

From Traditional to Low-Carbon: Examining the Green Transition of Micro, Small, and Medium Enterprises (MSMEs) in Indonesia

Elimawaty Rombe, Suryadi Hadi*, Muhammad Gunawan, Mukhlas Mansyur,
Roy Irawan Mendi

Department of Management, Tadulako University, Palu, Indonesia

Abstract - *This study examines green practices in micro, small, and medium enterprises (MSMEs) across the food processing, handicrafts, food and beverage, and fruit retail sectors. The results of the qualitative data analysis obtained from the ten informants produced five main themes, namely the adoption of green practices, market and consumer demand, financial and resource constraints, environmental regulations and policies, and knowledge and skills. This study identifies that MSMEs have a high awareness of waste reduction, energy efficiency, and environmentally friendly marketing. The main obstacles they face are that the cost of environmentally friendly materials is quite high, financing sources are still limited, and there are no standard regulations. Another obstacle is the wide knowledge gap, which limits the achievement of implementation. This study shows that policy support is vital, followed by simpler financing mechanisms, and there is a need for capacity building for MSMEs that provide opportunities for the integration of sustainability in their business practices.*

Keywords-low-carbon transition, MSMEs, Indonesia, green practices, thematic analysis

I. INTRODUCTION

The global climate has undergone significant changes in the last two decades, accompanied by a decline in environmental quality. In the global context, countries in the world are currently trying to find the right strategy to shift conventional production and consumption patterns towards a more sustainable direction. Changes in low-carbon economic activities are an important part of government planning and must be carried out by all parties, including business actors and civil society[1]. In addition to medium and large industries, the government must also focus on Micro, Small, and Medium Enterprises (MSMEs). This level of business represents approximately 99% of business

units and contributes significantly to employment and GDP [2].

In aggregate, MSMEs produce a fundamental environmental footprint, such as waste generation, and the use of non-renewable materials [3]. Many of these companies operate using a linear business model that prioritizes low-cost, informal practices over practicing sustainability principles [4]. Their carbon emission contribution is low, but the impact they generate in general is significant. To meet the climate trajectory set out in the ENDC document and the Net Zero Emissions 2060 roadmap, MSMEs are an important sector for Indonesia[5].

The green transition can be defined as the process by which companies adopt environmentally friendly technologies, practices, and values that can potentially increase productivity, reduce waste, increase resilience, and unlock access to green markets [6]. The conclusion of the study shows that MSMEs face several structural, financial, and information barriers. These barriers significantly affect their ability to engage in this transition effectively [7]. Several scientific articles have concluded that some of the challenges include a lack of access to financial institutions, limited technical knowledge, a lack of supportive policies, and low awareness of sustainability standards [5].

In the Indonesian context, the next challenge faced in focusing the role of MSMEs during this economic transition period is geographical disparities, uneven infrastructure, and informal economies in many regions still dominate[8]. Meanwhile, various initiatives and NGOs have sought to introduce green business practices among MSMEs in the aspects of eco-labeling, green financing, and sustainability certification [9]. However, the absorption rate of this initiation remains limited and uneven. The results of the empirical study show that MSMEs in Indonesia have not been fully active in practicing the low-carbon transition [10].

Based on the results of the previous study, this study was conducted to explore the experience of MSMEs qualitatively in the transition from traditional practices to low-carbon practices. A common question

*Corresponding author. Email:suryadihadi@untad.ac.id

of this study is how understanding MSMEs in Indonesia and their involvement in the transition to low-carbon operations are, and what factors facilitate or hinder this process. The purpose of this study was to understand the narratives, motivations, constraints, and drivers felt among small business owners who have started or are considering engaging in green practices. This study involved ten MSMEs from various sectors such as food processing, handicrafts, and services. This study used thematic analysis on interview data. The contribution produced by this study is an in-depth understanding of the meaning of sustainability at the MSME level in Indonesia. Furthermore, the forms of support are strategic to be implemented to advance an inclusive and sustainable economic transition in Indonesia.

II. LITERATURE REVIEW

A. MSMEs and Their Environmental Impact

Micro, Small, and Medium Enterprises (MSMEs) constitute a critical pillar of Indonesia's economy, making substantial contributions to both employment creation and national gross domestic product (GDP) [11]. Their agility, sectoral diversity, and widespread distribution across urban and rural areas have positioned them as an essential driver of economic resilience [12]. Nevertheless, the same factors that underpin their economic significance also contribute to environmental degradation. Many MSMEs rely on traditional production methods and resource-intensive processes that result in significant waste generation, excessive energy consumption, and pollution of air, water, and soil [13]. Consequently, while MSMEs are indispensable to economic growth, their operations present a notable challenge to Indonesia's environmental sustainability goals.

B. Definition and Concept of Green Transition

MSME actors are required to participate in reducing carbon emissions by practicing the green transition. This new concept represents a comprehensive transformation process from linear business practices to sustainable business practices [14]. This transition involves integrating eco-innovation, renewable energy technologies, and cleaner production systems to minimize ecological impact while sustaining economic performance [15]. Behind this green transition, there is a strategic opportunity for MSMEs to take advantage of in improving the efficiency of their business operations so that costs in the long term are reduced and able to adapt to changes in consumer behavior [16]. The changes that occur to consumers are due to the ease of access to extensive information so that they can influence the awareness of sustainability before deciding to buy. Consumers are starting to demand that companies succeed in transforming green practices. The green transition can be a business strategy to be a

weapon in beating competitors so that the business can continue in the long term.

C. Barriers to Green Transition in MSMEs

Various interrelated obstacles are still faced by MSMEs, so this is still a barrier to applying sustainable practices. [17]. The problem of working capital resources and the difficulty of getting access to loans caused them to face difficulties in investing. Technical obstacles in sustainability practices are still faced by MSMEs [18]. They do not have access to training as well as inappropriate guidance materials in the implementation of green innovations. This widens the knowledge gap in MSMEs [19]. Policies that have not been implemented are part of the problem that has worsened this phenomenon. Regulations that are not proactive and inconsistent in sustainability practices cause compliance levels to remain high [20]. MSME entrepreneurs who will practice sustainability still have to face a green funding mechanism that is still not good. They should be given low-interest loans, subsidies, or tax incentives. A well-coordinated and comprehensive support system can support MSMEs to carry out a sustainable operational transition [21], [22].

D. Enablers and Motivators for Greening MSMEs

MSME entrepreneurs face obstacles to realizing sustainability, so that positive things can smooth the transition process towards business practices that lead to sustainability. A strong policy system and support from institutions are also critical in creating an environment that supports change [23]. Government regulations, favorable tax policies, and targeted technical assistance programs can be the foundation needed for businesses to implement more environmentally friendly practices [14], [24]. Specialized learning and training programs, such as vocational training, industry-based workshops, and business-to-business learning platforms, can help address skills gaps and facilitate the exchange of experiences between entrepreneurs [25].

The main cause of change is the environmental and ethical values owned by MSME entrepreneurs [26]. Decisions in entrepreneurship are not only based on applicable regulations, but also on societal expectations, standards that apply in the business environment, and personal commitment to the environment [15]. In many cases, the passion to implement green practices stems from concern for environmental conservation and economic performance. Continuous operations can reduce production costs, improve the efficient use of resources, and open up opportunities to enter new markets [17], [19]. If these conditions are used properly, then MSMEs can overcome existing barriers and integrate sustainability into their core business strategy [27].

III. METHODOLOGY

To obtain in-depth results regarding the green transition of MSMEs, this study uses a qualitative research design. The main consideration of this research method is to get in-depth, contextual, and assessment-based on the experience of MSMEs. The MSME owners involved in this study are ten MSMEs, including food processing, food and beverages, and traditional handicrafts. These informants are selected through purposive sampling, with consideration of interests, or have implemented environmentally conscious business practices. The criteria used in selecting are variations in size, location, and sector. Semi-structured interviews were conducted to collect data. This method is considered appropriate in terms of flexibility to investigate the themes that arise while maintaining the consistency of the informant. Consent of each informant to record the results of an interview that lasts between 45 and 60 minutes. The interviews are transcribed verbatim and translated into English for analysis purposes.

Data yang ditranskripsi dianalisis menggunakan analisis tematik, ada prosedur enam fase [28], [29]: (1) familiarization with the data, (2) generation of initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. NVivo software was employed to assist in organizing and coding the data systematically.

The strategy carried out in this study is to check members, triangulate, and use reflexive journals. The ethical aspect is what is adhered to in this study by ensuring consent in obtaining information, ensuring the anonymity of participants, and ensuring the confidentiality of all data collected. The approach applied in this study can provide a rich exploration experience of the factors limiting and influencing the

green transition of MSMEs in the Indonesian context [30].

IV. FINDINGS AND DISCUSSION

Findings

The results obtained from this study show that there are still complex dynamics in practicing the green transition in MSMEs. Based on the characteristics of the informants in Table 1, it shows that there are several things that affect companies in carrying out green practices. The ownership model also influences corporate strategy, where family-owned and engaged companies tend to display a stronger community orientation, while sole proprietors and partnerships emphasize aspects of agility and market responsiveness. Furthermore, the location of the company also affects the feasibility of adopting green practices. Urban companies benefit from market access and branding opportunities, while rural companies remain tied to seasonal cycles and resource availability.

They are also aware of the importance of sustainability, but they still face some obstacles. Table 2 shows a summary of the thematic barriers and opportunities in sustainability adoption. The main obstacles they face include the high cost of green materials, limited access to funding, and an expensive certification process that hinders extensive implementation. In addition, the lack of clear regulatory guidance adds to the uncertainty. Limited aspects of knowledge and skills can limit the innovation process of green practice transition. Addressing these challenges requires government policy support through affordable financing mechanisms, and training initiatives that bridge the knowledge gap. This can provide space for MSMEs to integrate sustainability more effectively into their business models.

TABLE I
DESCRIPTIVE PROFILE OF STUDY PARTICIPANTS (N=10)

PARTICIPANT	SECTOR	YEARS IN BUSINESS	NUMBER OF EMPLOYEES	OWNERSHIP TYPE	LOCATION (URBAN/RURAL)
P1	Food Processing	8	12	Family-owned	Urban
P2	Handicrafts	5	6	Sole Proprietor	Rural
P3	Food & Beverage	10	20	Partnership	Urban
P4	Fruit Retail	3	4	Sole Proprietor	Rural
P5	Food Processing	12	15	Cooperative	Urban
P6	Handicrafts	7	10	Family-owned	Rural
P7	Food & Beverage	6	8	Partnership	Urban
P8	Fruit Retail	4	5	Sole Proprietor	Urban
P9	Food Processing	15	25	Family-owned	Rural
P10	Handicrafts	9	7	Cooperative	Urban

TABLE 2
FINDINGS FROM THEMATIC ANALYSIS OF MSME INTERVIEWS

THEMES	SUB-THEME	QUOTATION
Adoption of Green Practices	Waste reduction	"We try to minimize plastic packaging, but alternatives are often more expensive." (P1, P3, P7, P10)
	Energy efficiency	"Switching to energy-saving equipment helped reduce costs, but the initial investment was high." (P2, Handicrafts)
Market and Consumer Demand	Eco-conscious customers	"Young customers prefer eco-friendly products, so we adapt our marketing to highlight that." (P3, Food & Beverage)
	Niche market opportunities	"Tourists look for sustainable souvenirs, so using natural materials boosts sales." (P4, Handicrafts)
Financial and Resource Constraints	High costs of transition	"Eco-friendly materials cost nearly double, making it hard to compete." (P5, Food Processing)
	Limited access to funding	"Banks rarely give loans to small businesses like ours for green upgrades." (P6, Fruit Retail)
Regulation and Policy Environment	Lack of clear guidelines	"Government policies are vague, so we don't know what standards to follow." (P7, Food & Beverage)
	Compliance challenges	"Certification for green products is expensive and complicated." (P8, Handicrafts)
Knowledge and Skills	Awareness of sustainability	"We know sustainability is important, but training is limited." (P9, Food Processing)
	Technical know-how	"I want to use organic packaging, but I don't know where to source it." (P10, Fruit Retail)
Regulation and Policy Environment	Lack of clear guidelines	"Government policies are vague, so we don't know what standards to follow." (P7, Food & Beverage)
	Compliance challenges	"Certification for green products is expensive and complicated." (P8, Handicrafts)
Knowledge and Skills	Awareness of sustainability	"We know sustainability is important, but training is limited." (P9, Food Processing)

Discussion

The study provides valuable insights into how Indonesian MSMEs are navigating the transition from traditional production models to more sustainable and low-carbon production models.

Adoption of Green Practices

MSMEs in general show that they are increasingly responsible for the environment, especially in terms of waste reduction and the use of energy efficiency. Companies have started reducing the use of plastic packaging or purchasing energy-efficient equipment to reduce operational costs and negative impacts on the environment. However, this effort is often hampered because the price of raw materials and environmentally friendly technology is still relatively expensive. This shows that even though MSMEs are willing to implement green practices, cost issues remain the main factor affecting the extent to which they can be implemented.

Market and consumer demand

Consumer tastes are the main factor driving the adoption of sustainability. Young consumers living in urban areas are proving to be very open to environmentally friendly products, while the tourist market open opportunities for sustainable handicraft products. This

market provides an incentive for the use of environmentally friendly practices, showing that sustainability is not only morally important, but can also be an advantage in competition.

Financial and Resource Constraints

The biggest obstacle found in various sectors is financial limitations. MSMEs highlight the cost of sustainable materials that are too high and the lack of affordable loan options. For small companies, especially those operating in rural areas, these constraints severely limit their ability to switch to greener operations. Without adequate support, market opportunities alone are not enough to overcome these financial barriers.

Regulatory and Policy Environment

Institutional challenges also play an important role. Participants mentioned that clear rule guidelines are not available, and the cost for the certification process is too expensive. Situations like this prevent MSMEs from investing in sustainable practices, as uncertainty and bureaucratic procedures increase risks in business operations. The results of this study show that clearer and more accessible policies are needed, thereby reducing barriers to complying with the rules and encouraging the participation of MSMEs in the transition to sustainability.

Knowledge and Skills

This study emphasizes that training and practical knowledge are very strategic to be able to implement green practices in MSMEs. They still have a knowledge gap as informants state that their expertise and technical capabilities are limited in areas such as sourcing organic packaging or adopting alternative production methods. They need the help of capacity-building programs that can enable MSMEs to implement sustainability into their business strategies so that they are more effective.

V. CONCLUSION

This study emphasizes the formation of complex MSMEs sustainability practices as they are influenced by sectoral characteristics, market dynamics, financial constraints, and institutional frameworks. In general, informants show an awareness of environmental responsibility, but the ability to act on this awareness is uneven. The results of this study show that aspects of waste reduction, energy efficiency, and eco-friendly marketing are recognized by informants as viable business strategies. This is demonstrated by informants who are in urban areas where consumer demand and niche markets can provide real incentives.

However, the implementation of this green practice still faces obstacles. The cost of using environmentally friendly materials is still high, coupled with limited access to financing, and a burdensome certification process can be a significant obstacle. In addition, clear regulatory guidelines and low technical knowledge limit the capacity of MSMEs to transition to sustainable operations. These results also emphasize that structural and institutional support is essential.

Sustainable entrepreneurship among MSMEs must be encouraged to increase. However, this requires an integrated approach that combines financial assistance, accessible policies, and capacity-building initiatives. The assistance provided to overcome these constraints will assist MSMEs in transforming sustainability from peripheral concerns to a core element of their business model. The expected result is an increase in competitiveness while contributing meaningfully to environmental and social goals.

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