NEXUS BETWEEN RENEWABLE ENERGY EFFICIENCY, FINANCIAL LITERACY, AND GREEN MICROFINANCE: THE CASE OF WOMEN MICROFINANCE GROUP

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Abstract

This study aims to investigate the role of financial literacy in green microfinance investment in women's microfinance groups. It considers renewable energy efficiency and financial literacy as factors that influence green microfinance. The study's main goal is to examine the direct and indirect relationships among these three factors. The findings suggest that a pro-climate (SDG 13) policy in response to energy efficiency (SDG 7) is supported by pro-local knowledge-based financial inclusion (SDG 4). Energy efficiency, climate action, and local knowledge-based financial inclusion are seen as policy options to reduce poverty in rural areas in East Sumba.

Keywords: women microfinance group, green microfinance, renewable energy efficiency, financial literacy, PLS-SEM

JEL: C12, L26

1. Introduction

There has been quite a bit of recent scholarly effort aiming to understand green microfinance. Green microfinance is a sustainable system of supporting low-income people in rural areas financially to have an opportunity for economic activity. The rural area lacks the infrastructure to run a general business, and poverty keeps people from the idea of starting a business (Atahau *et al.*, 2021). Natural resources around them would be the only resource they could make use of for business (Atahau *et al.*, 2021). In that sense, green microfinance would be a solution for the villagers to get into an economic activity (Atahau *et al.*, 2021). Green microfinance is set out of consideration for its natural environmental surroundings. There are diverse ways to make use of natural resources. However, the term green in green microfinance shows that it goes for sustainability. A rural area has its local wisdom built for a long time. It has taken root in its society and affected all practices (Atahau *et al.*, 2020; Purnamawati & Adnyani, 2020). Each local area has its wisdom. Local wisdom has served as the best guidance for living in each area (Pramitasari & Harjanto, 2022), because local wisdom is the refined idea generated by ancestors' trials and errors. It shows how well rural people make use of the resources around them (Bardy *et al.*, 2018). From the context, managerial practices of microfinance in a rural area require a different approach from that in an urban area, even from the approach used in other rural areas. Rural people would need to come up with resources that serve as capital before their idea gets to microfinancing. They could find economic value and develop potential in natural resources around them. Local wisdom rooted in the rural area would guide them in sustainably using natural resources. It explains well why green microfinance has become an emerging issue in rural areas. This study focuses on the role of financial literacy in the relationship between renewable energy efficiency and green microfinance. Financial literacy is knowledge applied to making financial decisions (Golubić & Huertas, 2021). Understanding financing generally enables people to find an economic chance. It helps develop one's ability to look at the profit-making opportunity of capital one has. That comes to the linkage between financial literacy and green microfinance. This study has renewable energy efficiency and financial literacy as managerial factors for green microfinance. Energy efficiency includes how to consume as little energy as possible in producing economic output (Drago & Gatto, 2022). It also gets to reducing greenhouse gas emissions (Drago & Gatto, 2022; Liu *et al.*, 2021). Energy efficiency in a rural area achieves renewable energy. Green microfinance offers rural people a fund to develop facilities to generate clean energy from natural resources around them. This study surveys East Sumba, whose people collect water

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power to produce electricity. Sample collecting targets the women microfinance group Tapa Walla Badi in Mbatakapidu Village. This study first sets a connection between green microfinance, renewable energy efficiency, and financial literacy. When rural people consider generating energy sources from natural resources around them for their business, the idea would be accelerated by green microfinance. Financial literacy increases financial inclusion, and it easily relates rural people to green microfinance (Bongomin *et al.*, 2020). From the relationship, this study proposes the mediating role of financial literacy between renewable energy efficiency and green microfinance. This study aims to identify direct and indirect relationships between renewable energy efficiency, financial literacy, and green microfinance. The United Nations has promoted energy efficiency with SDG-7 (affordable and clean energy), and many countries have paid considerable attention to affordable and sustainable energy (Liu *et al.*, 2021). In this trend, this study will give insights into managing green microfinance in rural areas.

2. Literature Review and Hypothesis Development

Microfinance is the system that offers low-income people a fund to get access to sources available for their business (Allet & Hudon, 2015). Green microfinance imparts sustainability to microfinance (Allet & Hudon, 2015). In recent years the terminology of green microfinance has been given considerable scholarly attention with an emphasis on sustainability (Huybrechs *et al.*, 2019). Green microfinance has shown a sort of paradigm of managing business with sustainability (Huybrechs *et al.*, 2019). Microfinance is built in consideration of people far from easy to get a fund through a general banking system (Huybrechs *et al.*, 2019). Green microfinance embodies the uptake of surroundings in an eco-friendly way in addition to its general microfinancing management (Huybrechs *et al.*, 2019). Green microfinance not only supports a sustainable business but also drives microfinance clients to sustainable decision-making (Huybrechs *et al.*, 2019). Abid and Kacem (2018) found that green microfinance lessens the negative impact of abuse of natural resources. There are several necessary factors in running green microfinance. Bakteeva and van der Straeten (2015) found that energy efficiency has a positive effect on green microfinance. Energy efficiency is to produce more output by using less energy (Rácz, 2012). It also gets to reducing greenhouse gas emissions (Liu *et al.*, 2021). Drago and Gatto (2022) noted that energy efficiency has a substantial impact on cost savings and the environment. It shows that a high level of energy efficiency brings more green and profitable business (Drago & Gatto, 2022). A rural area achieves energy efficiency by generating power from renewable sources such as water, wind, and sunlight. Atahau *et al.* (2021) found that renewable energy efficiency boosts green microfinance in rural areas. Generally, people in rural areas lack financial support to build equipment for generating energy sources, and the consequence causes an inefficient and unsustainable use of natural resources around them (Bakteeva & van der Straeten, 2015). In that context, green microfinance facilitates sustainable energy use (Bakteeva & van der Straeten, 2015). A sustainable energy use gives rise to an economic potential. Insulation for heating brings several benefits at the household level in Kyrgyzstan (Bakteeva & van der Straeten, 2015). The insulation system prevents people from cold and keeps them warm, and it enables people to do more economic activity at home (Bakteeva & van der Straeten, 2015). Some rural areas have no access to financial resources to install equipment to use energy sources, even though those places have great potential to generate solar energy (Abikoye, 2022). The energy would impart many business chances to rural people only if they get access to financial resource (Abikoye, 2022). The conception brings people to green microfinance. Rouf (2012) proved that green microfinance facilitates micro-business. It suggests that green microfinance casts itself in the role of giving people in financial difficulty a chance to embody their sustainable business concepts (Rouf, 2012). People equipped with proper equipment for operating energy benefit from the energy efficiency that the operation gives (Bakteeva & van der Straeten, 2015). Green microfinance loans people capital to install sustainable energy-generating equipment, and energy self-sufficiency lends support to run economic activities (Bakteeva &

van der Straeten, 2015). At the same time, those business activities lead people to expect income to repay the loan. It suggests that there is a correlation between renewable energy efficiency and green microfinance. Green microfinance is a system to afford people a financial ground to do something (Bashar & Rashid, 2012). It allows diverse activities including installing equipment for energy generation (Bashar & Rashid, 2012). Generally, not until one has access to related financial information, would it be easy to have an idea of getting financial support from a related microfinancing system (Bashar & Rashid, 2012; Bongomin *et al.*, 2020). Viewed in this light, financial literacy serves as a linchpin in the connection between renewable energy efficiency and green microfinance. Financial inclusion from financial literacy leads to a sustainable business model envisioned in mind to reality. Bongomin *et al.* (2020) observed that financial literacy exerts a positive effect on microfinance in rural areas by increasing financial inclusion. Bashar and Rashid (2012) noted that people in urban areas have more access to financial information and related services and that it affords those people an economic chance. People in rural areas relatively have difficulty getting financial information and related services. It comes to the disparity in the level of economic activity between a rural area and an urban area (Bashar & Rashid, 2012). Given this perception, it is clear that there is a link between financial literacy and green microfinance. Brent and Ward (2018) demonstrated that there is a relationship between energy efficiency and financial literacy. They observed that those who have access to financial services are more likely to invest money to increase energy efficiency (Brent & Ward, 2018). A better understanding of financial capital management determines the practicability of energy self-sufficient initiatives (Boogen *et al.*, 2021; Brent & Ward, 2018; Filippini *et al.*, 2020; Kalmi *et al.*, 2021). Boogen *et al.* (2021) exhibited that energy-related financial literacy takes on an important role in materializing energy efficiency. Also, the demand for energy efficiency generates people's energy-related financial inclusion. The desire to achieve energy efficiency equips people with the willingness to obtain related information and resources to realize it. And the willingness to get financial resources for materializing energy efficiency schemes leads people to a higher level of financial literacy. Given the foregoing discussion, this study sets three hypotheses as follows:

H1: Renewable energy efficiency positively affects green microfinance.
H2: Renewable energy efficiency positively affects financial literacy.
H3: Financial literacy positively affects green microfinance.

The conceptual structure of the three hypotheses suggests a mediating role of financial literacy in the relationship between renewable energy efficiency and green microfinance. The practicability of energy efficiency is dictated by related equipment. However, people in unprivileged rural areas have difficulty even in getting access to loans for installing necessary equipment, and the consequence hampers achieving energy efficiency out of energy self-sufficiency (Bakteeva & van der Straeten, 2015). Given that financial inclusion gains credit for materializing energy initiatives, this study sets a hypothesis as follows:

H4: Financial literacy mediates the relationship between renewable energy efficiency and green microfinance.

3. Methodology

Sumba Island is one of the frontier, outermost, and least developed regions in Indonesia. East Sumba's government plans to build a hydroelectric power plant as a part of a renewable energy project from the Sumba iconic island scheme (Atahau *et al.*, 2021). Sumba iconic island is a joint program between several domestic (e.g., the Ministry of Energy and Mineral Resources, the State Electricity Company, and the local government) and foreign partners (e.g., Hivos, NGO, and the Asian Development Bank) (Wen *et al.*, 2022). This study employs purposive sampling to collect samples at the women's microfinance group Tapa Walla Badi in Mbatakapidu Village (East Sumba, Indonesia). From November to December 2022, we conducted a survey using questionnaires. Statistical power and pointing arrows are used to verify the sample size of 200

respondents for the analysis. Statistical power and pointing arrows are important factors in determining the sample size (Cohen, 1992). The minimum sample size with a statistical power of 80% and seven pointing arrows (R2 value is at least 0.5; probability of error is 5%) is 51. The sample size is decided based on a standard sample size for the PLS-SEM. This study employs PLS-SEM to test path hypotheses. The SmartPLS 3 software is used for the analysis. The study conducts a Hayes-type analysis to examine indirect effects (Hayes, 2013). The methodology is related to the bootstrap technique. Bootstrapping is to process of creating many subsamples with existing samples (at least 500 subsamples). It is processed until 5,000 subsamples are created. PLS-SEM first defines constructs. This process lays the groundwork for designing individual indicators. Each indicator is measured with the five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). Each indicator is set to be capable of representing a corresponding latent construct in Table 1.

Table 1. *Construct and Indicator*

Construct	Code	Indicator
Renewable energy efficiency	EE1	MFIs allocate funds according to members' needs in managing local energy resources.
	EE2	MFIs apply management principles based on local culture to manage local energy resources.
	EE3	MFIs have adequate access to improve their members' economic welfare in managing local energy resources.
	EE4	MFIs have adequate access to different fund sources for managing local energy resources.
	EE5	MFI activities are beneficial for improving the economic status of their members in managing local energy resources.
	EE6	MFIs have a skilled management team in managing local energy resources.
Green Microfinance	GM1	MFIs offer soft loans for eco-friendly businesses.
	GM2	Live pharmacy is encouraged by MFIs.
	GM3	MFI members follow the principle of affordability by performing tasks efficiently.
	GM4	MFIs help to reduce grassland and forest fires.
	GM5	In MFIs, utensils are used repeatedly.
	GM6	MFIs have a recycling policy.
Financial Literacy	FL1	My business will benefit from a low-interest loan.
	FL2	It is necessary to set up funds for unplanned expenses.
	FL3	Purchasing life insurance will protect you from the risks of accidents and other disasters.
	FL4	The debit side records incoming funds, while the credit side records outgoing funds.
	FL5	Making a financial budget is important for determining funding priorities.
	FL6	Saving money in a variety of assets reduces the risk of losing money.

Source: Authors' own work

Based on the constructs and indicators formulated, this study develops a research framework as follows:

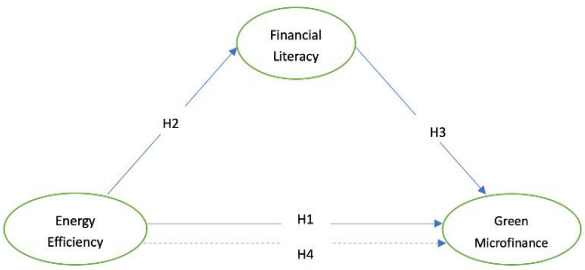

Figure 1. *Research Framework*
Source: Authors' own work

Figure 1 illustrates the relationship among the constructs. It also shows each relationship corresponding to each hypothesis. The arrow relating renewable energy efficiency to green microfinance comes to H1. Likewise, H2, H3, and H4 are identified. Therefore, three equations were derived from the simple mediation framework as follows (Rijnhart *et al.*, 2017):

$$Green_i = \alpha_1 + cEnergy_i + \varepsilon_i \quad (1)$$
$$Literacy_i = \alpha_2 + aEnergy_i + \varepsilon_i \quad (2)$$
$$Green_i = \alpha_3 + c'Energy_i + bLiteracy_i + \varepsilon_i \quad (3)$$

The data is analyzed in two steps. The first step is to estimate reflective model measurement. In the reflective measurement model, the constructs are examined with internal consistency, convergent validity, and discriminant validity. Internal consistency is measured by Cronbach's alpha, composite reliability, and rho_A. Convergent validity is measured by the average variance extracted and indicator reliability. Then, discriminant validity is measured by the heterotrait-monotrait ratio of correlation (HTMT). Cronbach's alpha level of greater than 0.7 is typically considered acceptable (Taber, 2017). A composite reliability value of higher than 0.7 indicates that internal consistency exists (Fornell & Larcker, 1981). Rho_A value of more than 0.7 represents acceptable internal consistency. An AVE of 0.5 or higher suggests an adequate convergence. Outer loadings assess individual indicator reliability. A value of greater than 0.6 is considered reliable. An HTMT value close to 1 means a lack of discriminant validity (Zmnako & Chalabi, 2019). After the reflective measurement model is examined, it shifts focus to build a specific model. It involves assessing the overall model fit and path between constructs. The Goodness-of-Fit index of the structural model is checked to compare the effects of structural model relationships (Cifci, 2021). The second step is to test the direct and indirect effects of financial literacy, renewable energy efficiency, and green microfinance. A diagram of the overall procedure would be also very useful to present the way of thinking about PLS-SEM. To sum it up, we provide an overall description of the followed procedure in PLS-SEM. Figure 2 below is important to provide an overview of our work.

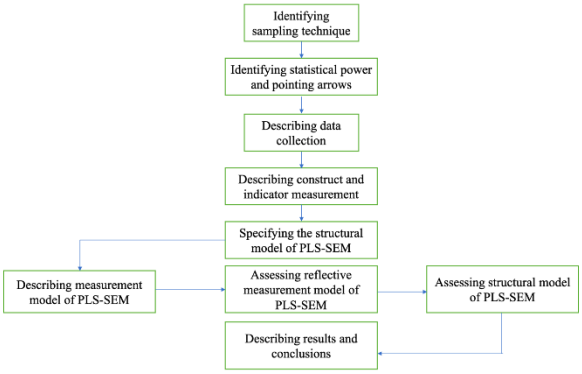

Figure 2. *Procedure for Applying PLS-SEM*
Source: Authors' own work

4. Empirical Analysis

4.1 Statistical Description

Statistical description consists of several demographic variables, such as age, gender, education, occupation, and income. All information related to demographic characteristics is described in Table 2.

Table 2. *Demographic Characteristics*

Age	Frequency	%
20-35	85	42.5
36-44	44	22
45-54	27	13.5
55-64	20	10
65+	24	12
Total	200	100
Gender	Frequency	%
Male	99	49.5
Female	101	50.5
Total	200	100
Education	Frequency	%
Did not finish Elementary School	18	9

Elementary School	118	59
Junior High School and equivalent	29	14.5
Senior High School and equivalent	26	13
Diploma / Bachelor Degree	9	4.5
Total	200	100
Occupation	Frequency	%
Teacher	6	3
Housewife	54	27
State Civil Apparatus	1	0.5
Community Leader	1	0.5
Entrepreneur	3	1.5
Farmer	135	67.5
Total	200	100
Income	Frequency	%
≤ IDR 1,000,000	175	87.5
> IDR 1,000,000 – 5,000,000	18	9
> IDR 5,000,000	7	3.5
Total	200	100

Source: Authors' own work

Table 2 shows that most respondents have a small income and a low level of education. The majority of the respondents were 20-35 years old. And most respondents were working as farmers.

4.2 Reflective Measurement Results

The indicator reliability of financial literacy (FL6) was deleted from the reflective measurement model in the first step because the outer loading value is smaller than 0.6 in the first stage. The outer loading values are all greater than 0.6 after FL6 was removed from the model. Table 3 describes reflective measurement results.

Table 3. *Reflective Measurement Model*

Model	1st OL	2nd OL	Rho_A	Alpha	Compo-site	AVE
EE1 ← Energy	0.743					
EE2 ← Energy	0.675					
EE3 ← Energy	0.785					
EE4 ← Energy	0.802		0.858	0.852	0.890	0.576
EE5 ← Energy	0.795					
EE6 ← Energy	0.746					
FL1 ← Literacy	0.749					
FL2 ← Literacy	0.819					
FL3 ← Literacy	0.770					
FL4 ← Literacy	0.807		0.860	0.858	0.898	0.639
FL5 ← Literacy	0.847					
FL6 ← Literacy	-					
GM1 ← Green	0.652					
GM2 ← Green	0.741					
GM3 ← Green	0.867					
GM4 ← Green	0.819		0.871	0.865	0.900	0.602
GM5 ← Green	0.850					
GM6 ← Green	0.701					

Source: Authors' own work

All three metrics (Cronbach's alpha, rho_A, and composite reliability) are greater than 0.7. An AVE value is greater than 0.5, and it proves convergent validity. This indicates that convergent validity and discriminant validity of indicators are supported by their reliability. The HTMT result is also supported by empirical results as follows:

Table 4. Heterotrait-Monotrait ratio of correlation (HTMT)

Ratio	β	Bias	2.5%	97.5%
Green → Energy	0.889	-0.003	0.807	0.951
Literacy → Energy	0.683	0.002	0.533	0.808
Literacy → Green	0.855	0.009	0.736	0.949

Source: Authors' own work

The discriminant validity is supported by the HTMT correlation ratio because it is smaller than 1. The square root of AVE multiplied by R squared was used to generate the Goodness of Fit index. The coefficient of determination is represented by constructs of financial literacy (0.349) and green microfinance (0.723).

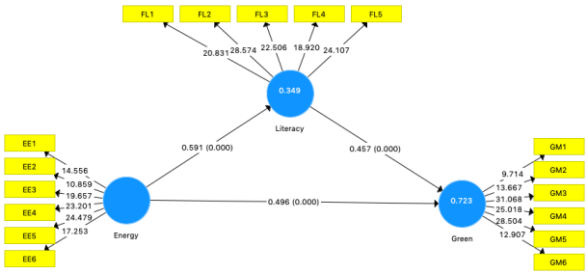

Figure 3. *Variance Based PLS-SEM Outcome*
Source: Authors' own work

Table 5. *Goodness of Fit Index*

Construct	R^2	AVE	$= \sqrt{\text{AVE X } R^2}$
Energy	-	0.576	-
Green	0.723	0.602	-
Literacy	0.349	0.639	-
Average	0.536	0.606	0.570

Source: Authors' own work

A Goodness-of-Fit index of 0.570 shows that the model is well-fitted and has a strong predictive power. Around 5,000 bootstrap subsamples were utilized to evaluate the hypotheses through a bootstrapping approach with Confidence Intervals Bias Corrected (CIBC).

$$\widehat{\text{Green}} = 0.496\text{Energy} \quad (4)$$

$$\widehat{\text{Literacy}} = 0.591\text{Energy} \quad (5)$$

$$\widehat{\text{Green}} = 0.270\text{Energy} + 0.457\text{Literacy} \quad (6)$$

Table 6. *Hypothesis Testing (Direct Effects)*

Hypothesis	β	t-stat.	Bootstrapping			Conclusion
			Bias	Lower	Upper	
Energy → Green	0.496	4.872***	-0.017	0.312	0.682	Accepted
Energy → Literacy	0.591	10.561***	0.005	0.466	0.687	Accepted
Literacy → Green	0.457	4.866***	0.018	0.269	0.623	Accepted

Note: *** p < 0.001 level of significance.

Source: Authors' own work

Based on Table 6, renewable energy efficiency positively influences green microfinance (β1 = 0.496; p < 0.001). Renewable energy efficiency also positively influences financial literacy (β2 = 0.591; p < 0.001). Then, financial literacy positively influences green microfinance (β3 = 0.457; p < 0.001). The direct effects are all supported.

Table 7. Hypothesis Testing (Indirect Effects)

Hypothesis	β	t-stat.	Bootstrapping			Conclusion
			Bias	Lower	Upper	
Energy → Literacy → Green	0.270	3.947***	0.014	0.153	0.402	Accepted
Sobel Test	Test. stat	Std. dev.	p-value			
Energy → Literacy → Green	4.416	0.061	0.000			Accepted

Note: *** p < 0.001 level of significance.

Source: Authors' own work

From the proposed model, financial literacy has an indirect effect on renewable energy efficiency and green microfinance. The indirect effect is consistent with the predicted hypothesis (β4 = 0.270; p < 0.001). The Sobel test also backs up the claim that financial literacy mediates the relationship between renewable energy efficiency and green microfinance (Test. stat = 4.416; p < 0.001).

5. Discussion

We investigated the mediation role of financial literacy in the relationship between renewable energy efficiency and green microfinance. Our empirical results show that the mediation model is a good estimator in explaining the relationship. This claim is supported by our empirical findings from the estimation (Table 6 and 7). According to our findings, renewable energy efficiency and financial literacy all have a significant impact on green microfinance initiatives. Based on the mediation tests, financial literacy has a mediation effect on the relationship between renewable energy efficiency and green microfinance in microfinance groups in Sumba island. Many rural areas have traditionally produced energy sources for living in a way of consuming the natural environment around them and the lack of knowledge may have prevented the utilization of resources in a more productive way. Not until the concept of renewable energy efficiency is built in mind, would people think of its practicability. The process of thinking would bring them to green microfinance. Financial literacy would serve as a linkage in the process of searching for a way of embodying their idea of realizing energy self-sufficiency. This study researched a mediating role of financial literacy targeting the women microfinance group Tapa Walla Badi in Mbatakapidu Village. The group supports capital to build the facility of producing energy from water power. It would be challenging for rural people living in an isolated and remote place such as Sumba to obtain a stable energy source from a systematically allocated power grid. The lack of a systematic power grid often causes power cuts. The stable supply of electricity is conditional upon a well-equipped power grid network. In that context, regional power generation from natural resources is the solution for a stable energy source. Local electrification backed by green microfinance also brings some positive changes (women's empowerment) to the community. It makes domestic activities efficient and gives some

activities precluded by energy limitation possibilities. Our study shows a clear system for vitalizing green microfinance. The combination of abundant natural resources and ideas of sustainable energy use conceptualizes renewable energy efficiency. But materializing the concept needs capital. Green microfinance is a tool for the financial need. Financial literacy paves the way for the connection between green efficiency and green microfinance. Capital from green microfinance enables the building of sustainable electricity facilities. It contributes to a stable energy supply in rural areas. The stability in energy supply gives access to business chances and it also saves labor for generating traditional energy sources in rural households. It gives women extra time to engage in productive activities to make a profit. Ultimately, it contributes to economic development in rural areas. Our results are consistent with the first hypothesis which states that promoting energy efficiency speeds up green microfinance initiatives. According to Atahau *et al.* (2021), the availability of renewable energy facilitates the formation of green Microfinance institutions (MFIs). Access to renewable energy technology and energy-saving equipment is expected from energy-efficient microcredits. Some countries have operated renewable energy systems (solar systems, wind energy, and hydropower). In East Sumba, green loans are given in a variety of ways including waste banks, water pumps, micro-hydropower plants, and biogas equipment (Atahau *et al.*, 2021). In addition, the majority of MFIs accept biogas as collateral for loans. Accordingly, MFIs modify their operations to be climate-friendly MFIs. To achieve sustainability, MFIs promote the 3 Rs (Reduce, Reuse, Recycle). Indigenous people of Tapa Walla Badi have a variety of options to get renewable energy in the indigenous territory. Through the Tapa Walla Badi women's microfinance group, renewable energy has an impact on Mbatakapidu village both socially and economically. The lives of individuals are strongly affected by renewable energy (cooking, heating, and lighting). Energy access is generally quantified by binary metrics of whether a household has access to energy sources. When electricity cost is established, a household that has access to electricity only in the evening might be classified as the same category of household available for continuous electricity supply that can run high-wattage appliances like televisions and refrigerators 24 hours a day. Investment planning in power infrastructure is necessary to establish business models and to address issues of social equity related to energy, policy officials, energy firms, and stakeholders. Stakeholders need to know what type of electricity households choose to purchase in Sumba island. The SDG7 can be achieved in Sumba Island and other developing countries by improving energy access, and a deeper knowledge of households' preferences for higher-quality electricity supply could be useful information for future efforts in this region (Wen *et al.*, 2022). Domestic industry uses renewable energy as an important raw material. It shows that renewable energy works as an essential economic source. Renewable energy needs to be affordable and reliable. Accessibility to energy increases household productivity. In this light, renewable energy efficiency by green MFIs increases household productivity. Green MFI is a soft loan that allows the organization to support its economic growth in an environmentally friendly manner (Rouf, 2012). Interestingly, Mbatakapidu people think that using renewable energy prevents carbon emissions and that it supports energy production. They increase the efficiency of wind, solar, biomass, geothermal, and hydroelectric energy in this regard. An increase in the ability to use renewable energy prompts MFIs to convert themselves to green MFIs. At the same time, it shows how the green loan requirement motivates participants to create a green business (Atahau *et al.*, 2021). The microfinance participants in Sumba experience the indigenous knowledge (Marapu) value in their daily activities to increase their green business ideas. Marapu is the Sumbanese's local wisdom for managing an economic life in harmony with a natural and social environment (Triple Bottom Line). We also found that renewable energy efficiency has a positive and significant impact on financial literacy. Our study contributes to the increasing body of literature by examining how renewable energy efficiency affects green microfinance on sustainability. Energy-related financial literacy has a significant role in the realization of energy efficiency (Boogen *et al.*, 2021). The demand for energy efficiency brings

people to financial inclusion in the energy sector. Marapu backed by energy efficiency gives rise to their level of financial literacy. The presence of Marapu catalyzes environmental harmony.

The following three key elements are necessary for survival in a dry area with a scarce natural resource: First, nature must be always conserved; Second, resources should be efficiently used; Third, resources should be fairly used (Huruta & Kurniasari, 2018). With the tacit rules related to energy efficiency (protect springs, anti-illegal logging, etc.), people have learned it from their local wisdom and used it to improve their financial capacity. To improve their understanding of finances, they incorporate the Marapu idea into their regular routines (e.g., Hillu Kandutuku and Rotu Padang). The Marapu idea would be characterized as Sumbanese traditional knowledge for governing economic life in harmony with the environment (Lee & Huruta, 2022). An eco-friendly business model has been considered a good solution in the financial industry. This trend has worked as momentum for the development of green microfinance (MFIs).

The current study demonstrates the relationship between sufficient financial literacy and the probability of obtaining microfinance services. Building role-based local financial literacy is an alternative strategy for sustainable green microfinance. Gender-targeted programs in pro-literacy policies should be taken into account to ensure the viability of green microfinance (Lee & Huruta, 2022).

6. Conclusion

This study observed a mediating role of financial literacy in the relation of renewable energy efficiency to green microfinance. The finding shows that financial literacy catalyzes green microfinance. This study confirmed that renewable energy efficiency acquired by energy self-sufficiency in a rural area is positively linked to green microfinance. It is uncontested that the probability of producing clean energy sources from their surroundings leads to business chances in a rural area.

The daily lives of the Sumbanese people are significantly influenced by Marapu beliefs (local wisdom). This idea has served as the foundation for Sumba's tradition. The women microfinance groups in Tapa Walla Badi have proved that a combination of financial education and energy efficiency goes for promoting green MFIs. To eliminate poverty in rural areas in East Sumba, energy efficiency (SDG 7), climate action (SDG 13), and local knowledge-based financial inclusion (SDG 4) have been recognized as policy alternatives. The government, general public, non-governmental groups, university social responsibility, and corporate social responsibility all serve as important terms in the penta-helix village model. This study shows a mechanism between renewable energy efficiency, green microfinance, and financial literacy in East Sumba. The mechanism is set against the background of local wisdom in the area. Green microfinance supports a business whose model is committed to sustainability. In the area which lacks general capital to build a business, natural elements become capital. Local wisdom tells rural people in the area how to make energy without compromising the environment.

Natural energy serves as power for running their business. The sustainable operation for energy generating helps businesses save cost of paying for power. Environmental management fits the purpose that green microfinance pursues. It gets those business owners access to green microfinance. Financial literacy expedites the process. Financial literacy enables people to get familiar with financial information.

This study confirms the mediating role of financial literacy in the relation of renewable energy efficiency to green microfinance. In that sense, governmental administrators and policymakers design policies to raise levels of financial literacy. At the same time, local governmental offices put forward local activities to promote the economic benefits of the local green microfinance system. Both efforts contribute to economic development in East Sumba. The current study provides an initial contribution to the literature on green microfinance, but it requires further refinement.

To gain a better understanding of financial literacy, future studies need to refine the classification of respondent characteristics, including identity requirements, amounts of money, minimum balances, time deposits, simple interest, compound interest, loan interest, price discounts, inflation, time value of money, and money illusions. Our study demonstrated the workings of financial literacy while also showing how renewable energy efficiency supports green microfinance. More research is necessary to explore the role of local wisdom in green microfinance in rural areas.

As noted in our study, rural areas have their local wisdom, encapsulating the culture and serving as unbreakable rules that govern society. Local wisdom guides important decisions and dominates the way of life in rural areas. Green microfinancing in rural areas is influenced by local wisdom. Therefore, further study needs to consider local wisdom to fully explain green microfinance in rural areas.

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