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Evolving Landscape of Renewable Energy Strategies among MSMEs and Startups for Sustainability

Mrs. Fleur Mario Fernandes
Assistant Professor, Bachelor of Management Studies
SIES College of Commerce and Economics (Autonomous), Mumbai, India
ORCID iD : 0000-0002-3100-8211

Abstract: *This research examines the innovative practices of startups and MSMEs in the renewable energy sector to promote sustainable development. It aims to understand the factors contributing to their success and provide recommendations for policymakers to support their growth. The study uses primary and secondary sources, including interviews with industry experts, case studies, and policy framework analysis. Key trends include the increasing adoption of renewable energy technologies, new business models, and sustainability. The research also examines the challenges faced by startups and MSMEs, such as access to finance, regulatory barriers, and technical issues. The study also analyzes policy frameworks that support the growth of innovative businesses, including financial incentives, regulatory frameworks, and innovation support programs.*

Keywords: renewable energy, UN SDGs, MSME, startups

I. INTRODUCTION

The use of renewable energy sources, such as sunlight, wind, water, and biomass, to produce energy is a growing global trend. There are four primary categories of energy: hydro, solar, wind, and bioenergy. Photovoltaic cells and concentrated solar power systems are used to generate solar energy; wind turbines are used to convert wind energy; hydropower plants are used to generate hydro energy; and organic matter is used to generate bioenergy. New technologies are also being investigated, such as tidal and geothermal energy. Batteries and pumped hydro storage are two examples of energy storage technologies that are growing in importance. Particularly in emerging markets, the industry contributes significantly to economic growth and the creation of jobs. But it faces obstacles like high initial costs, technical problems, and legal restrictions, which makes it hard for MSMEs and startups to enter the market. Lawmakers are putting new laws into effect to assist creative companies in the renewable energy industry.

The global transition to a low-carbon economy and lower greenhouse gas emissions is driving up adoption of the renewable energy sector. As a result, the use of renewable energy technologies has increased dramatically, particularly in developing nations. Community solar projects are examples of the new business models that are emerging to align the interests of consumers, utilities, and developers. As investors and consumers grow more aware of their energy usage, sustainability and environmental stewardship are also becoming more and more crucial. As a result, emphasis has shifted to energy efficiency, sustainable raw material sourcing, and the proper disposal of renewable energy technologies. Since intermittent renewables like solar and wind can be difficult to integrate into the electricity grid, the integration of renewable energy into the larger energy system is also becoming more and more important.

Solar panels and wind turbines are examples of renewable energy technologies that, if not sourced sustainably, may have detrimental effects on the environment. A growing emphasis on sustainable raw material sourcing, which guarantees high environmental and social standards in mining and extraction, is being made in response to these worries. To cut down on energy consumption, emphasis is also being placed on energy efficiency in manufacturing processes. Since renewable energy technologies have a limited lifespan and must be disposed of responsibly, which includes recycling materials, minimising waste, and preventing toxic substances from being released into the environment, responsible end-of-life disposal is also essential.

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1.1 New Business Models

New business models are being implemented in the renewable energy sector to better align the interests of consumers, utilities, and developers. The growing realisation that conventional business models might not be ideal for the particular qualities of renewable energy technologies is reflected in these models. Businesses and individuals can invest in solar energy projects in their community and receive credit for the energy produced on their electricity bills by participating in community solar projects. This helps people who might not have the means or skills to install solar panels and increases access to renewable energy.

In order to provide grid services, virtual power plants, which are networks of dispersed energy resources, can be managed as a single unit. This eliminates the need for physical power plants and enables renewable energy developers to compete in the electricity market and balance supply and demand. Peer-to-peer energy trading raises the value of renewable energy and creates a more decentralised and democratic energy system by enabling people and companies with the capacity to generate renewable energy to sell their excess energy to other consumers.

Providing energy services as opposed to selling energy as a commodity is the focus of the energy as a service model. Developers of renewable energy supply customers with services like heating and lighting and are paid according to the quality of work done, which encourages conservation and energy efficiency. The increasing realisation that conventional business models might not be ideal for the particularities of renewable energy technologies is reflected in these new business models.

II. METHODOLOGY

Data collection technique : Survey
Data collection tool : Questionnaire
Sample : Founders of MSMEs and Startups
Sample Size : 68
Geographical Scope : Pan-India
Sampling Method : Purposive Sampling

III. LITERATURE REVIEW

Qamar et al. (2022) found that enterprises' size, perceived solar energy technology's ease of use and its perceived reliability are the top three driving factors in adopting solar energy. Lack of SET technical expertise, customer preferences for MSMEs, and the significance of eco-labels and green stickers have lower importance. Farghali et al. (2023) concluded that systems using hybrid energy are more dependable and more resilient to the effects of climate change on the power grid. The research shows that MSMEs can increase their monthly earnings by 25% and reduce their energy costs by 36.64% when using solar power. However, the decision to adopt solar energy depends on trade-offs between production, economic, and environmental effects, as well as business owners' and product characteristics. To ensure dependable, affordable, and environmentally friendly energy systems, governments, NGOs, and legislators must promote solar energy adoption (Sekyere et. al., 2024). The increasing global energy demand, particularly nonrenewable energy, poses a threat to the Sustainable Development Goals and community participation in economic activities. Tanzania, with high levels of solar energy, has the potential to contribute significantly to energy access. However, studies on factors influencing energy choice by Micro Small and Medium Enterprises (MSME) in Tanzania are inadequate. A cross-sectional survey and questionnaires were used to collect data from 236 employees in Morogoro region. Results showed that not expensive energy sources, availability of solar appliances, and easy access significantly influence the industry's choice of solar energy and hydro-electricity (Lyakurwa).

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IV. RESULTS AND DISCUSSION

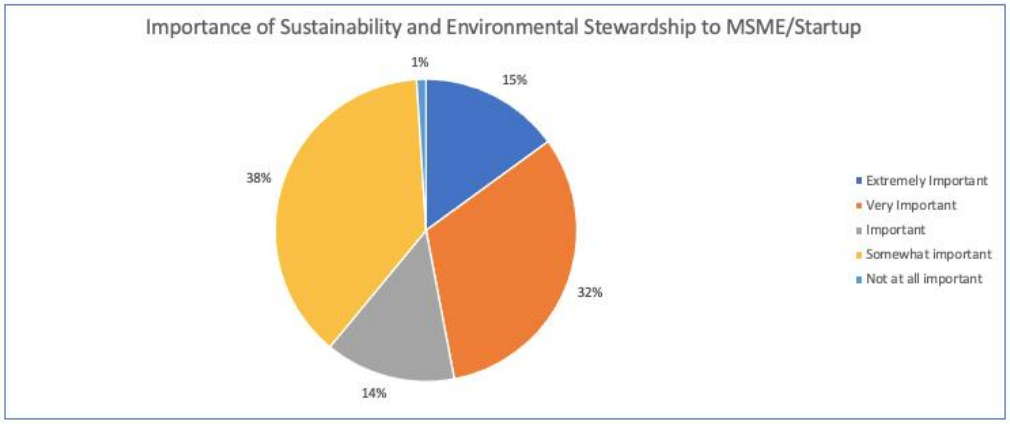

Table 1 : Importance of Sustainability and Environmental Stewardship to MSME/Startup

There are mixed views on this, with 47% respondents viewing it as Important, while 52% respondents giving minimal or no importance to sustainability and environmental issues.

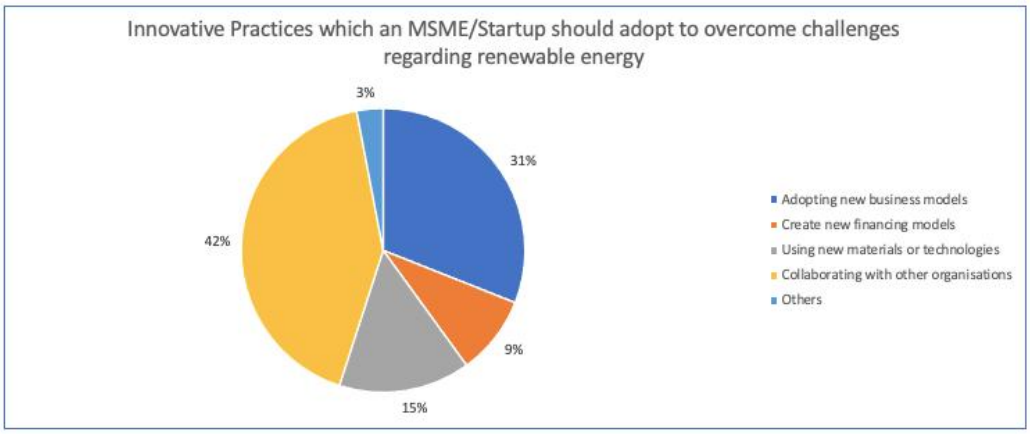

Table 2 : Innovative practices for overcoming challenges related to renewable energy

Adopting new business models as well as collaborating with other organisations are considered to be the most effective practices by MSME/Startup founders for overcoming challenges related to renewable energy

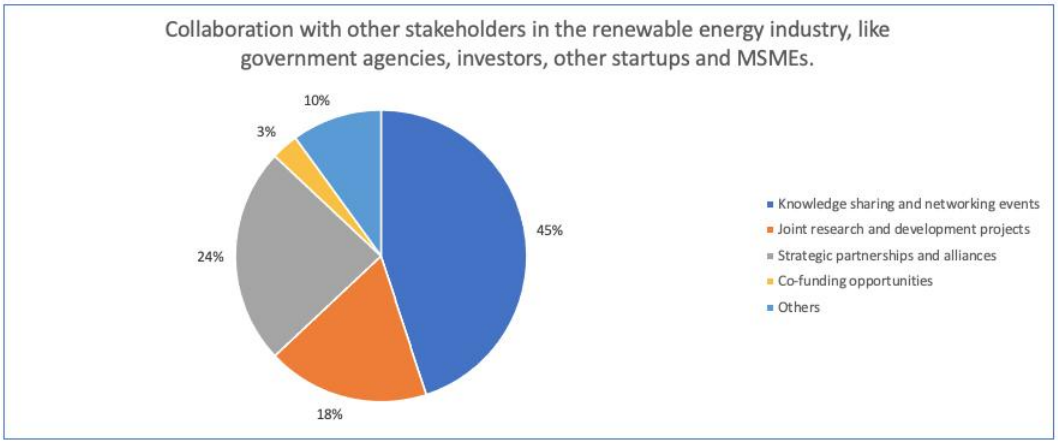

Table 3 : Collaboration opportunities with other stakeholders in the renewable energy industry

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Knowledge sharing and networking events are deemed to be the best opportunities for collaboration with other stakeholders in the renewable energy industry. Strategic partnernships and alliances are the next most popular collaborative method.

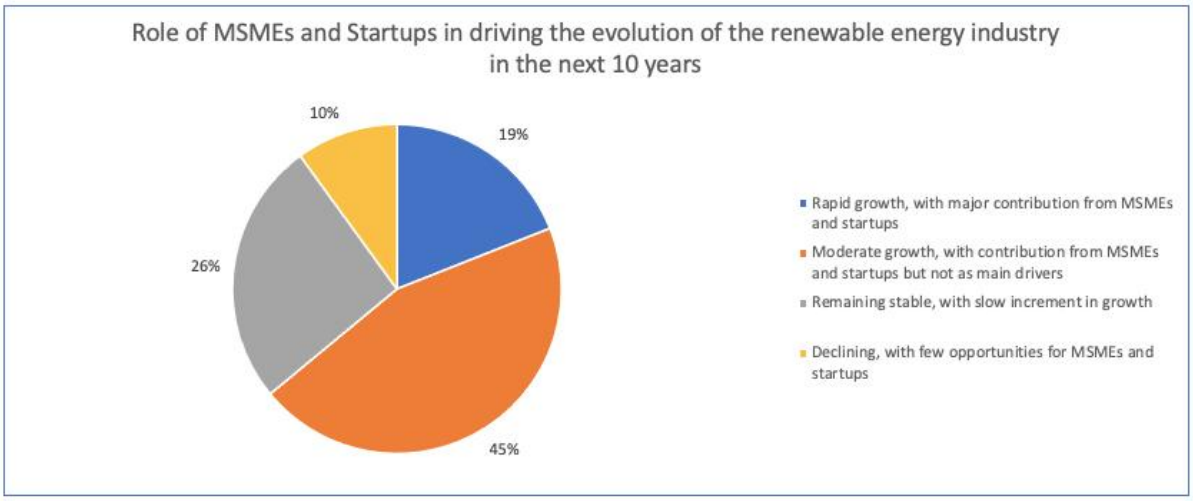

Table 4 : Role of MSMEs and Startups in driving the evolution of the renewable energy industry in the next 10 years

MSME and startup founders foresee moderate growth in the renewable energy sector, with contribution from MSMEs and startups. However, MSMEs and startups are not expected to be the main drivers of growth.

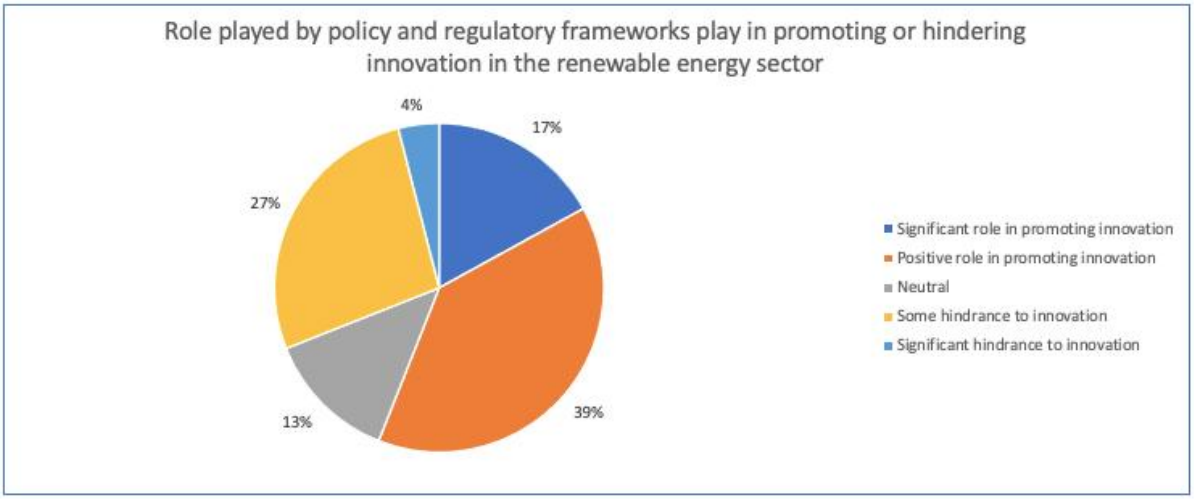

Table 5 : Role played by policy and regulatory frameworks in promoting/hindering innovation in the renewable energy sector

MSME/startup founders are of the opinion that government policy and regulatory frameworks play a significant, positive role in promoting innovation

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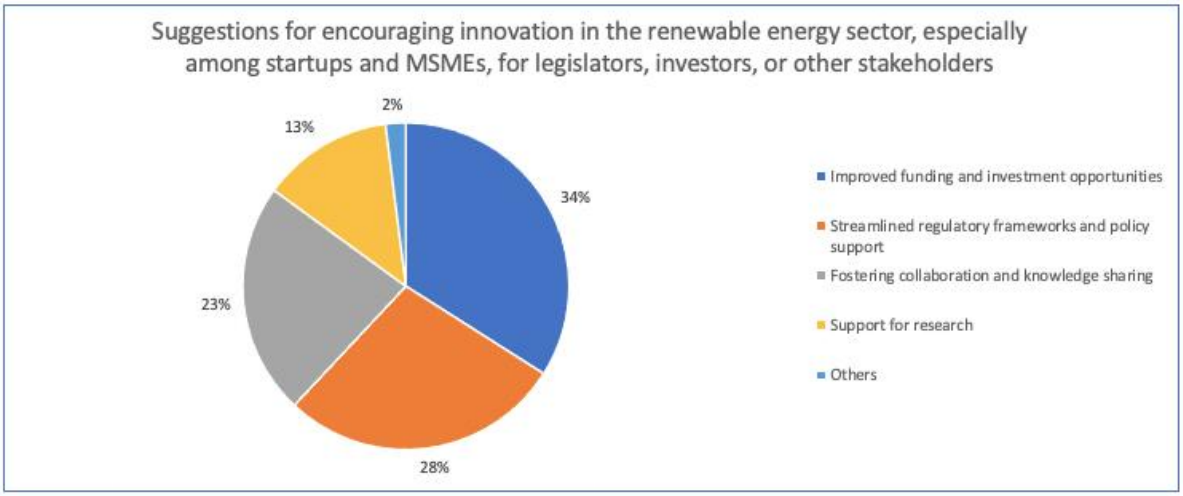

Table 6 : Suggestions to legislators, investors and other stakeholders for encouring innovation in the renewable energy sector, especially among startups and MSMEs

Improved access to funding and investment opportunities as well as streamlined regulatory frameworks and policy support were found to be the most important aspects for supporting innovation in the renewable energy sector

The competitiveness of the renewable energy sector has increased significantly due to a number of important factors. First off, the cost of renewable energy is becoming more and more competitive with conventional fossil fuels thanks to the development of technologies like solar and wind power. Second, rising public and private sector spending has spurred innovation and reduced expenses. Thirdly, encouraging policies like tax breaks and renewable portfolio standards have been put in place by governments all over the world. Fourthly, a market for renewable energy products has been created as a result of public demand for clean energy due to environmental concerns. Finally, technological developments like battery storage have increased dependability and efficiency. Even though issues like grid integration and intermittency still exist, the industry is expected to grow going forward.

To support the renewable energy industry, various tactics can be employed, including ongoing investment in research and development, supportive policies like feed-in tariffs and tax incentives, accessible funding sources like low-interest loans, international cooperation for investment and information sharing, public awareness campaigns to increase demand for clean energy, and predictable regulatory frameworks to stimulate investment and reduce uncertainty. Innovative practices such as energy storage solutions, decentralized energy systems, energy efficiency technologies, circular economy-based business models, sustainable supply chains, and electric vehicles are also beneficial.

In this industry, governments can be extremely helpful to startups and MSMEs. Funding, grants for R&D and startup expenses, tax breaks for investments, hospitable regulatory frameworks, incubators and accelerators, and educational and training initiatives are some examples of this support. By offering this kind of assistance, governments can create an atmosphere that supports the expansion and prosperity of companies engaged in renewable energy, thereby promoting a more sustainable energy system on a worldwide scale.

V. CONCLUSION

The study highlights the importance of sustainability and innovation in the renewable energy sector while bringing attention to the difficulties faced by MSMEs and startups, including poor infrastructure, restricted access to capital, and a dearth of supportive policy frameworks. To spur expansion and support sustainability, however, prosperous companies have embraced cutting-edge strategies like crowdfunding, data analytics, and blockchain technology.

In order to facilitate the expansion of these startups and MSMEs, policymakers must enact legislation that is favourable to their needs, increase financial accessibility, and build out infrastructure. Educating and raising stakeholder awareness of the advantages of sustainability and renewable energy is also essential. By implementing energy-efficient practices, making investments in renewable energy, endorsing renewable energy policies, and educating others about renewable energy, individuals can help the renewable energy sector grow sustainably.

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