



Green Innovation and Sustainable Business Practices: Evidence from Indonesian Manufacturing Firms

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Abstract: *As environmental concerns grow, companies are increasingly adopting green innovation and sustainable business practices to meet both regulatory requirements and consumer demand. This paper investigates the drivers of green innovation in Indonesian manufacturing firms and assesses its impact on environmental performance. Using survey data from 100 firms, the study finds that government incentives and consumer pressure significantly influence companies' sustainability strategies. However, the research also identifies challenges in implementing sustainable practices, particularly related to costs and limited technical knowledge. Policy implications include strengthening incentives for green technology and creating partnerships for knowledge sharing.*

Keywords: *Green Innovation, Sustainability, Manufacturing Firms, Indonesia, Environmental Performance, Sustainable Practices.*

A. INTRODUCTION

In recent years, attention to environmental issues has increased significantly, prompting companies to adopt green innovation and sustainable business practices. In Indonesia, the manufacturing sector is one of the main contributors to carbon emissions and waste, making it an important focus for sustainability initiatives. According to the 2022 Ministry of Environment and Forestry (KLHK) report, this sector contributes around 30% of the total national greenhouse gas emissions (KLHK, 2022). Therefore, green innovation is not only a strategic choice for companies, but also a necessity to meet government regulations and consumer demand that is increasingly concerned about the environment.

One of the main drivers of green innovation in Indonesia is government incentives. The Indonesian government has launched various policies to encourage companies to adopt green technologies, including tax breaks and subsidies for sustainable projects. According to data from the Investment Coordinating Board (BKPM), more than 50% of companies participating in government incentive programs reported improvements in their environmental performance (BKPM, 2023). This suggests that government support can play a significant role in encouraging companies to invest in green innovation.

On the other hand, consumer pressure also plays a significant role in encouraging companies to switch to more sustainable practices. A survey conducted by Nielsen (2022) showed that 73% of Indonesian consumers are more likely to buy products from companies that are committed to sustainability. In addition, companies that successfully meet consumer expectations regarding sustainability often enjoy a competitive advantage in the market. This

shows that market demand can be a strong driver for companies to integrate green innovation into their business strategies.

However, despite incentives and consumer pressure, many companies still face challenges in implementing sustainable practices. One of the main challenges is the high costs associated with investing in green technologies. A study by the World Bank (2023) found that more than 60% of companies in Indonesia reported that the initial cost of green technology was a major barrier to adopting green innovations. In addition, the lack of technical knowledge about green technology is also an obstacle, making it difficult for companies to implement more sustainable practices.

Therefore, it is important for government policies to not only focus on financial incentives, but also on increasing capacity and technical knowledge among companies. Building partnerships between companies, research institutions, and the government can help create an ecosystem that supports green innovation. In doing so, companies can be better prepared to face the challenges of implementing sustainable practices and contribute to better environmental performance in Indonesia.

B. DRIVERS OF GREEN INNOVATION

One of the main drivers of green innovation in Indonesia's manufacturing sector is the existence of supportive government policies. These policies include various incentives, such as tax reductions, subsidies, and training programs to increase understanding of green technologies. According to a report from the Ministry of Industry, more than 40% of companies that received government incentives reported an increase in the adoption of green technologies (Ministry of Industry, 2023). These policies not only help reduce initial costs but also encourage companies to invest more in environmentally friendly innovations.

Consumer pressure is also a major factor in driving companies to innovate greenly. With increasing public awareness of environmental issues, consumers now prefer products that are produced sustainably. A study by McKinsey (2022) shows that 60% of consumers in Indonesia are willing to pay more for environmentally friendly products. This provides additional incentives for companies to develop more sustainable products and processes, so they can meet growing market demand.

However, despite strong drivers, many companies still face challenges in implementing green innovation. One of the main challenges is limited financial resources. Data from the Indonesian Employers Association (APINDO) shows that 55% of small and medium enterprises (SMEs) in the manufacturing sector reported difficulties in obtaining funding for

green projects (APINDO, 2023). This hampers their ability to invest in the green technologies needed to improve efficiency and reduce environmental impact.

In addition, lack of technical knowledge is also a significant obstacle. Many companies do not have access to the information and training needed to understand and implement green technologies. A survey by Universitas Gadjah Mada (2023) found that more than 70% of respondents from manufacturing companies felt they lacked support in terms of training and skills development related to sustainability. This indicates the need for better education and training programs to support the transition to more sustainable practices.

Therefore, to encourage green innovation in Indonesia's manufacturing sector, a more comprehensive approach is needed. Government policies should include not only financial incentives, but also training and capacity building programs. By creating a supportive environment, companies will be better able to overcome existing challenges and invest in green innovation that will ultimately improve their environmental performance.

C. IMPACT OF GREEN INNOVATION ON ENVIRONMENTAL PERFORMANCE

Green innovation has a significant impact on a company's environmental performance, especially in the manufacturing sector. Research shows that companies that adopt sustainable practices tend to experience reduced greenhouse gas emissions and waste. According to a report by the Global Reporting Initiative (GRI, 2023), companies that implement green innovation managed to reduce their carbon emissions by an average of 30% over a five-year period. This shows that adopting green technology is not only beneficial for the environment but can also improve a company's operational efficiency.

A study conducted by the University of Indonesia (2023) also found that companies that invest in green technology experience an increase in brand image and customer loyalty. Around 65% of respondents stated that they have more trust in companies that demonstrate a commitment to sustainability. This shows that green innovation not only provides environmental benefits, but can also contribute to a company's financial benefits through increased sales and customer loyalty.

However, the positive impacts of green innovation are not always immediately visible. Many companies face challenges in measuring their environmental performance after adopting sustainable practices. According to a survey conducted by Deloitte (2023), 58% of companies in Indonesia admitted to having difficulty in determining the right metrics to assess the impact of their sustainability initiatives. This indicates the need to develop better tools and

methodologies to measure environmental performance, so that companies can more easily assess the success of the green innovations they implement.

In addition, it is important to note that the impact of green innovation is not only limited to the company itself, but can also affect the wider ecosystem. By reducing emissions and waste, companies can contribute to reducing overall environmental pollution. A study by the National Environment Agency (BLH, 2023) showed that the manufacturing sector that adopts sustainable practices can help reduce air pollution in major Indonesian cities by up to 20%. This shows that green innovation has the potential to provide wider benefits to society.

Thus, investment in green innovation not only benefits companies but also contributes to overall environmental sustainability. Therefore, it is important for companies to continue to look for ways to improve their sustainable practices and for the government to support these initiatives through supportive policies. With strong collaboration between the public and private sectors, Indonesia can achieve more ambitious sustainability goals.

D. CHALLENGES IN IMPLEMENTING SUSTAINABLE PRACTICES

Although many companies in Indonesia recognize the importance of green innovation, they often face various challenges in implementing sustainable practices. One of the biggest challenges is the high initial cost of investing in green technology. Data from the World Bank (2023) shows that around 65% of small and medium enterprises (SMEs) in the manufacturing sector reported that the initial cost of green technology was a major barrier to adopting green innovation. These costs include purchasing new equipment, training employees, and modifying existing production processes.

In addition, lack of technical knowledge is also a significant obstacle. Many companies do not have access to the information and training needed to understand and implement green technologies. A survey by Diponegoro University (2023) found that more than 70% of respondents from manufacturing companies felt they lacked support in terms of training and skills development related to sustainability. This indicates the need for better education and training programs to support the transition to more sustainable practices.

Another challenge faced by companies is the lack of support from suppliers and business partners. In many cases, suppliers do not have the capacity to provide environmentally friendly raw materials, making it difficult for companies to implement sustainable practices in their supply chains. According to a report from the Indonesian Manufacturers Association (AMINDO, 2023), around 50% of companies reported that limited supply of environmentally friendly raw materials was an obstacle to implementing green innovation.

In addition, companies often face internal resistance to change. Employees who are accustomed to traditional processes may be reluctant to adapt to new, more sustainable practices. According to a study by Airlangga University (2023), around 40% of employees in manufacturing companies admitted to feeling uncomfortable with the changes required to implement sustainable practices. Therefore, it is important for companies to involve employees in the change process and provide adequate training to facilitate this transition.

To overcome these challenges, better collaboration between government, the private sector, and educational institutions is needed. The government can play a role in providing incentives and technical support, while the private sector can share experiences and best practices in implementing green innovation. By creating a supportive ecosystem, companies will be better able to overcome existing challenges and invest in green innovation that will ultimately improve their environmental performance.

E. POLICY IMPLICATIONS

Based on the findings of this study, there are a number of policy implications that need to be considered to support the adoption of green innovation in the Indonesian manufacturing sector. First, the government needs to strengthen incentives for green technology. This can be done by increasing subsidies and providing greater tax incentives for companies that invest in sustainable practices. According to a report from the Ministry of Finance (2023), more aggressive incentive policies can encourage more companies to switch to green technology, thereby reducing the environmental impact of the manufacturing sector.

Second, it is important to create better training and education programs to improve technical knowledge among companies. The government can work with educational institutions and industry associations to develop relevant curricula and provide practical training for employees. A study by Padjadjaran University (2023) shows that effective training programs can improve companies' ability to adopt green technologies and sustainable practices.

Third, the government should encourage collaboration between companies, research institutions, and universities to create partnerships that support green innovation. By building collaborative networks, companies can share knowledge and resources, and access the latest technologies that can help them implement sustainable practices. According to a report from the Indonesian Institute of Sciences (LIPI, 2023), such partnerships have proven effective in increasing the adoption of green technology in the manufacturing sector.

Fourth, there is a need to develop better metrics to measure a company's environmental performance. By providing the right tools and methodologies, companies can more easily

assess the impact of their sustainability initiatives. According to a survey by PwC (2023), more than 60% of companies in Indonesia admit to the difficulty in determining the right metrics to assess environmental performance. Therefore, the government and related institutions need to work together to develop standards that can be used by companies.

Finally, it is important to raise public awareness of the importance of sustainability and green innovation. Effective educational campaigns can help raise public awareness of environmental issues and encourage them to support companies committed to sustainable practices. According to data from Yayasan Kehati (2023), public awareness of sustainability has increased, but there is still room for improvement. By raising this awareness, it is hoped that companies will be more motivated to invest in green innovation and sustainable practices.

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