations. Methodologically, the project encompassed preparation, technology deployment and installation, technology transfer, and mentoring. To address these issues, a community service program introduced Eco-Crowdinvesting green business technology with solar panels to help MSMEs recover sustainably. Solar panels and the Eco-Crowdinvesting platform reduce operational costs, improve finance, and strengthen MSMEs, making energy affordable for them. In line with national digital and green economy strategies, this program gives MSMEs access to solar power and an innovative financing platform, strengthening their economic resilience, promoting sustainable business practices, and increasing environmental awareness.*

Keywords: *Community empowerment, eco-friendly MSME, green economic ecosystem, eco-crowdinvesting*

Introduction

The COVID-19 pandemic has had a severe impact on the global economy[1], notably affecting MSMEs in Kelurahan Meteseh. These MSMEs, despite possessing significant potential, are under immense pressure to survive and respond effectively to the crisis.[2]

[1] Maital Shlomo and Ella Barzani, "The Global Economic Impact of Covid-19: A Summary of Research," *Samuel Neaman Institute for National Policy Research*, no. March 2020 (2020): 1–12, https://www.neaman.org.il/EN/Files/Global Economic Impact of COVID-19_20200322163553.399.pdf.

[2] Hai Guo et al., "The Digitalization and Public Crisis Responses of Small and Medium Enterprises: Implications from a COVID-19 Survey," *Frontiers of Business Research in China* 14, no. 1 (2020): 1–25, https://doi.org/10.1186/s11782-020-00087-1.

Concurrently, they face challenges posed by climate change and environmental degradation, which threaten economic growth and increase risks and costs.[3] In Meteseh, many residents are small traders offering distinctive local culinary products and engaging river tubing attractions for visitors. However, they struggle with securing energy resources for their operations and finding investors willing to finance their development. The MSMEs in Kampung Dung Tungkul, Kelurahan Meteseh, in Semarang, Central Java, teeming with potential, are grappling with a trifecta of issues:

1. The availability of energy resources for business operations, with the adaptation of green energy solutions, like solar power, being deterred by the hefty upfront investments required.[4]
2. Capital limitations. Most SMEs in the area lack the capital to establish and maintain solar power infrastructure.[5] Furthermore, financing issues hinder the management and leverage of the region's rich natural resources.[6]
3. Deficiencies in modern financial management. Modern financial management is also a necessary element to handle tourism potential and foster MSME growth.[7]

Addressing these challenges is urgent due to the significant impacts of COVID-19 on both national and global economies, and the amplification of cost risks due to climate change.[8] Accelerating the development of a green economic ecosystem, where MSMEs conduct their businesses digitally while utilizing environmentally friendly local resources, is of paramount importance.[9] This approach aims not only to facilitate MSME economic recovery during the COVID-19 era but also to promote sustainable, resilient, competitive, and eco-friendly SME economic growth.[10] At the heart of this transformation

[3] Ashraful Alam et al., "SMEs Respond to Climate Change: Evidence from Developing Countries," *Technological Forecasting and Social Change* 185, no. November 2021 (2022): 122087, https://doi.org/10.1016/j.techfore.2022.122087.

[4] Patrick Sipopa Akayombokwa, "Small and Medium Enterprises Strategies for Winning Mining Walden University," 2021.

[5] Simone Pizzi and Leonardo Corbo, "Fintech and Smes Sustainable Business Models: Reflections and Considerations for a Circular Economy," *Baltic Journal of Management* 15, no. 2 (2020): 141–47.

[6] Andrea Cantú, Eduardo Aguiñaga, and Carlos Scheel, "Learning from Failure and Success: The Challenges for Circular Economy Implementation in SMEs in an Emerging Economy," *Sustainability (Switzerland)* 13, no. 3 (2021): 1–34, https://doi.org/10.3390/su13031529.

[7] M Nizar and A Rakhmawati, "Strategy for Strengthening the Economy of Local Communities Through Business Guidance and Assistance in SME Community of Indonesian Student Entrepreneurs …," *… Conference on University Community …*, 2022, https://icon-uce.com/index.php/icon-uce/article/view/60%0Ahttps://icon-uce.com/index.php/icon-uce/article/download/60/70.

[8] Nicola Ranger, Olivier Mahul, and Irene Monasterolo, "Managing the Financial Risks of Climate Change and Pandemics: What We Know (and Don't Know)," *One Earth* 4, no. 10 (2021): 1375–85, https://doi.org/10.1016/j.oneear.2021.09.017.

[9] Mahesh K. M., P. S. Aithal, and Sharma K. R. S., "Impact of Sustainable Finance on MSMEs and Other Companies to Promote Green Growth and Sustainable Development," *International Journal of Applied Engineering and Management Letters*, no. February (2022): 60–76, https://doi.org/10.47992/ijaeml.2581.7000.0120.

[10] Siti Nur 'Atikah Zulkiffli et al., "Eco-Innovation Capabilities and Sustainable Business Performance during the COVID-19 Pandemic," *Sustainability (Switzerland)* 14, no. 13 (2022), https://doi.org/10.3390/su14137525.

is the community service program's pioneering initiative, melding the virtues of Eco-Crowdinvesting with the cutting-edge integrations of solar panels and IoT to assist MSMEs in their environmentally friendly economic recovery.[11] This synergy will enhance production with lower and more efficient input and operational costs while preserving the environment and promoting collaborations and partnerships between MSMEs and investors to develop sustainable green businesses.[12]

The community service program implements research results from the Matching Fund, aligning with the strategic national issues focusing on Digital Economy (technologies for MSMEs) and utilizing renewable, environmentally friendly energy (Green Economy).[13],[14] Eco-Crowdinvesting, a funding model where individuals collectively invest in green projects or environmentally friendly initiatives, offers an alternative financing method.[15] This model focuses specifically on sustainability and environment-oriented projects or businesses, allowing individuals to collectively invest in green projects or eco-friendly initiatives.[16]

The emergence of crowdfunding intersecting with renewable energy is a modern phenomenon, having its roots only as far back as 2010. Mosaic blazed the trail with its innovative business model that adapted crowdfunding principles, providing loans for solar project developments.[17] Similarly, WindCentrale, birthed in the Netherlands the same year, sought to accelerate the shift towards renewable energy.[18] The platform uniquely allowed individuals to partake in wind turbine ownership, enabling them to benefit directly from wind energy.[19] Despite the proliferation of research on

[11] Yongjun Hou and Zhen Fang, "Unleashing the Mechanism between Small and Medium Enterprises, and Green Financing in China: A Pathway toward Environmental Sustainability and Green Economic Recovery," *Environmental Science and Pollution Research* 30, no. 1 (2023): 1672–85, https://doi.org/10.1007/s11356-022-21448-8.

[12] Hariyanto Hariyanto, Muhamad Rusdi, and Jayadi Jayadi, "Implementation of Solar-Powered Submersible Pump Technology (PSTSP) to Increase Rainfed Rice Field Production," *Engagement: Jurnal Pengabdian Kepada Masyarakat* 7, no. 1 (2023): 200–210, https://doi.org/10.29062/engagement.v7i1.1096.

[13] Erman Aminullah et al., *Interactive Components of Digital MSMEs Ecosystem for Inclusive Digital Economy in Indonesia*, *Journal of the Knowledge Economy*, 2022, https://doi.org/10.1007/s13132-022-01086-8.

[14] R. Masdar et al., "Implementation of a Sustainable Green Economy in Indonesia: A Literature Review," *IOP Conference Series: Earth and Environmental Science* 1075, no. 1 (2022), https://doi.org/10.1088/1755-1315/1075/1/012056.

[15] Muhammad Asif Khan et al., "Does Green Finance Really Deliver What Is Expected? An Empirical Perspective," *Borsa Istanbul Review* 22, no. 3 (2022): 586–93, https://doi.org/10.1016/j.bir.2021.07.006.

[16] Aleksy Kwilinski and Oleksii Lyulyov, "Spillover Effects of Green Finance on Attaining Sustainable Development : Spatial Durbin Model," 2023.

[17] Ibrahim Ari and Muammer Koc, "Philanthropic-Crowdfunding-Partnership: A Proof-of-Concept Study for Sustainable Financing in Low-Carbon Energy Transitions," *Energy* 222 (2021): 119925, https://doi.org/10.1016/j.energy.2021.119925.

[18] D. F. Botelho et al., "Innovative Business Models as Drivers for Prosumers Integration - Enablers and Barriers," *Renewable and Sustainable Energy Reviews* 144, no. March (2021): 111057, https://doi.org/10.1016/j.rser.2021.111057.

[19] Jan Jonker and Niels Faber, *Organizing for Sustainability*, *Organizing for Sustainability*, 2021,

crowdfunding, there's a conspicuous lacuna in the realm of renewable energy: the lack of digital technologies tailored to crowdfunding models for renewable energy investments for MSMEs, especially those equipped with calculations on electricity operational cost efficiency.[20]

When piecing these insights together, the emerging picture underscores the undeniable significance of eco-crowdinvesting for green business MSMEs. This financial conduit achieves several paramount feats:

First, Democratization of Renewable Energy: By facilitating crowd-based investments, MSMEs can tap into renewable energy resources without the traditionally hefty upfront costs.

Second, Promotion of Sustainable Practices: Eco-crowd investing resonates with the contemporary call for eco-friendly business procedures, aligning MSME operations with global sustainability goals.

Third, Market Expansion: The platform sets the stage for MSMEs to evolve, enabling them to market high-quality, eco-friendly products. This inevitably broadens their reach, making their products more competitive and accessible to a wider audience.

Fourth, Cultivating Collaborations and Partnerships: Eco-crowdinvesting nurtures the growth of collaborations and partnerships between MSMEs, investors, technology developers, and financial institutions. This collaborative environment enriches the synergy between stakeholders, fostering a collective drive towards sustainable innovations.

As the world gravitates towards sustainable energy and eco-consciousness, the convergence of crowdsourcing, crowdfunding, and green energy via eco-crowdinvesting emerges not just as an innovative financial strategy but a pivotal instrument. It holds the promise to bolster the vigor, adaptability, and sustainability of MSMEs, situating them at the forefront of the green business revolution.

Method

The method for implementing community service includes preparation activities, design, development, technology transfer, mentoring, dissemination of results, monitoring and evaluation, and reporting, as illustrated in Figure 1.

Phase 1: Preparation Activities. The foundation for the community service program is laid in the preparation phase. This involves two primary tasks:

https://doi.org/10.1007/978-3-030-78157-6.

[20] Zahid Yousaf et al., "Towards Sustainable Digital Innovation of Smes from the Developing Countries in the Context of the Digital Economy and Frugal Environment," *Sustainability (Switzerland)* 13, no. 10 (2021): 1–28, https://doi.org/10.3390/su13105715.

First, field Measurements in Kelurahan Meteseh: Detailed on-site measurements and data collection provide a snapshot of the existing conditions in Kelurahan Meteseh. This includes potential energy resources and relevant environmental sustainability aspects. The focus on potential energy resources and sustainability aspects provides context for the subsequent intervention.

Second, preparation activities also involve conducting Focus Group Discussions (FGDs) that engage stakeholders, such as local leaders, SMEs, and other relevant parties. The objective of these discussions is to gain deeper insights and understanding of the problems and needs within the area.

Phase 2: Design Activity. Following the preparation is the design activity, where a system is planned that incorporates solar cell design, Internet of Things (IoT), and Artificial Intelligence (AI) for Eco-Crowdinvesting. Once the design phase concludes, the development of the system takes place, which includes the construction and implementation of technology for solar cells, IoT, and AI, as per the prepared design: (1) Solar Cell Design: A sustainable energy source harnessing sunlight; (2) IoT: Implementing devices interconnected via the internet for better data sharing and analysis; (3) AI for Eco-Crowdinvesting: An innovative way to merge technology and finance, enabling community members to invest in sustainable projects using AI-driven insights.

Phase 3: Development. Post design, the program moves into the tangible phase with the creation and implementation of the proposed technological solutions. The technology envisaged in the design phase, including solar cells, IoT, and AI, is constructed and deployed in line with the initial design specifications.

Phase 4: Technology Transfer and Mentoring. Technology transfer is a critical phase ensuring that the community not only benefits from the introduced technologies but also has the capability to manage, troubleshoot, and harness them effectively. This phase is about empowerment, consisting of:

First, Training and Skill Development: Community members, especially SMEs, are trained in solar panel installation, troubleshooting, and using the Eco-Crowdinvesting system.

Second, Continuous Support and Mentoring: Post-training, a support mechanism is established for a month to help SMEs adapt to the new technology and resolve any operational issues. Mentoring ensures the smooth adoption of the introduced technologies. The continuous support provided to SMEs empowers them to effectively use and manage the solar cell technology, IoT systems, and Eco-Crowdinvesting.

Phase 5: Dissemination of Results, Monitoring & Evaluation, and Reporting. Though not elaborated in your initial outline, these stages are crucial. Dissemination ensures that stakeholders are informed of the program's outcomes. Monitoring and evaluation are continual processes that assess the project's impact, and reporting

formalizes the findings and lessons learned.

The described method is rooted in a systematic and comprehensive approach, integrating both community insights and technological solutions to address local challenges in Kelurahan Meteseh. By leveraging sustainable technologies and the crowdinvesting model, the program not only seeks immediate improvements but also ensures a longer-term impact aligned with sustainable development goals.

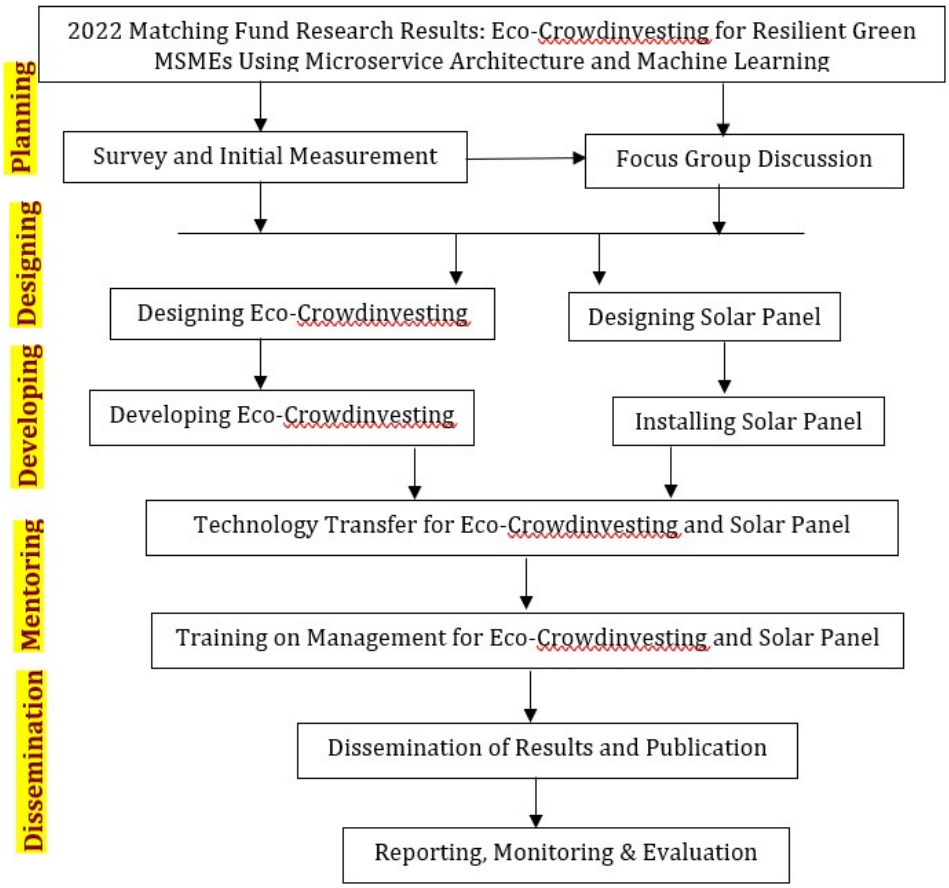


Figure 1. Method

Result

This community service initiative aims to address the issues related to energy resources, capital, and marketing for SMEs in Kampung Dung Tungkul, Kelurahan Meteseh by installing solar panels and integrating them with a green business eco-crowdinvesting system. This solution offers SMEs access to affordable and stable energy, reducing operational costs and boosting profits. It also opens new opportunities for SMEs to expand by marketing environmentally friendly, high-quality products, thus enhancing product competitiveness and fostering collaboration and partnerships between SMEs and investors, ultimately strengthening sustainable business development that positively

impacts the community and environment. We conducted a Focus Group Discussion (FGD) in Kampung Dung Tungkul, Meteseh Subdistrict as shown in Figure 1, engaging stakeholders such as local leaders, SMEs, and other relevant parties. The purpose of these discussions is to gain deeper insights and a better understanding of the area's problems and needs.

Figure 2. FGD in Kampung Dung Tungkul, Meteseh Subdistrict

The initiative commenced with the installation of a 2KWp capacity solar panel, yielding positive results after a month of implementation. The solar panel efficiently operates for six hours from 5:00 PM to 11:00 PM, using energy stored in its battery, thereby supporting extended and efficient SME operations and potentially increasing revenue. With additional energy from the solar panel, SMEs noted a reduction in operational costs, promoting a more sustainable and environmentally friendly business environment. The installation incorporates Internet of Things (IoT) technology, facilitating real-time monitoring of energy use, power, and other parameters. IoT not only optimizes energy use but also assists in predictive maintenance and care, minimizing downtime and extending asset life.

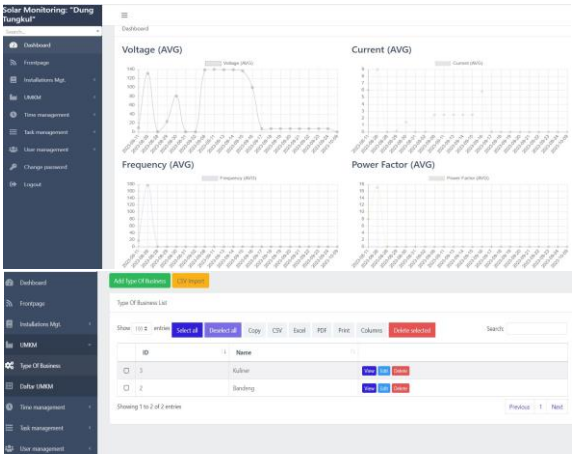
The system is seamlessly integrated with an innovative Eco-Crowdinvesting platform, simplifying capital access for SMEs transparently, as shown in Figure 3. It offers flexible financing patterns, allowing SMEs to secure funds based on their capacity. After implementing the solar panel and eco-crowdinvesting system in Kampung Dung Tungkul, Kelurahan Meteseh, the next step involves training and technology transfer mentoring to the local SME community, empowering them to effectively manage and utilize this cutting-edge technology. During the technology transfer mentoring, significant focus areas include managing solar panels and the Automatic Transfer Switch (ATS) and utilizing the green business eco-crowdinvesting system. Training on solar panel management is crucial and has been conducted, equipping the SME community with knowledge from basic maintenance to common troubleshooting techniques for solar panels. This enables them to perform routine maintenance and simple repairs

independently, ensuring a stable energy supply for their businesses. In terms of ATS management, the community has been provided with understanding and skills for the correct operation and maintenance of this device. Through ongoing mentoring, SME operators in Kampung Dung Tungkul have successfully operated and optimized the ATS function and identified and addressed operational issues. Mentoring also includes the application of the green business eco-crowdinvesting system, a crucial innovation supporting the financial sustainability of SMEs. The green business eco-crowdinvesting system is designed to facilitate SME access to investors through a transparent process. The Kampung Dung Tungkul community has been introduced to innovative financing models and funding sources that support their enterprises, fostering a culture of collective investment responsible for social and environmental aspects, invigorating the local economy while promoting more sustainable business practices. Through eco-crowdinvesting, SMEs in Kampung Dung Tungkul now have alternative financing options that not only support business growth but also their positive contribution to the environment. Through trainingring in managing solar panels and ATS, and access to green financing platforms, as shown in Figure 3, an ecosystem is created that supports the growth of environmentally and economically sustainable SMEs. The entire process underlines that the right technology application and financing access can significantly empower SMEs, making them stronger and more resilient economic entities. Despite significant progress in implementing and adopting this new technology, capacity development challenges and a deeper understanding of concepts by the community remain areas of focus. Raising awareness and understanding of new technology among the community requires time and process. Continuous education and mentoring are necessary to ensure the knowledge and skills imparted can be fully utilized by the community in their daily operations, maintaining and growing the positive contribution of solar panel installation and eco-crowdinvesting system to the development of SMEs in Kampung Dung Tungkul.

(a)

(b)

(c)



(d)

Figure 3. Training for the management of (a) ATS, (b) solar panel batteries, (c) solar panels, and (d) Eco-Crowdinvesting system

The effectiveness of the community service initiatives was evaluated through a questionnaire survey involving twenty respondents from the Small and Medium Enterprises (SME) community in Kelurahan Meteseh.

Level of Achievement from an Attitudinal Change Perspective

The metamorphosis in attitude regarding MSME management capabilities is a notable byproduct of the community service activities. The efforts have culminated in cultivating a more refined, organized, and strategic approach to business operations within the thematic village tourist spot of Kampung Tematik Dung Tungkul Meteseh, as illustrated in Table 1.

Diverse Responses to Different Management Aspects.

Table 1 furnishes us with a granular insight into specific areas of management. While certain areas like "Oversight and monitoring" and "Strategy and task planning" witnessed significant positive shifts (with 100% and 90% affirmative responses respectively), there's a noticeable bifurcation in areas like "Understanding of effective business administration", "Comprehension of the break-even point", and "Familiarity with ROI calculations". This divergence is indicative of the varying challenges faced by MSMEs in different facets of business management.

Pinnacle of Supervision.

The unanimous positive response (100%) to the supervision aspect underscores its paramount importance. This possibly indicates a universal recognition among MSME operators and managers that consistent monitoring and oversight are crucial for the sustainability and growth of a business.

Planning - The Proactive Approach.

"Strategy and task planning" also garnered an overwhelming positive nod with 90% affirmatives. Proactive planning, by preempting pitfalls and capitalizing on opportunities, can steer MSMEs towards stability and prosperity. The Meteseh community's recognition of this bodes well for its future trajectory.

Balancing Act in ROI Understanding.

The split response regarding calculating return on investment indicates that while half of the community is adept at gauging the profitability and effectiveness of their investments, there's an equal fraction that may benefit from further education on this front. Ensuring comprehensive financial literacy can be the keystone to the sustained profitability and scalability of MSMEs.

Tabel. 1 Enhancement of MSME Management Abilities in Meteseh Sub-district

Description	Answered Yes		Answered No		Total Responded	
	Count	%	Count	%	Count	%
Comprehension of business management principles	9	45	11	55	20	100
Structuring and planning of activities	18	90	2	10	20	100
Oversight and monitoring	20	100	0	0	20	100
Knowledge about the break-even point	9	45	11	55	20	100
Familiarity with calculating investment returns	10	50	10	50	20	100
Average	13,2	66	6,8	34	20	100

Source: Primary Data processed in 2023

An average positive response rate of 66% is indeed commendable and stands as testimony to the effectiveness of the community service activities in shifting attitudes. However, the 34% on the other side of the spectrum can't be overlooked. This number hints at the segments of the community that are yet to fully embrace or understand enhanced management practices.

Level of Achievement from a Socio-Cultural Perspective

Meteseh's endeavors, notably in leveraging solar panels and the Eco-Crowdinvesting system, offer a rich tapestry of socio-cultural interactions that transcend beyond mere economic or environmental ramifications. These interactions, involving city government, sub-district, neighborhood, MSME community members, and the service team from Politeknik Negeri Semarang, have enhanced the collaborative culture in the business sector, especially in utilizing solar panels and the Eco-Crowdinvesting system.

Socio-Cultural Embedment through Multi-Stakeholder Engagement.

One of the noteworthy aspects of the initiatives in Meteseh is the diverse range of stakeholders involved. This isn't a top-down approach led by a single entity. Instead, the community is seeing participation from the city government, the sub-district, neighborhoods, and the SME community, all supplemented by the service team from Politeknik Negeri Semarang. This multi-tiered, inclusive participation signifies a move towards collective decision-making and shared ownership of the community's future.

Facilitating Social Interactions.

Interactions between different segments of the community can lead to a melting pot of ideas, fostering mutual understanding and respect. With different stakeholders coming together, there's not only a sharing of technical know-how or resources but also of values, visions, and aspirations. It's an exercise in building trust, aligning objectives, and forging new relationships or strengthening existing ones.

Enhanced Collaborative Culture

The collaboration doesn't end at mere interaction. Meteseh is witnessing the crystallization of a new culture - one of cooperative business practices. Especially in the realm of using solar panels and the Eco-Crowdinvesting system, the synergy between the stakeholders has laid the groundwork for innovative business models, risk-sharing mechanisms, and mutual support systems. This collaborative ethos can significantly smoothen the process of technology adoption, ensure equitable benefits, and address challenges more holistically.

Solar Panels and Eco-Crowdinvesting as Catalysts

While the technology and economic benefits of solar panels and the Eco-Crowdinvesting system are palpable, their socio-cultural impacts are equally profound. These systems aren't just transforming the energy landscape or business models; they are acting as bridges, bringing together diverse groups under a unified goal. The adoption of such sustainable solutions in the community showcases a forward-thinking mindset, commitment to environmental stewardship, and an emphasis on collaborative growth.

Level of Achievement from the Target Community's Economic Perspective Through Employment Increase

Increase in Employment

Meteseh, with its unique positioning in the landscape of technological and sustainable advances, serves as a fertile ground to assess the dynamics between innovation and employment. The integration of solar panels and the groundbreaking approach of Eco-Crowdinvesting, championed by stakeholders like the MSME operators, managers of Kampung Tematik Dung Tungkul, and the supportive Semarang City

Government, highlight a progressive shift in the socio-economic fabric of the region. With Politeknik Negeri Semarang lending its mentoring expertise, these initiatives are well-guided and hold promise. This promise, however, is accompanied by the logistical demands of managing and scaling such operations, notably in the labor sector. Table 2, a reflection of the Meteseh community's insights, offers a deep dive into these implications:

First, Eco-Crowdinvesting: The data resonates with a robust 90% of participants endorsing Eco-Crowdinvesting as a pivotal job creator. The mechanism, by facilitating easier access to capital for budding and existing ventures, catalyzes business activities. In turn, these operations would naturally demand a larger workforce.

Second, Production and Employment Correlation: A matching 90% consensus underscores a fundamental economic principle; an upswing in production typically signals a subsequent need for more hands on deck. This indicates the community's understanding of and belief in the ripple effect of increased business activities.

Third, Edu-Green Tourism: This segment reiterates the strong belief (90%) in the potential of sustainable tourism. As the world leans into eco-consciousness, regions like Meteseh that pivot to such sustainable models stand to benefit, both in terms of tourism revenue and job creation.

Fourth, Digital Economy: While 70% of respondents acknowledge the digital domain as a potent employer, the 30% divergence possibly indicates concerns tied to the nature of digital jobs. Could they be temporary? Is there a steep learning curve? Or perhaps, does automation pose a threat to traditional roles? These are questions stakeholders might need to address.

Fifth, Solar Power Plants: A 50-50 split in opinion offers food for thought. While solar installations might provide initial employment during setup phases, the community seems divided on its long-term job potential. Solar plants, once operational, might not necessitate a significant workforce for maintenance, explaining the community's divided stance.

Tabel 2. Increase in Employment

Description	Answered Yes		Answered No		Total Responded	
	Count	%	Count	%	Count	%
Eco-Crowdinvesting fosters job creation	18	90	2	10	20	100
Surge in production correlates with job growth	18	90	2	10	20	100
Edu-Green Tourism has labor demands	18	90	2	10	20	100
Digital economy calls for workforce	14	70	6	30	20	100
Solar Power Plants hold employment potential	10	50	10	50	20	100
Average	15,6	78	4,4	22	20	100

Source: Primary Data processed in 2023

Increased in Production Capacity

Table 3 offers insights into how the Meteseh community perceives the impacts of the community service program and the establishment of solar panels on production capacity. Across the board, an overwhelming majority of respondents (98% on average) acknowledge the benefits. Detailed findings from table 3 are as follows:

First, Community Service Program's Impact on Production: A full 100% of respondents believe that the community service program positively affects production levels. This unanimity underscores the program's success and its perceived effectiveness within the community.

Second, Product Diversification: 90% of participants recognize the community service program as a catalyst for diversifying product ranges. While this is an impressive majority, the 10% who disagreed might reflect a segment that either doesn't see the direct benefit or has other reasons for not expanding their product range.

Third, Innovation and Creativity Boost: Again, the consensus is strong, with all respondents (100%) feeling that the program encourages innovation and creative thinking. This shows that not only are tangible production benefits recognized but also the intangible benefits which can have long-term positive effects on the community's growth and sustainability.

Fourth, Solar Panels and Electricity Supply: The introduction of solar panels seems to be a resounding success, with the entirety of the community (100%) acknowledging its role in strengthening the electricity supply. This suggests the solar panels meet a

critical need in the community, potentially addressing previous power shortages or reliability issues.

Fifth, Solar Panels as a Secondary Energy Source: Continuing the theme, every respondent sees the solar panels as a valuable supplemental power source. This addition likely brings with it increased energy security for the community.

Tabel. 3 Increase in Production Community

Description	Answered Yes		Answered No		Total Responded	
	Count	%	Count	%	Count	%
Initiatives from the community service program amplify production levels	20	100	0	0	20	100
The community service program aids in broadening the range of products	18	90	2	10	20	100
The community service program stimulates inventive and innovative thinking	20	100	0	0	20	100
Installation of solar panels strengthens electricity supply	20	100	0	0	20	100
Solar panels recognized as supplementary power sources	20	100	0	0	20	100
Average	19,6	98	0,4	2	20	100

Source: Primary Data processed in 2023

Income Generation

The results as shown in table 4 show that:

First, Solar Panels as an Income Driver: The unanimous response indicates the perceived value of solar panels in driving revenue. This implies a strong community understanding and acceptance of renewable energy as not just an environmentally-friendly option, but also as a lucrative one.

Second, Business Profitability: The slightly reduced percentage (90%) suggests while many see the direct correlation between the solar panels and profitability, a small fraction (10%) may have concerns or are yet to experience the direct financial benefits.

Third, Direct Income Source for Managers: This high percentage (100%) underscores the significance of solar technology as a viable business, especially for those managing these systems, potentially indicating the creation of new job roles or opportunities centered around solar panel maintenance and administration.

Fourth, Eco-crowdinvesting Enhancing Brand Visibility: An overwhelming response supporting the idea indicates that the community understands and values the concept of eco-crowdinvesting. They recognize its role not just in capital generation but also in improving a brand's market standing.

Fifth, Eco-Crowdinvesting's Financial Facilitation: The unanimous positive response reflects the community's understanding of eco-crowdinvesting as a tool to procure capital easily, which in turn, aids in bolstering marketing efforts and expanding business capacity.

The average response rate of 98% in favor of the above methods boosting income generation highlights a strong community consensus on these innovative strategies and tools.

Tabel. 4 Increase in Employment

Description	Answered Yes		Answered No		Total Responded	
	Count	%	Count	%	Count	%
Solar Panels as a revenue enhancer	20	100	0	0	20	100
Solar Panels' role in augmenting business profitability	18	90	2	10	20	100
Solar Panels serving as a direct income source for administrators	20	100	0	0	20	100
Impact of Eco-crowdnvesting on escalating a MSME's visibility in the market	20	100	0	0	20	100
Eco-Crowdinvesting's influence on income by facilitating financial accessibility and capacity growth	20	100	0	0	20	100
Average	19,6	98	0,4	2	20	100

Source: Primary Data processed in 2023

Discussion

The results of this community service initiative in Kampung Dung Tungkul, Kelurahan Meteseh are promising and showcase a multi-faceted positive impact on various aspects, including attitudinal change, socio-cultural integration, and economic development.

The community service activities have led to a significant positive shift in the attitude of SMEs toward management capabilities. This is evident from the high percentage (66%) of respondents who reported a positive change. Specific areas like "Oversight and monitoring" and "Strategy and task planning" saw substantial improvements, indicating that the community recognizes the importance of these aspects in business management. However, there are areas where respondents showed less improvement, such as "Comprehension of the break-even point" and "Familiarity with ROI calculations." This divergence suggests that some SMEs may still require additional education and support in these areas. The majority have adapted and integrated enhanced management techniques into their businesses, showcasing the potency of community service activities. However, for a holistic upliftment, it becomes imperative to address the remaining gaps and ensure that every member of the community is equipped with the requisite knowledge and skills to excel in their business ventures. The emphasis should be on continuous education, targeted interventions, and fostering an environment of shared learning and growth.

In dissecting Meteseh's journey from a socio-cultural lens, it's evident that the initiative's ripple effects are profound and multifaceted. Multi-stakeholder engagement involving local government, community members, and educational institutions has created a shared sense of ownership and decision-making, promoting trust and mutual understanding. The collaboration extends beyond interaction and has resulted in a culture of cooperative business practices, particularly in the use of solar panels and the Eco-Crowdinvesting system. It's a testament to the power of collective action, the potential of collaborative endeavors, and the profound impact of integrating sustainability, innovation, and community welfare. As Meteseh continues on this trajectory, it's poised to become a model community, illustrating the harmonious confluence of economic progress, environmental stewardship, and socio-cultural enrichment. The initiative's success is not limited to economic and environmental benefits but extends to fostering a collaborative culture within the community.

Meteseh stands as a testament to how localized interventions, guided by broader policy directions and innovative solutions, can reshape the socio-economic landscape. The community's discernment, as manifested in the survey as shown in Table 2, reflects a blend of optimism, pragmatism, and a dash of caution. It's an invitation for the key stakeholders to not only invest in these initiatives but also to ensure that they are buttressed by skill development, training, and community engagement to actualize the full employment potential of these interventions. The community’s belief that these

services will be pivotal in job creation emphasizes the intertwined nature of sustainable solutions and socio-economic betterment.

Table 3 offers insights into how the Meteseh community perceives the impacts of the community service program and the establishment of solar panels on production capacity. The Meteseh community appears to have widely embraced the community service program and solar panels, seeing them as pivotal in increasing production capacity. The unanimous or near-unanimous positive responses highlight how community-centered projects, when executed effectively, can have profound and universally recognized impacts. One area to potentially explore further would be to understand the reasons behind the 10% who didn't see benefits in product diversification. This could provide insights into potential areas of improvement or highlight specific challenges faced by a subsection of the community. Furthermore, the evident success of the solar panels in enhancing electrical capacity presents a compelling case for the expansion of such renewable initiatives. Not only do they offer environmental benefits, but as this survey indicates, they directly contribute to the community's productivity and self-sufficiency. In conclusion, for the Meteseh community, harnessing these resources and tools effectively could pave the way for a brighter, more sustainable future, where increased production capacity is coupled with innovation and self-reliance.

The Meteseh community appears to be forward-thinking and receptive to modern methods of income generation, as evidenced in table 4 by their response to the use of solar panels and eco-crowdinvesting. Solar panels are seen as effective income drivers by all respondents, highlighting their potential for revenue generation. Business profitability is positively correlated with solar panels, although a small fraction of respondents may have concerns. Solar technology is perceived as a direct income source for administrators, indicating potential job roles related to solar panel maintenance and administration. Eco-crowdinvesting is recognized for enhancing brand visibility and facilitating financial accessibility and capacity growth, with unanimous positive responses. The almost unanimous recognition of these methods as potent income boosters underscores their effectiveness and the potential for wider adoption. However, the slight hesitation, as seen in the 10% response about solar panels increasing business profits, is worth noting. It suggests the need for further community engagement, training, or possibly even infrastructure support to ensure that the full financial benefits of these innovations are realized. In conclusion, the Meteseh community, through its positive responses, showcases an eagerness to adopt and benefit from modern sustainable and financial practices. The key for continued success will be to address the small reservations and ensure that the entire community can reap the benefits.

Overall, the community service program has resulted in positive social behavior changes, with the community becoming more environmentally conscious, adopting technologies that positively influence their quality of life in the long run. The knowledge shared has equipped the community to advocate for or formulate policies that promote

communal welfare. With a better understanding of their rights and obligations, community members are now more active participants in decision-making processes in their environment. Directly, the service activities have provided economic benefits through reduced energy operational costs, leading to increased SME income.

Conclusion

The global challenges, including the COVID-19 pandemic and climate change, have ushered in a new era where adaptability and resilience are paramount, especially for MSMEs. In Kelurahan Meteseh, community service activities have taken a proactive approach to navigate these challenges, emphasizing renewable energy, financial access, and sustainability. The tangible benefits of these initiatives, from employment creation to enhanced production capacity, are evident. Further, the attitudinal shift in SMEs underscores the community's ability to embrace innovation and move towards sustainable practices. Meteseh serves as an emblem of how strategic community interventions can not only drive resilience but also lay the foundation for a sustainable economic future.

The community service program's effectiveness in Meteseh, particularly with respect to technology transfer and training, was assessed via a questionnaire involving twenty MSME respondents.

First, Attitudinal Change. (a) *Achievement*: There was a significant shift in attitude regarding MSME management capabilities, with a 66% positive response to the community service activities. This reflects a move towards better business strategies and practices. (b) *Implication*: While the change is commendable, the 34% non-positive response rate shows there's still room for improvement. Efforts should focus on ongoing education, tailored interventions, and promoting shared growth to bring everyone on board.

Second, Socio-Cultural Perspective: (a) *Achievement*: Meteseh's use of solar panels and the Eco-Crowdinvesting system resulted in increased collaboration among government bodies, SMEs, and educational institutions. This promotes a culture of innovation and sustainability. (b) *Implication*: The socio-cultural impact is vast and shows the potential of collaborative endeavors. As Meteseh progresses in this direction, it can serve as a model for community growth that integrates economic, environmental, and cultural elements.

Economic Perspective: (1) Increase in Employment: (a) *Achievement*: Meteseh has successfully showcased how technological and sustainable advancements can boost employment opportunities, especially with the integration of solar panels and Eco-Crowdinvesting. (b) *Implication*: The survey indicates that while there's optimism, there's also a need for skill development, training, and community engagement to fully

realize the employment benefits of these initiatives. (2) Increase in Production Capacity: (a) *Achievement*: 98% of respondents saw the benefits of the community service program and solar panels in amplifying production capacity. (b) *Implication*: With such overwhelming positive feedback, the focus should perhaps shift to understanding the reservations of the 2% who disagreed. The success of the solar panels suggests potential for expanding such green initiatives. (3) Income Generation: (a) *Achievement*: A staggering 98% of the community acknowledges the income-generating potential of the solar panels and eco-crowdinvesting. (b) *Implication*: The 2% that were reserved about the profit potential of these tools signal an area to delve deeper. It's crucial to ensure that everyone in the community can capitalize on the financial benefits of these innovations.

The community service program in Meteseh has fostered positive behavioral changes, making the community more environmentally conscious and proactive in their decision-making processes. Direct economic benefits were also evident, as reduced operational costs led to increased SME income. The program's success sets a precedent for other regions to follow, integrating community upliftment, technology adoption, and sustainable practices for a brighter future. Outcomes from this community service initiative include: (a) Creation of new employment opportunities in solar panel management, (b) SMEs have effectively boosted their production capacity, (c) There’s an emergence of a cooperative culture and increased environmental awareness among SMEs.

Recommendations for future community service activities are as follows.

Firs, Invest in Renewable Energy: Given the evident success and potential of solar panels in Meteseh, there should be an ongoing commitment to invest in and expand renewable energy infrastructure. This would not only ensure consistent energy supply but also help in mitigating the effects of climate change.

Second, Facilitate Financial Access: To foster the growth of SMEs, it's crucial to forge strong collaborations with financial institutions and potential investors. By easing access to capital, SMEs can innovate, scale, and contribute more effectively to the local economy.

Third, Strengthen Stakeholder Cooperation: The success in Meteseh is largely attributable to collaborative efforts. Thus, enhancing cooperation between SMEs, local governments, educational bodies, and other stakeholders is pivotal. This collaborative approach will support the continuous growth and evolution of sustainable and eco-friendly SMEs.

Fourth, Periodic Assessment and Adjustment: The dynamism of the global economic landscape necessitates periodic evaluations of community service programs. This will help in identifying areas of improvement, adjusting strategies, and ensuring that the initiatives remain relevant and impactful. Feedback mechanisms, like the questionnaire survey used, should be employed regularly to gauge community sentiment, and gather

actionable insights.

Fifth, Continued Education and Training: Addressing the 34% non-positive response rate on attitudinal change calls for a continuous commitment to education and training. Tailored interventions should be designed to bring everyone on board, ensuring that the entire community benefits from the knowledge and resources available.

Sixth, Expand Green Initiatives: The successful implementation of solar panels should be taken as a cue to explore other sustainable technologies and practices. This could range from water conservation projects to waste management solutions, all aimed at creating a more sustainable and eco-friendly community.

In essence, the path forward for Meteseh lies in leveraging the successes of the past, being adaptable, and focusing on collaborations, sustainability, and inclusivity. By doing so, the community can navigate the complexities of the global landscape and ensure a prosperous and sustainable future for all its members. Furthermore, it's vital to periodically assess and adjust the community service programs as necessary, making improvements to guarantee the initiative's sustainability and its long-term positive impact on both MSMEs and the local community.

Acknowledgements

The authors would like to express gratitude to the Directorate General of Vocational Education of the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek), the Regional Development Planning Agency (BAPPEDA) of Semarang City, Tembalang District, and Meteseh Sub-district. This work was supported in part by the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia under Grant 157/SPK/D.D4/PPK.01.APTV/VI/2023.

References

Akayombokwa, Patrick Sipopa. “Small and Medium Enterprises Strategies for Winning Mining Walden University,” 2021.

Alam, Ashraful, Anna Min Du, Mahfuzur Rahman, Hassan Yazdifar, and Kaleemullah Abbasi. “SMEs Respond to Climate Change: Evidence from Developing Countries.” *Technological Forecasting and Social Change* 185, no. November 2021 (2022): 122087. https://doi.org/10.1016/j.techfore.2022.122087.

Aminullah, Erman, Trina Fizzanty, Nawawi Nawawi, Joko Suryanto, Nika Pranata, Ikbal Maulana, Luthfina Ariyani, et al. *Interactive Components of Digital MSMEs Ecosystem for Inclusive Digital Economy in Indonesia*. *Journal of the Knowledge Economy*, 2022. https://doi.org/10.1007/s13132-022-01086-8.

Ari, Ibrahim, and Muammer Koc. “Philanthropic-Crowdfunding-Partnership: A Proof-of-

Concept Study for Sustainable Financing in Low-Carbon Energy Transitions." *Energy* 222 (2021): 119925. https://doi.org/10.1016/j.energy.2021.119925.

Botelho, D. F., B. H. Dias, L. W. de Oliveira, T. A. Soares, I. Rezende, and T. Sousa. "Innovative Business Models as Drivers for Prosumers Integration - Enablers and Barriers." *Renewable and Sustainable Energy Reviews* 144, no. March (2021): 111057. https://doi.org/10.1016/j.rser.2021.111057.

Cantú, Andrea, Eduardo Aguiñaga, and Carlos Scheel. "Learning from Failure and Success: The Challenges for Circular Economy Implementation in SMEs in an Emerging Economy." *Sustainability (Switzerland)* 13, no. 3 (2021): 1–34. https://doi.org/10.3390/su13031529.

Guo, Hai, Zhuen Yang, Ran Huang, and Anqi Guo. "The Digitalization and Public Crisis Responses of Small and Medium Enterprises: Implications from a COVID-19 Survey." *Frontiers of Business Research in China* 14, no. 1 (2020): 1–25. https://doi.org/10.1186/s11782-020-00087-1.

Hariyanto, Hariyanto, Muhamad Rusdi, and Jayadi Jayadi. "Implementation of Solar-Powered Submersible Pump Technology (PSTSP) to Increase Rainfed Rice Field Production." *Engagement: Jurnal Pengabdian Kepada Masyarakat* 7, no. 1 (2023): 200–210. https://doi.org/10.29062/engagement.v7i1.1096.

Hou, Yongjun, and Zhen Fang. "Unleashing the Mechanism between Small and Medium Enterprises, and Green Financing in China: A Pathway toward Environmental Sustainability and Green Economic Recovery." *Environmental Science and Pollution Research* 30, no. 1 (2023): 1672–85. https://doi.org/10.1007/s11356-022-21448-8.

Jonker, Jan, and Niels Faber. *Organizing for Sustainability*. *Organizing for Sustainability*, 2021. https://doi.org/10.1007/978-3-030-78157-6.

K. M., Mahesh, P. S. Aithal, and Sharma K. R. S. "Impact of Sustainable Finance on MSMEs and Other Companies to Promote Green Growth and Sustainable Development." *International Journal of Applied Engineering and Management Letters*, no. February (2022): 60–76. https://doi.org/10.47992/ijaeml.2581.7000.0120.

Khan, Muhammad Asif, Hammad Riaz, Masood Ahmed, and Abubakr Saeed. "Does Green Finance Really Deliver What Is Expected? An Empirical Perspective." *Borsa Istanbul Review* 22, no. 3 (2022): 586–93. https://doi.org/10.1016/j.bir.2021.07.006.

Kwilinski, Aleksy, and Oleksii Lyulyov. "Spillover Effects of Green Finance on Attaining Sustainable Development : Spatial Durbin Model," 2023.

Masdar, R., Husna, Jurana, R. Amborowatie, L. Meldawaty, Tenripada, M. I. Mursali, and N. Naida. "Implementation of a Sustainable Green Economy in Indonesia: A Literature Review." *IOP Conference Series: Earth and Environmental Science* 1075, no. 1 (2022). https://doi.org/10.1088/1755-1315/1075/1/012056.

Nizar, M, and A Rakhmawati. "Strategy for Strengthening the Economy of Local Communities Through Business Guidance and Assistance in SME Community of Indonesian Student Entrepreneurs …." *… Conference on University Community …*, 2022. https://icon-uce.com/index.php/icon-uce/article/view/60%0Ahttps://icon-uce.com/index.php/icon-uce/article/download/60/70.

Pizzi, Simone, and Leonardo Corbo. "Fintech and Smes Sustainable Business Models: Reflections and Considerations for a Circular Economy." *Baltic Journal of Management* 15, no. 2 (2020): 141–47.

Ranger, Nicola, Olivier Mahul, and Irene Monasterolo. "Managing the Financial Risks of Climate Change and Pandemics: What We Know (and Don't Know)." *One Earth* 4, no. 10 (2021): 1375–85. https://doi.org/10.1016/j.oneear.2021.09.017.

Shlomo, Maital, and Ella Barzani. "The Global Economic Impact of Covid-19: A Summary of Research." *Samuel Neaman Institute for National Policy Research*, no. March 2020 (2020): 1–12. https://www.neaman.org.il/EN/Files/Global Economic Impact of COVID-19_20200322163553.399.pdf.

Yousaf, Zahid, Magdalena Radulescu, Crenguta Ileana Sinisi, Luminita Serbanescu, and Loredana Maria Păunescu. "Towards Sustainable Digital Innovation of Smes from the Developing Countries in the Context of the Digital Economy and Frugal Environment." *Sustainability (Switzerland)* 13, no. 10 (2021): 1–28. https://doi.org/10.3390/su13105715.

Zulkiffli, Siti Nur 'Atikah, Nur Farah Zafira Zaidi, Siti Falindah Padlee, and Najahul Kamilah Aminy Sukri. "Eco-Innovation Capabilities and Sustainable Business Performance during the COVID-19 Pandemic." *Sustainability (Switzerland)* 14, no. 13 (2022). https://doi.org/10.3390/su14137525.