**Research Paper**

# How New Green Technologies are Changing the Indonesian Economy

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## Abstract

Rapid disruption simplifies company performance improvement. Instead, businesses must be conscious of environmental risks. Innovation in green technology is a business strategy for preventing environmental damage. However, few studies have investigated the internal mechanisms and underlying factors that link ecological innovation to corporate financial performance. The methodology of this research used content analysis to examine companies listed on the IDX in the manufacturing sector with heavy pollution. In addition, it is important to learn that developing more eco-friendly processes and merchandise can boost a business's bottom line. In addition, the company's green reputation could mitigate the effects of innovative green products and new green processes on the bottom line. The results can provide valuable input and recommendations for effectively implementing green technology in Indonesia.

**Keywords**: green technology innovation; environmental risk; financial performance.

## 1. Introduction

Environmental concerns at the national level continue to grow. The preservation of the environment is a critical concern for manufacturing companies, given the substantial accountability they have for their environmental impact. In addition to taking consumer needs and corporate social responsibility into account, according to Liu et al. (2021), pollution is evidence of a corporation's accountability in its pursuit of financial gain. Green technology, which is environmentally benign, is the optimal option for mitigating the effects of pollutants. As a result, green innovation is crucial for addressing environmental issues. Additionally, it has the potential to enhance the market competitiveness of environmentally aware corporate entities. Furthermore, according to Rekik & Bergeron (2017), micro, small, and medium-sized businesses benefit greatly from the implementation of green technology because it restricts environmental exploitation and promotes technological modernization on an economic level. Sahoo et al. (2023) argue that organizations need contemporary knowledge and technology to effectively implement environmentally favorable technological advancements. In addition to incorporating ecologically sustainable approaches, the procedure itself yields environmental benefits (Dragomir, 2020).

Although there is a wealth of international research on the health effects of air pollution, Jakarta, Indonesia, has a dearth of local data regarding the financial toll it imposes. Air pollution impacts over 10.5 million inhabitants in Jakarta. According to data from the DKI Jakarta Provincial Environmental Agency, Jakarta has the maximum annual ambient PM2.5 concentration in Indonesia. The World Health Organization (WHO) states that air pollution causes respiratory disease, cardiovascular disease, and cancer (World Health Organization, 2022). Moreover, the Institute for Health Metrics and Evaluation, (2019) adds that air pollution in Jakarta was responsible for 5,054 fatalities (equivalent to a rate of 54 per 100,000 individuals) and 168,000 years of illness, disability, or premature mortality. Therefore, Indonesia is motivated to adopt green technology to mitigate pollution and address other environmental issues. Indonesia is also home to numerous sectors, including industry, transportation, agriculture, and energy, which collectively contribute to air, water, and land pollution and have a significant environmental impact. Air pollution in major cities such as Jakarta raises concerns about environmental devastation and public health (Syuhada et al., 2023).

Additionally, this occurrence will exacerbate worldwide climate change. Technologies that are favorable to the environment can mitigate these effects. In addition, environmentally sustainable product development and management practices serve as substantial indicators of a firm's performance. Furthermore, the expansion of green technological innovation across all industries is accelerating (Li & Wang, 2022). Nevertheless, despite this innovation's potential, conventional systems continue to provide an extensive array of eco-friendly markets. Enterprises dedicated to environmental sustainability contrast with conventional systems (Wicki & Hansen, 2019). Tidd & Bessant (2018) argue that green technology innovation is considered revolutionary because it diverges from business and market trends and incorporates significant and unpredictable variables. Additionally, Schot (2020) asserts that the majority of businesses continue to disregard environmentally responsible innovation. Fernando & Wah (2017) argue that the favorable consequences of environmentally sustainable innovation have prompted established companies to adapt. Moreover, the matter of uncertain climate change underscores the criticality of innovation in environmentally sustainable management (Wang et al., 2023). This represents an endeavor to mitigate environmental contamination through the implementation of diverse degrees of innovation, including ramifications for business operations, manufacturing procedures, and marketing strategies (Rezende et al., 2019).

In order to address the aforementioned research void and offer further understanding regarding the extent to which environmentally sustainable technological advancements benefit organizations, it is necessary to conduct a comprehensive analysis that identifies the determinants of the performance benefits that green technology implements. Hence, this study aims to investigate how ecological management inventiveness, green innovation in goods, and process innovation contribute to enhancing corporate performance. Content analysis will explore the moderating influence of green image, providing more precise and meaningful insights for organizations, the environment, and society regarding the implementation of green technology innovations.

## 2. Methods

### 2.1 Research Design

This study employs quantitative research methods to examine the relationship between financial performance (Y) and green technology innovation, with financial reports of companies serving as the independent variable (X). In addition, green image serves as a mediating variable in determining the effect of environmentally favorable technological innovations implemented by businesses. In August 2022, researchers at Beijing University of Chemical Technology (BUCT) conducted a study to determine the impact of implementing green technology innovation in Indonesia on the evidence and determinants of research findings in China. We employed purposive sampling to select companies for the sample based on their registration on the IDX and their adoption of environmentally favorable technological innovations. This research investigates not only the significance of the correlation between environmentally sustainable process innovation and financial performance but also the applicability of such processes. This analysis examines how proactively implementing sustainable practices can yield economic benefits for businesses, including cost effectiveness, product innovation, reputation enhancement, and brand development. Green technology principles guide the environmentally conscious processes employed by a company, resulting in these advantages. Therefore, the researchers developed a number of hypotheses for this study, including:
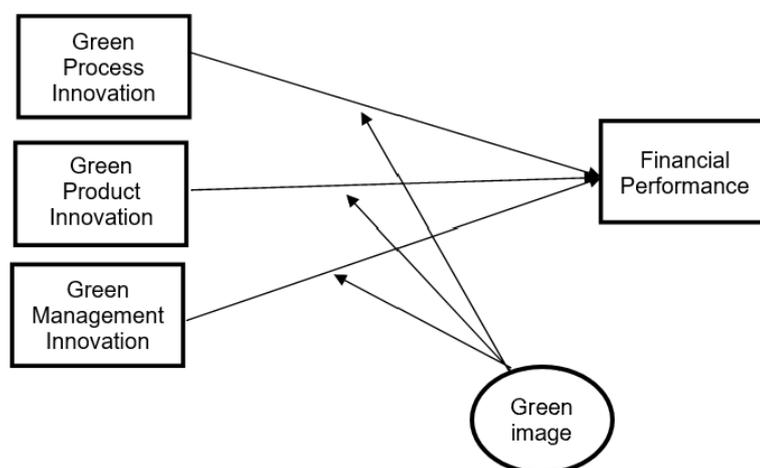


*Figure. 1. Theoretical Framework (Researcher, 2023)*

$H_1$: The green innovation in process is a significant effect on financial performance

$H_2$: Green process development positively affect the financial performance.

$H_3$: Innovation in green management has a beneficial impact on financial performance.

$H_4$: Green image connects green innovation in processes to financial performance.

$H_5$: Green image mediates the relationship between for new green products and financial performance

$H_6$: The green image plays the role of a mediator in the relation across managerial innovation and financial performance.

### 2.2 Collecting Data

Researchers gathered data by verifying the environmental protection status granted to different business sectors by the Indonesian Ministry of Environment. Furthermore, the verification process will exclude organizations that fail to disclose social responsibility reports, which are mandatory for gathering information on environmentally sustainable product innovation, environmentally sustainable management innovation, and environmentally sustainable image. Studying in further depth how developments in sustainable innovations have influenced business results by utilizing content analysis on company annual reports to extract control variables including financial constraints, total asset turnover, age, and company size. Due to the potential impact on financial performance. We will gather information regarding environmentally friendly product innovation and environmentally friendly management innovation through manual content analysis. Two programmers subsequently encoded the data.

Researchers ascertain the dependence of the two variables by calculating Krippendorff alpha, utilizing an expected value of 0.67 or higher (Hussain et al., 2018). According to Henseler et al., (2015), the HTMT heterotrait macro feature in SPSS is valid for data processing.

### 2.3 Variables

#### 2.3.1. Dependent variable: financial performance

The return on assets ratio serves as the dependent variable to observe a company's performance, ensuring stable and reliable financial performance. ROA can reflect returns on the Islamic capital market and measure other financial performance that has an impact on company management (Jastacia et al., 2021).

#### 2.3.2 Independent variable: green product innovation and green management innovation

According to Kiefer et al. (2019) (see Table 1), they propose to use them to evaluate product innovation technology. Corporate social an overview of a Company's Responsibility Report (CSR) as an innovative green process using the content analysis method, where each item is scored from 0 to 2: 0 if no associated description, 1 if a single apparent explanation with no actionable details (e.g., complete strategies, execution procedures, or measurable demands, as such proving an organization actually follows pursuits), and 2 if there is a connected description with detail on implementation

**Table 1**: Measurement and Variables

| Variables | Measurements | Data sources | Sources |
|---|---|---|---|
| Financial performance | Return on Asset (ROA) | Firm's Annual Reports | Jastacia et al., (2021) |
| Green product innovation | Changing product design to avoid harmful or poisonous substances during production or to enhance energy efficiency during utilization | Firm's Corporate Social Responsibility Reports | Kumar et al., (2021) |
| Green management innovation | Implement advance environment and energy management making a major change to the organization, such management structure or integrating different department | Firm's Corporate Social Responsibility Report | Ma et al., (2018) |

Source: Kiefer et al., (2019)

## 3. Results and Discussions

### 3.1 Data and Sample

This study's technical analysis employed purposive sampling of companies suspected of having environmental contact. We obtained 20 suitable and ready-to-analyze industry companies (see Table 2) from the IDX for the period 2016–2021, as well as company financial reports for return on assets, debt, DER, turnover, age, and company size.

**Table 2**.: List of Samples

| Name of Company | Description |
|---|---|
| PT PLN (Persero) | In the development of renewable energy solutions and the evaluation of energy efficiency |
| PT Pertamina (Persero) | In identifying the environmental impacts of oil and gas operations and their efforts to reduce these impacts. |
| PT Astra International Tbk | In monitoring fuel efficiency and environmentally responsible practices in the as an automotive industry. |
| PT Unilever Indonesia Tbk | regarding the monitoring of the environmental impact of the retail product supply chain and sustainable initiatives. |

**Table 2.** Continued

| Name of Company | Description |
|---|---|
| PT Indofood CBP Sukses Makmur Tbk | In the analysis of the environmental impact of food and drink products. |
| PT Bank Rakyat Indonesia (Persero) Tbk | In assessing the positive impact of green banking initiatives and sustainable finance programs, we consider the following factors. |
| PT Telkom Indonesia Tbk | In analyzing the energy efficacy of ICT infrastructure. |
| PT Adaro Energy Tbk | In assessing the environmental impact of coal mining and the mitigation strategies implemented. |
| PT Danone Aqua Tbk | Monitoring the environmental impact of the distilled water industry and its adoption of sustainable practices. |
| PT HM Sampoerna Tbk | In assessing the environmental impact of the tobacco industry and their sustainability efforts. |
| PT Semen Indonesia (Persero) Tbk | In analyzing cement production's carbon emissions and their efforts to reduce them, |
| PT Matahari Department Store Tbk | In monitoring products' carbon footprints and their efforts to reduce plastic pollution. |
| PT Kalbe Farma Tbk | In evaluating the environmental impact of the pharmaceutical industry and their ongoing efforts. |
| PT Vale Indonesia Tbk | Monitoring the environmental effects of nickel extraction and associated mitigation measures. |
| PT Gudang Garam Tbk | In monitoring the effects of the tobacco industry and their efforts to be socially and environmentally responsible. |
| PT Blue Bird Tbk | In analyzing the fuel economy and administration of public vehicle fleets. |
| PT Geo Dipa Energi (Persero) | In monitoring water quality for waste and water conservation initiatives. |
| PT Pan Brothers Tbk | In the analysis of the product's life cycle and their endeavors to reduce the environmental impact of products, the life cycle of the product is considered. |

Source: IDX, 2023

The accumulation of data for analysis of green technology will aid these businesses in measuring, monitoring, and enhancing their sustainable practices, as well as in taking more effective steps towards green development in Indonesia.

### 3.2  Description Analysis

Table 3 presents the classifiers for the variable and the values of the correlation. An intrinsic correlation exists between green management innovation and green product innovation. In addition, the findings indicate that financial performance and green management have a related value of up to 840. Moreover, green product innovation accounts for 741.29 percent of the mean data.

**Table 3**. Descriptive Statistic and Correlations

| Variables | Descriptive statistics | | Correlations | |
|---|---|---|---|---|
| | Mean | SD | 1 | 2 |
| Financial Performance | 604.73 | 841.154 | | |
| Green Product Innovation | 741.29 | 536.574 | 1.000 | -.071** |
| Green Management innovation | 945.24 | 848.072 | -.071** | 1.000 |

** Correlation is significant at the 0.05 lev.05 level (2-tailed)

### 3.3 Normality and Reliability Test

The researchers obtained the data regarding the impact of green product innovation and green management innovation on financial performance through content analysis. Two programmers subsequently encoded the data. Hussain et al. (2018), computed Krippendorff's alpha to assess the reliability of the aforementioned three variables' data. In order to draw meaningful conclusions, the alpha value needs to exceed 0.67. We implemented the KAPALPHA criteria in SPSS to compute Krippendorff's alpha. As recommended by Nili et al. (2020), two coders assigned codes to sixty reports, and we assessed inter-coder reliability through the analysis of this data. Krippendorff's alpha values for the green product innovation and green image indices all exceeded the threshold value of 0.67, providing further evidence for the dependability of the data.

**Table 4**: Normality Test

|  | Minimum | Maximum | Mean | Std. Deviation | N |
|---|---|---|---|---|---|
| *Residual* | -1004931776.000 | 8450805760.000 | .000 | 1519486397.685 | 51 |
| *Std. Predicted Value* | -1.704 | 1.395 | .000 | 1.000 | 51 |
| *Std. Residual* | -.648 | 5.449 | .000 | .980 | 51 |
| *Test Statistic* | 0.119 | | | | |
| *Asymp. Sig. (2-tailed)* | 0.116 | | | | |

a.    Dependent Variable: FP

**Table 5**: Reliability Test

| Reliability Statistics |
|---|
| Cronbach's Alpha |
| .814 |

Table 4 and 5 display the normality and reliability test of green technology innovation. The test for normality uses the Kolmogorov-Smirnov test with a single sample. The results in Table 4 indicate that the data in this study meet the normality test criteria, suggesting that they follow a normal distribution. Therefore, a significance value (Asymp, Sig.) of 0.116 > 0.05 (see Table 4) suggests that the data follows a normal distribution. In addition, Table 5 shows that the value of Cronbach alpha was 0.814. The value of Cronbach alpha, which is greater than 0.67, indicates that it is reliable.

**Table 6**: Regression results

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 6003674556948 241400.000 | 2 | 3001837278474 120700.000 | 1.248 | .296[b] |
| | Residual | 1154419456374 20500000.000 | 48 | 2405040534112 927200.000 | | |
| | Total | 1214456201943 68730000.000 | 50 | | | |

a.    Dependent Variable: FP
b.    Predictor (Constant), GM, GPI

**Table 6.** Continued

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95.0% Confidence |
| | B | Std. Error | Beta | | | Lower Bound |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | | | | | | - |
| (Constant) | -1520,348 | 5034,338 | | -0,302 | .764 | 116.466.612 |
| GPI | .062 | .053 | .167 | 1.186 | .241 | -0,043 |
| GM | .444 | .464 | .135 | .957 | .343 | -0,489 |

a.    Dependent Variable: FP

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
| --- | --- | --- | --- | --- | --- |
| 1 | .222[a] | .049 | .010 | 1550819310.59 5 | 1.908 |

a.    Predictors: (Constant), GM, GPI
b.    Dependent Variable: FP

The findings presented in Table 6, which were derived from the SPSS analysis, indicate that neither green product innovation (GPI) nor green management innovation (GMI) significantly impact the performance of the organization, with a mere 4.9% variance. This renders the implementation of green innovation technology in Indonesia potentially fruitful, with only a minority of green innovation products and green innovation management failing to influence the performance of the organization. Therefore, the advancement of green technology in Indonesia has the potential to generate novel products that are more sustainable (Hu et al., 2021).

### 3.4 Innovation in Green Products and Green Management

Good green management innovation is required for the proper adoption of innovative ecological products, including the development of strategies to increase product differentiation. Additionally, green product innovation with a substantial market share can have a positive effect on green management innovation. As a result, in order to enhance financial performance, the business community in Indonesia must develop environmentally sustainable product innovations and management practices. Sellitto et al. (2020), concur that a cohort of furniture manufacturers in Brazil may enhance their operational efficiency through the introduction of environmentally friendly products. In addition, this strategic move fosters a positive corporate image and broadens the market segment, which aligns with the growing public concern for ecological conservation. Additionally, it can decrease business expenses. Green innovation ultimately represents a concerted effort by businesses to mitigate their environmental footprint and pollution levels. Ouyang et al. (2020), concur that air pollution has the potential to impact a company's Total Factor Productivity (TFP). Therefore, adopting green innovation offers consumers a fresh perspective, decreases organizational expenses, and contributes to environmental sustainability. Additionally, Liao (2018) emphasized that environmentally responsible innovation has a positive effect on financial performance and mitigates the adverse environmental effects of global activities in the Chinese automotive industry. Consequently, environmentally responsible innovation correlates with an organization's success. Therefore, organizations can utilize this innovation in environmentally friendly products to promote environmental management performance and safeguard the adjacent environment.

Four performance metrics pertaining to environmentally responsible product innovation are available for consideration by businesses. Companies begin by selecting products that exhibit minimal polluting tendencies during the process of product development or design. Following this, businesses select product materials that require the least quantity of resources and energy during product development or design. Thirdly, companies minimize the use of materials in the production and development of product designs. Companies must ultimately give careful consideration to a number of factors during the process of product development. For example, if products are easily recyclable, reusable, and decomposable, they

are considered environmentally favorable (Liu et al., 2021). The objective of environmentally sustainable product innovation is to modify and alter products in multiple ways. As a consequence, novel perspectives are required concerning the quantity of life cycles, the manufacturing-to-distribution process, and the implementation of product mechanisms. Moreover, environmentally sustainable products may have associations with sectors that have a propensity to generate pollution. Organizations require cutting-edge products that feature enhanced longevity and capacity for recycling (Xie et al., 2019). As a result, the organization will mitigate recurring production expenses due to the product's reusability.

### 3.5 Sustainable New Products and Image Impact on Firm Performance

Innovations in environmentally sustainable management have a substantial impact on financial performance. According to Khan et al. (2021), the development of green products requires green management innovation. Because employees and upper management are able to assist in the implementation of environmentally favourable technological innovations, this also entails the implementation of ecological management practices. Conversely, Kanda et al. (2020), assert that there is a lack of consensus within the operations management community regarding green production. In contrast, researchers and practitioners of conventional production operations management may be more unfamiliar with the terms, concepts, and methodologies associated with "green" than the sustainability community.

Literature, theory, and empirical evidence support the influence of market, regulatory, and economic conditions on technological progress (Ouyang et al., 2020). Xie et al. (2019), conducted a study to investigate the effect of green technology implementation on the financial performance of businesses. The researchers then focus on the paradigm that corporations employ in relation to sustainability and innovation. Furthermore, market failure is a factor in reducing emissions and encouraging the implementation of environmentally responsible solutions. According to Dangelico & Vocalelli (2017), a green image signifies a business's commitment to and care for the environment. Moreover, the organization will experience an increase in customer loyalty and a positive impact on public perception (Schot, 2020). Indeed, consumers are now willing to pay a premium for products that are environmentally beneficial (Xie et al., 2019). However, there are still certain deficiencies and constraints, such as the relatively limited number of businesses considered environmentally conscious (Przychodzen et al., 2020). Moreover, a dearth of literature reviews exists concerning ecological innovation in Indonesia. Therefore, these results may serve as a benchmark for assessing the impact of environmentally sustainable product development, environmentally favorable innovation, and environmentally sustainable management in Indonesia.

### 3.6 Economic Benefit of Green Technologies

*Job creation: The green economy is expected to create millions of new jobs in Indonesia*

Green economic policy implementation in Indonesia is expected to boost job growth. The staffing needs of many different fields, including renewable energy, energy efficiency, sustainable transportation, waste management, and sustainable agriculture, present the potential for the green economy to create both direct and indirect employment opportunities (Sulich & Sołoducho-Pelc, 2022). Apart from that, Miao et al. (2023) also highlighted that the green economy in the future is projected to have an overall favorable influence. However, trained and competent workers are required for the green economy transition (Napathorn, 2022). Another big issue in Indonesia is the requirement for transition funding. Developing new eco-friendly technologies and infrastructure requires substantial resources (Gobena & Kant, 2022). Nonetheless, Indonesia can use and advance green technologies (Rhofita et al., 2022). As a result of economic diversification, Indonesia will be less reliant on fossil fuels and will have a smaller impact on the environment (Rahman et al., 2021).

*Economic diversification: Green technologies can help Indonesia reduce its reliance on fossil fuels and diversify its economy*

By 2021, Indonesia will have overtaken the United States as a major consumer and producer of fossil fuels (Herindrasti, 2022). Despite this, the economy has grown at a steady 5 percent each year during the past decade (Rahman et al., 2021). Meanwhile, fossil fuels provide a disproportionate share of Indonesia's

energy needs at home. Apart from that, Kurniawan et al. (2020) also mentioned that the use of coal for electricity consumption is more than 90%. There will be long-term consequences for things like air quality, global warming, and economic stability as a result of this action. As a result, eco-friendly technology can be a solution to these issues (Aithal & Aithal, 2021). According to Langer et al. (2021), Indonesia is rich in potential sources of renewable energy, including geothermal and wind power. In this way, energy efficiency and decreased carbon emissions will play a role in Indonesia's efforts to diversify its economy. In contrast, Kurniawan & Managi (2018) noted that Indonesian rules are the single most important factor in facilitating a green transition toward enhancing Indonesia's economy.

*Improved air quality and public health: Green technologies can help reduce air pollution and improve public health*

Public health is tied to pollution problems (Manisalidis et al., 2020). Air pollution is responsible for an estimated 7 million deaths annually around the world (Cohen et al., 2017). Moreover, this is a major issue that has the potential to lessen air pollution and improve the health of the general population. One possible technological fix is the widespread adoption of electric vehicles, which would significantly cut down on transportation-related pollution (Shah et al., 2021). Indonesia's humid environment and infrastructure are the key obstacles to the widespread adoption of electric vehicles (Miao et al., 2023). However, improving public transportation, walking, and biking can help cut down on pollution in major cities (Glazener & Khreis, 2019). In addition, 24% of world emissions come from producing power (Oberschelp et al., 2019). Industrial activities contribute nearly as much to air pollution in Indonesia. Therefore, it is worthwhile for every business to adopt eco-friendly technologies (Paparoidamis & Tran, 2019). Surya et al., (2021) agree that sustainable economic growth in Indonesia will be influenced by the use of environmentally friendly technology.

*Enhanced climate resilience: Indonesia is particularly vulnerable to the impacts of climate change, and green technologies can help the country adapt and mitigate these impacts*

As a country with an archipelagic geography and a tropical climate, Indonesia is particularly vulnerable to the effects of climate change, which are reflected in rising sea levels, droughts, forest fires, and frequent storms (A. Kumar et al., 2021). However, environmentally friendly technology can mitigate these effects and play an important role in helping Indonesia adapt to the changing climate (Dharmayanti et al., 2023).

### 3.7 Challenge and Opportunities

*Financing the transition to a green economy: Indonesia will need significant investments to transition to a green economy*

Changing to environmentally friendly technologies is a pressing issue for the world economy (Walz et al., 2017). Its use ensures continued economic growth while also combating climate change and decreasing reliance on fossil fuels. According to González-Ruiz et al. (2018), this substantial funding was allocated to the incorporation of eco-friendly technologies in the creation of sustainable practices and the improvement of existing infrastructure. An investment of $3 trillion to $5 trillion is required. Martawardaya et al. (2022) stated that Indonesia can make the shift to a green economy. Financial sources that can be maximized are domestic government financing, international financial institutions, private sector investment, and environmentally friendly bonds. Whiteside (2020) noted that this is still happening in the present day. Legislative changes and public-private partnerships can mobilize private capital. Furthermore, the development of financing instruments that can be used to fund green initiatives is crucial. Even though Indonesia has a richness of natural resources and a growing product market, the country still requires assistance from a variety of stakeholders in order to implement environmentally friendly technology (Sharvini et al., 2018). Regulatory or policy barriers, a lack of ability and competence in environmentally friendly finance, and a general lack of awareness and understanding of environmentally friendly financing alternatives all contribute to this. Therefore, the government of Indonesia has to improve capacity development by training its citizens, streamlining its policies and regulations, and encouraging cooperation and the exchange of information regarding environmentally friendly technologies.

*Building capacity and expertise in green technologies*

The transition to a green economy is gaining momentum across the world, driven by the urgency of addressing climate change and environmental degradation. Green technologies, which include solutions

for sustainable energy production, resource conservation, and pollution reduction, play an important role in this transition (Söderholm, 2020). However, Kamis et al. (2018) state that the successful implementation and use of environmentally friendly technology requires a skilled workforce equipped with the necessary knowledge and expertise. Therefore, building capacity and expertise in environmentally friendly technologies is essential for countries to effectively transition towards a greener future (Muench et al., 2022). Nowotny et al. (2018), informing that rapid technological progress, emerging fields, and multidisciplinary knowledge can increase the capacity of expertise in environmentally friendly technologies. Ramdhani et al. (2017) also agree that education and training, as well as advanced research and development, need to be carried out to build capacity and expertise in green technology in Indonesia. So, in the future, it will accelerate the adoption of environmentally friendly technology, increase innovation and sustainable economic growth, and preserve nature through sustainable development.

*Seizing opportunities for green exports and attracting green investment*

The global transition to a green economy presents many opportunities for countries to harness their environmental strengths and drive sustainable growth (Ali et al., 2021). Alamsyah et al. (2020) adds that as demand for environmentally friendly products and services increases, countries that can effectively position themselves as environmentally friendly export hubs and attract environmentally friendly investment will gain significant economic and environmental benefits. Green exports, which include a variety of environmentally friendly goods and services, are experiencing rapid growth as consumers and businesses around the world seek sustainable alternatives (Khan et al., 2020). Apart from that, it can attract environmentally friendly investment in the form of projects and collaboration between countries (Yin, 2019). Thus, identifying comparative advantages, developing targeted strategies, promoting environmental collaboration, and involving stakeholders.

## Conclusions

Top management and employees embrace environmentally friendly technological improvements that boost financial performance. Operations managers disagree on green manufacturing. Economic, regulatory, and commercial factors affect technological growth. Environmental dedication helps green firms build customer loyalty and goodwill. Lack of environmentally conscious enterprises and ecological innovation literature reviews in Indonesia are constraints. According to the findings, green innovation technology improves firm performance. Thus, this is consistent with Liao (2018), Xie et al. (2019), Ouyang et al. (2020), and Liu et al. (2021). We utilized case studies of Chinese green innovation technology from diverse industries. Despite no significant impact, the proportion was 4.9%. With only a small number of things and management failing to increase organizational performance, environmentally friendly, innovative technology in Indonesia may succeed. This report predicts millions of jobs in renewable energy, energy efficiency, sustainable transportation, waste management, and sustainable agriculture in Indonesia's green economy. The change requires skilled workers and large investments in green technologies and infrastructure. Indonesia has various renewable energy sources. Thus, green technologies can diversify its economy and reduce its fossil fuel dependence. Green solutions can improve air quality and public health since air pollution kills 7 million people annually. The humid environment and infrastructure of Indonesia limit electric vehicle adoption, which could reduce traffic pollution. Public transportation, walking, and biking lessen pollution in major cities. Climate change threatens Indonesia, but green technologies can help it adapt. Indonesia faces challenges and opportunities with green technologies, but with the right laws and regulations, it can achieve sustainable economic growth and reduce its environmental impact. Indonesia needs significant investments to transition to a green economy for economic growth, climate change mitigation, and fossil fuel reduction. Government financing, international financial institutions, private sector investment, and green bonds can do this. The country requires stakeholder support to implement green technology. Lack of green finance skills, regulatory constraints, and financing possibilities contribute to this issue. The government must train citizens, streamline policies, and encourage cooperation to increase capability. Successful implementation demands green technology expertise. New domains and rapid technological progress can improve green technology expertise. Green technology development in Indonesia requires education, training, and sophisticated research. Green trade and investment can profit from environmental advantages and sustain countries. Eco-friendly export centers and investments can enhance economies and the environment.

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