Optimizing Green Leadership With N-Soft Sets: A Sustainable Finance Strategy In The Manufacturing Industry In Indonesia

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Abstract— **This research aims to apply the N-soft set algorithm model as one of the Multi-Criteria Data Analysis [MCDA] methods in decision-making related to the analysis of green leadership behavior in the manufacturing industry in Indonesia. Green leadership is considered crucial in reducing the negative environmental impact of manufacturing activities, especially in Indonesia, which in 2022 was recorded as the country with the highest emissions in Southeast Asia and ranked among the top 30 highest-emitting countries in the world (IQAir Report). The research sample consists of 30 respondents from various manufacturing companies listed on the Indonesia Stock Exchange. The results indicate that the lack of willingness in the manufacturing industry to implement green finance is driven by two main factors: a lack of leadership support and insufficient financial incentives. Based on these findings, it is recommended to conduct a comprehensive analysis of the Return on Investment (ROI) of green finance practices, integrate these practices into corporate business plans, and provide education and training to company leaders. Additionally, more effective communication on the benefits of green finance is needed, as well as considerations for implementing incentives and rewards, along with utilizing technology and innovation to reduce the costs of implementing green finance practices.**

Keywords: *green leadership; green finance; N-soft set; manufacturing industry; Indonesia*

I. INTRODUCTION

The growing environmental degradation in Indonesia has raised deep concerns about the sustainability of natural resources, which are vital to life. This phenomenon not only affects human quality of life but also threatens the entire ecosystem's sustainability. In this context, the corporate sector plays a highly significant role, as industrial activities are often the main contributors to environmental damage. Ironically, many companies still prioritize maximum profit without considering the environmental impact they create. A study by Gartner [1] shows that 8% of company leaders in the United States do not consider sustainability important, viewing environmental preservation as a cost burden that can reduce profits. This is illustrated in Figure I below.
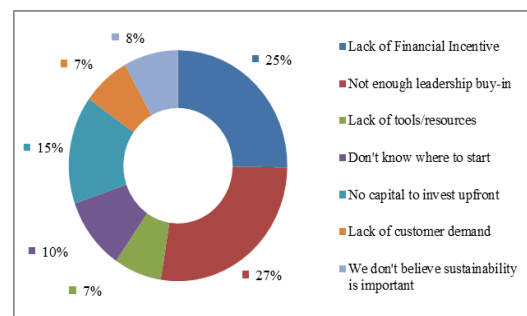

Figure I. Barriers to Sustainable Business Practice Investment

Business actor awareness of the negative impacts of production activities often only arises in response to external pressures. According to research by Bennet et al. [2], there are two main ways to encourage business awareness in building sustainability: through government policies and stakeholder pressure. In this regard, the Indonesian government has sought to promote sustainable business practices through Law No. 16 of 2016, which ratifies the Paris Agreement. This agreement

emphasizes a commitment to limit global temperature increases, adapt to climate change, and support global financing for climate-related actions.

In the framework of green finance, top management support and strong leadership are crucial to ensuring commitment to environmental issues across an organization. Darnall et al. state that success in implementing sustainability policies greatly depends on effective leadership and sufficient management support. Recent studies from Akhter et al. and Zafar et al. show that innovative leadership and high commitment from leaders can transform organizational perceptions and attitudes towards sustainability. Prasetya also highlights the importance of adaptive management in integrating sustainable practices into business strategy, which is key to building a positive corporate image and enhancing long-term performance.

A relevant approach in green finance decision-making is Multi-Criteria-Data-Analysis (MCDA), Mardani et al .[3] which provides a framework for evaluating complex criteria in dynamic situations, helping in making more informed and transparent decisions. One interesting algorithmic model in this context is N-Soft Sets, by Fatimah [4] which offer flexibility in handling uncertainty and ambiguity in data, allowing for optimized decision-making processes. This research aims to apply the N-soft set algorithm model in decision-making related to green finance [Green Financing]. The focus of this study is on how green leadership can contribute to supporting financial sustainability through an N-soft set approach, expected to offer new insights into MCDA model implementation. The novelty of this research lies in applying the N-soft set algorithm in decision-making related to green finance. Although MCDA has been applied in various decision-making contexts, the use of N-soft sets as an algorithmic model to support strategic decisions in green finance remains underexplored. Moreover, this study is expected to provide new perspectives on the importance of green leadership in supporting corporate sustainability through more effective and efficient decisions in the sustainable finance sector.

Green Leadership

Green leadership is a managerial approach that prioritizes environmental sustainability in every aspect of business operations. Green leaders are responsible for ensuring that corporate decisions, policies, and strategies always consider their environmental impact. Then Chen et al. [5] integrate green practices, such as renewable energy use, efficient waste management, and eco-friendly technology innovations, to balance business and environmental goals. Additionally, green leadership emphasizes collaboration with external stakeholders, such as policymakers and industries, to foster broader positive change. By leveraging their influence [6], these leaders not only support sustainable internal company policies but also actively contribute to public policies that favor environmental protection.

Green leadership plays a central role in encouraging proactive employee behavior towards the environment. Green leaders can create a work culture that fosters employees' commitment to green practices through clear communication and a strong sustainability vision from Pham et al. [7]. Green-oriented leadership also stimulates sustainable innovation, which not only enhances operational efficiency but also minimizes environmental impact. This includes various initiatives by Norton et al. [8], from adopting energy-saving technologies to more eco-friendly products and production processes. Thus, green leadership is not only essential within a company's internal management but also has broader impacts in promoting systemic changes toward more sustainable business practices.

Green Financing

Green finance, or sustainable finance, is an increasingly important concept within responsible environmental and social economic development. This approach emphasizes the need to consider environmental impacts in financial decision-making, promoting investments in projects that benefit ecosystems and communities. Such projects include renewable energy, energy efficiency, eco-friendly transportation, and sustainable infrastructure. According to IRENA at 2021, investing in renewable energy not only reduces carbon emissions but also creates new jobs. On the other hand, investments in energy efficiency can lower energy consumption and reduce long-term costs, as highlighted by the International Energy Agency at 2020.

Theoretically, green finance is rooted in sustainability principles and stakeholder theory, which emphasize the need to consider the interests of all parties in decision-making. This has led to the development of innovative financial instruments like green bonds, Norton et al. [7] which provide transparency and accountability in sustainable project financing. By integrating social and environmental considerations into investments, green finance is expected to be a key driver in achieving sustainable development goals while addressing global challenges like climate change and biodiversity loss from OECD 2023 and Turrentine et al.

Multi-Criteria Decision Analysis (MCDA)

Multi-Criteria Decision Analysis (MCDA) is an approach used to support decision-making in situations where multiple criteria need to be considered. In this context, MCDA provides a systematic framework that helps decision-makers select the best alternative among available options. This approach Belton et al. [9] is often applied in fields such as environmental management, product development, and transportation

planning, where trade-offs between different criteria, like cost, environmental benefits, and reliability, need to be evaluated. Mardani et al. [2] on MCDA relies on various techniques, including ranking, weighting, and value aggregation, to optimize decisions based on stakeholder preferences. Emphasizes that MCDA from Fatimah [3] is also highly relevant in the context of sustainable development, where decision-making must simultaneously consider social, economic, and environmental dimensions.

An innovative approach within MCDA is the use of N-Soft Sets, which offer a way to handle uncertainty and incomplete information. N-Soft Sets extend the fuzzy set concept by allowing more flexible and complex information modeling, particularly in situations where criteria cannot be measured precisely [10]. This approach provides advantages in complex decision-making scenarios by enabling a more dynamic analysis of criteria that can adapt to changing conditions. Fatimah [3] explains that using N-Soft Sets in MCDA can enhance decision-making effectiveness by accommodating uncertainty and improving the ability to evaluate alternatives based on conflicting criteria. By applying N-Soft Sets in MCDA [11], decision-makers can better assess alternatives based on diverse and often conflicting criteria, resulting in solutions more suited to the specific context.

State Of The Art [SOTA]

Recent studies highlight that leaders with a green orientation can drive the adoption of green financial policies that support sustainable projects, such as renewable energy, water management, and green infrastructure development from Cai et al. and Zhu et al. Furthermore, green leadership is also associated with improving corporate performance in implementing ESG principles, which not only contribute to environmental sustainability but also enhance corporate reputation and competitiveness in the global market from Prasetya. With the growing global challenges such as climate change and economic instability, green leadership in sustainable finance is becoming increasingly relevant. Green leaders must be able to manage trade-offs between short-term profitability and long-term environmental benefits, as well as collaborate with other stakeholders, such as governments, investors, and communities, to create inclusive and sustainable long-term value from Syarief et al [12] .

The state of the art in research on green leadership in the context of sustainable finance emphasizes the importance of a holistic approach to decision-making that considers economic, environmental, and social sustainability. Recent advancements in multi-criteria analysis approaches, such as N-soft set, have also made significant contributions to how green leaders can make more effective decisions in green finance by considering various interrelated factors from Prasetya.

TABLE I. STATE OF THE ART

Author	Data Analysis	Title
Mittal & Dhar (2016)	*Structural Equation Modeling [SEM]*	The Influence of Green Transformational Leadership on Green Creativity: A Study on Tourism Hotels
Ali Wahab. (2019)[13].	*Descriptive statistics*	Green Leadership as an Emerging Style to Address Climate Change Issues in Schools
Kardoyo, K., Feriady, M., Farliana, N., & Nurkhin, A. (2020)[14]	*Structural Equation Modeling [SEM]*	The Influence of Green Leadership on Environmental Policy Support
Begum, S., Xia, E., Ali, F., Awan, U. and Ashfaq, M. (2022)[15]	*Struktural Equation Modeling [SEM]*	Achieving Green Product and Process Innovation Through Green Leadership and Creative Engagement in the Manufacturing Sector
Perez & Ejaz (2023)[16]	*AMOS*	Green Transformational Leadership, GHRM, and Pro-Environmental Behavior: Effective Drivers for Environmental Performance in Small and Medium Enterprises

II. METHOD

This research employs a quantitative descriptive method to describe phenomena related to manufacturing companies in Indonesia, focusing on environmental preservation as part of sustainable development (SDGs). The research object is manufacturing companies listed on the Indonesia Stock Exchange in 2023, with a population consisting of 95 large and medium-sized enterprises.

TABLE II. SAMPLE SIZE OF THE RESEARCH

Questionnaire Status	Quantity	Percentage of Total Population [%]	Percentage of Returned Questionnaires [%]
Total Population	95	100%	-
Returned Questionnaires	46	48.4%	100%
- Incomplete	16	16.8%	34.8%

- Complete [Sample Size]	30	31.6%	65.2%
Not Returned	49	51.6%	-

Source: processed data

Data were collected from primary sources through surveys of financial managers and environmental managers, as well as secondary sources from literature such as journal articles and other publications. Conflict analysis methods are crucial in decision-making, and one approach used to address this conflict is the N-soft set model, which offers parametric flexibility, facilitating its application and assisting in meeting decision-makers' needs [3]. The soft set concept was first introduced by Molodtsov from 1999 and has continued to evolve, particularly in the context of decision-making. In this study, leadership behavior in applying sustainable finance or green financing can be analyzed using the multi-criteria decision analysis (MCDA) method with N-soft sets, to evaluate the reasons for the implementation or rejection of sustainability schemes in decision-making. Below is the problem-solving approach using N-Soft sets.
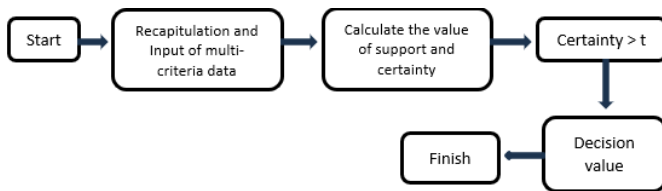

Figure II. Flowchart of the Problem-Solving Approach

The following are the steps in multi-criteria analysis using N-Soft Sets:

a. Identify Criteria: Determine the relevant criteria related to the problem at hand.

b. Measure Criteria: Establish the measurement scale for each criterion.

c. Assess Alternatives: Evaluate each alternative based on the established criteria by assigning membership values between 0 and 1. A value of 1 indicates a high fit with the criterion, while a value of 0 indicates a low fit.

d. Aggregate Criterion Values: Use aggregation methods, such as weighted averages, to combine the values of each criterion into a single overall score for each alternative. The weight of each criterion is taken into account in this process.

e. Rank Alternatives: Analyze the overall scores of each alternative for ranking, with the alternative having the highest score selected as the best. Present the materials, methods, survey, questionnaire etc. used for the study. This section should be easy enough for any reader to repeat the study under similar conditions.

III. RESULTS AND DISCUSSION

This research analyzes conflicts in real data related to green finance by applying the N-Soft Sets algorithm. Out of a total of 95 questionnaires distributed to manufacturing companies listed on the IDX, the researcher was only able to collect complete data from 30 respondents [n]. The respondents who provided feedback on the implementation of sustainable finance revealed reasons for their reluctance to adopt green finance, symbolized as U = {ui}, where i = 1, 2, 3, ..., 30. These reasons include a lack of financial incentives, insufficient support from leadership, confusion about how to get started, limitations in investment funds, and doubts about the importance of sustainable business practices. Based on this, these reasons are used as parameters to measure the implementation of sustainable finance, detailed as follows:

- a1 indicates a lack of financial incentives

- a2 indicates insufficient leadership support

- a3 indicates a lack of understanding on how to start

- a4 indicates a lack of funds for investment

- a5 indicates disbelief in the importance of sustainable business

These parameters are evaluated or analyzed by assigning a star rating with the following explanations:

- * means strongly disagree

- ** means disagree

- *** means neutral

- **** means agree

- ***** means strongly agree

The results of the evaluation of the reluctance to implement sustainable finance from the respondents' perspectives are presented in the following table:

No.	a1	a2	a3	a4	a5
25.	**	****	*****	**	**
26.	****	****	**	**	***
27.	***	*	****	**	*
28.	**	***	***	**	*
29.	***	**	***	*	**
30.	***	***	**	**	**

Based on the evaluation results, an analysis was then conducted with the following steps:

a. **Input N-Soft Sets**

The responses in Table 3 were converted into numerical form by assigning values as follows: "strongly disagree" as 1, "disagree" as 2, "neutral" as 3, "agree" as 4, and "strongly agree" as 5. This means $N=5N = 5N=5$, resulting in a 5-soft set with responses from 30 participants, as shown in Table 4.

TABLE IV. N-SOFT SET

No.	a1	a2	a3	a4	a5
1.	2	3	3	4	3
2.	2	2	5	3	3
3.	4	2	3	4	1
4.	4	4	4	3	3
5.	3	4	4	4	3
6.	4	3	5	3	3
7.	4	4	5	4	4
8.	4	4	5	4	1
9.	3	4	4	2	4
10.	3	4	3	4	4
11.	3	2	1	4	4
12.	2	4	4	2	1

TABLE III. ASSESSMENT OF RELUCTANCE TOWARDS SUSTAINABLE FINANCE

No.	a1	a2	a3	a4	a5
1.	**	***	***	****	***
2.	**	**	*****	***	***
3.	****	**	***	****	**
4.	****	****	****	***	***
5.	***	****	****	****	***
6.	****	***	*****	***	***
7.	****	****	*****	****	****
8.	****	****	*****	****	***
9.	***	****	****	**	****
10.	***	****	***	****	****
11.	***	**	*	****	****
12.	**	****	****	**	**
13.	*****	**	****	***	***
14.	****	****	*****	****	***
15.	****	*	****	***	*
16.	***	****	***	**	****
17.	****	****	**	***	*****
18.	**	****	***	****	**
19.	****	****	*	***	****
20.	***	****	***	**	**
21.	****	****	****	****	*
22.	***	*****	****	**	***
23.	****	**	****	*	***
24.	****	****	*****	***	*

13.	5	2	4	3	3
14.	4	4	5	4	3
15.	4	1	4	3	1
16.	3	4	3	2	4
17.	4	4	2	3	5
18.	2	4	3	4	2
19.	4	4	1	3	4
20.	3	4	3	2	2
21.	4	4	4	5	1
22.	3	5	4	2	3
23.	4	2	4	1	3
24.	4	4	5	3	1
25.	2	5	5	2	2
26.	4	4	2	2	3
27.	3	1	4	2	1
28.	2	3	3	2	1
29.	3	2	3	1	2
30.	3	3	2	2	2

Calculating Support

Support is the count of set members that meet a particular criterion, or in other words, its cardinality. $Supp_{rx}[a_j] = card [\{a_j \varepsilon A: F[a_j][u] = r_x\}]$, where a_j represents each ranking and $r_x \varepsilon R$, $x = 1,2,3,...N$.

For example:

$r_1 = 1$ is $Supp_1[a_1] = card [\{a_1 \varepsilon A: F[a_1][u] = 1\}]$

$= card [0] = 0$

$r_2 = 2$ is $Supp_2[a_1] = card [\{a_1 \varepsilon A: F[a_1][u] = 2\}]$

$= card [u_1, u_2, u_{12}, u_{18}, u_{25}, u_{28}] = 6$

$r_3 = 3$ is $Supp_3[a_1] = card [\{a_1 \varepsilon A: F[a_1][u] = 3\}]$

$= card [u_5, u_9, u_{10}, u_{11}, u_{16}, u_{20}, u_{22},$

$u_{27}, u_{29}, u_{30}] = 10$

$r_4 = 4$ is $Supp_4[a_1] = card [\{a_1 \varepsilon A: F[a_1][u] = 4\}]$

$= card [u_3, u_4, u_6, u_7, u_8, u_{14}, u_{15},$

$u_{17}, u_{19}, u_{21}, u_{23}, u_{24}, u_{26}] = 13$

$r_5 = 5$ is $Supp_5[a_1] = card [\{a_1 \varepsilon A: F[a_1][u] = 5\}]$

$= card [u_{13}] = 1$

The results of the Support calculation can be written as follows:

- Support a_1: $supp_1 [a_1] = 0$

$supp_2 [a_1] = 6$

$supp_3 [a_1] = 10$

$supp_4 [a_1] = 13$

$supp_5 [a_1] = 1$

- Support a_2: $supp_1 [a_2] = 2$

$supp_2 [a_2] = 6$

$supp_3 [a_2] = 4$

$supp_4 [a_2] = 16$

$supp_5 [a_2] = 2$

- Support a_3: $supp_1 [a_3] = 2$

$supp_2 [a_3] = 3$

$supp_3 [a_3] = 8$

$supp_4 [a_3] = 10$

$supp_5 [a_3] = 7$

- Support a_4: $supp_1 [a_1] = 2$

$supp_2 [a_1] = 10$

$supp_3 [a_1] = 8$

$supp_4\ [a_1] = 9$

$supp_5\ [a_1] = 1$

- *Support* a_5: $supp_1\ [a_1] = 8$

$supp_2\ [a_1] = 5$

$supp_3\ [a_1] = 10$

$supp_4\ [a_1] = 6$

$supp_5\ [a_1] = 1$

Calculating Certainty
Certainty is calculated using the formula:

$cer_{rx}\ [a_j] = supp_{rx}[a_j]\ /\ |u_i|$

As explained above, U represents the total number of respondents, so $|u_i| = 30$. Therefore, the certainty calculation for parameter a1 at each rating level is performed as follows:

- $cer_1\ [a_1] = [supp_1\ [a_1]]\ /\ |u_i| = 0\ /\ 30 = 0{,}000$

- $cer_2\ [a_1] = [supp_2\ [a_1]]\ /\ |u_i| = 6\ /\ 30 = 0{,}200$

- $cer_3\ [a_1] = [supp_3\ [a_1]]\ /\ |u_i| = 10\ /\ 30 = 0{,}333$

- $cer_4\ [a_1] = [supp_4\ [a_1]]\ /\ |u_i| = 13\ /\ 30 = 0{,}433$

- $cer_5\ [a_1] = [supp_5\ [a_1]]\ /\ |u_i| = 1\ /\ 30 = 0{,}033$

Hasil perhitungan *certainty* dapat dilihat sebagai berikut:

- *Certanty* a_1: $cer_1\ [a_1] = 0{,}000$

$cer_2\ [a_1] = 0{,}200$

$cer_3\ [a_1] = 0{,}333$

$cer_4\ [a_1] = 0{,}433$

$cer_5\ [a_1] = 0{,}033$

- *Certainty* a_2: $cer_1\ [a_2] = 0{,}067$

$cer_2\ [a_2] = 0{,}200$

$cer_3\ [a_2] = 0{,}133$

$cer_4\ [a_2] = 0{,}533$

$cer_5\ [a_2] = 0{,}067$

- *Certainty* a_3: $cer_1\ [a_3] = 0{,}067$

$cer_2\ [a_3] = 0{,}100$

$cer_3\ [a_3] = 0{,}267$

$cer_4\ [a_3] = 0{,}333$

$cer_5\ [a_3] = 0{,}233$

- *Certainty* a_4: $cer_1\ [a_1] = 0{,}067$

$cer_2\ [a_1] = 0{,}333$

$cer_3\ [a_1] = 0{,}267$

$cer_4\ [a_1] = 0{,}300$

$cer_5\ [a_1] = 0.033$

- *Certainty* a_5: $cer_1\ [a_1] = 0{,}267$

$cer_2\ [a_1] = 0{,}167$

$cer_3\ [a_1] = 0{,}333$

$cer_4\ [a_1] = 0{,}200$

$cer_5\ [a_1] = 0{,}033$

The results of the support and certainty calculations are summarized in Table 5 as follows:

TABLE V. RESULTS OF SUPPORT AND CERTAINTY CALCULATIONS

No.	Deskripsi	*Support*	*Certainty*
1.	F,a^1_1	0	0,000
2.	F,a^2_1	6	0,200
3.	F,a^3_1	10	0,333
4.	F,a^4_1	13	0,433
5.	F,a^5_1	1	0,033
6.	F,a^1_2	2	0,067
7.	F,a^2_2	6	0,200

8.	F,a^3_2	4	0,133
9.	F,a^4_2	16	0,533
10.	F,a^5_2	2	0,067
11.	F,a^1_3	2	0,067
12.	F,a^2_3	3	0,100
13.	F,a^3_3	8	0,267
14.	F,a^4_3	10	0,333
15.	F,a^5_3	7	0,233
16.	F,a^1_4	2	0,067
17.	F,a^2_4	10	0,333
18.	F,a^3_4	8	0,267
19.	F,a^4_4	9	0,300
20.	F,a^5_4	1	0,033
21.	F,a^1_5	8	0,267
22.	F,a^2_5	5	0,167
23.	F,a^3_5	10	0,333
24.	F,a^4_5	6	0,200
25.	F,a^5_5	1	0,033

Decision

With a certainty threshold $t=0.358t = 0.358t=0.358$, only cer4[a2] and cer4[a1] exceed this threshold, with values of 0.533 and 0.433, respectively. Parameter a_2 indicates insufficient leadership support, while parameter a_1 indicates a lack of financial incentives. The index 4 represents a four-star rating [****], meaning agree.

Empirical evidence of the application of N-Soft Sets in green finance analysis indicates that a lack of leadership support and financial incentives are two primary barriers. The calculations reveal that parameters cer4[a2] and cer4[a1] have values above the certainty threshold [0.533 and 0.433], indicating that the majority of respondents agree these factors significantly hinder the implementation of green finance. In a business context, strong leadership is essential to drive organizational change aligned with sustainability goals. A study by Jia et al. [17] demonstrates that in countries such as China and the United States, leadership support influences corporate engagement in green practices and carbon reduction efforts. Meanwhile, the lack of financial incentives has proven to be a significant obstacle for the private sector in adopting green finance practices.

A Mighini et al. [18] highlight that the private sector is reluctant to invest in green projects without adequate incentives, such as subsidies or tax breaks. This is echoed in the findings of, which emphasize the importance of incentive schemes to help companies adopt clean technologies and renewable energy. Although green investments hold long-term profit potential, many companies remain concerned about high initial costs in the absence of sufficient financial support.

In Indonesia, barriers to implementing sustainable finance include a lack of commitment from corporate leaders, inadequate fiscal incentives, and challenges in understanding and applying regulations such as POJK No. 51 [19] and POJK No. 60 [20]. Despite the presence of these regulations, sustainability initiatives are often overlooked without active top management support, and allocated resources remain minimal. Furthermore, the fiscal incentives offered are perceived as insufficient to stimulate investment in green projects. Presidential Regulation No. 98 on Carbon Economic Value [21], aimed at introducing carbon trading as an incentive, also faces challenges due to limited understanding and dissemination among organizational leaders. Infrastructure limitations and restricted access to green technologies further complicate efforts to establish effective sustainable finance practices in Indonesia. Thus, collaboration among the government, private sector, and society is crucial to creating an ecosystem that supports sustainability.

IV. CONCLUSIONS

The application of N-Soft Sets in green finance analysis empirically identifies a lack of leadership support and financial incentives as key barriers to implementation. In a business context, strong leadership and adequate financial incentives are essential to drive sustainability transitions. Studies from various countries also highlight the significant influence of leadership and financial incentives on adopting green practices. In Indonesia, despite existing sustainable finance regulations, implementation remains constrained by insufficient leadership commitment, inadequate fiscal incentives, and limited understanding of regulations.

These findings enrich the literature on the application of N-Soft Sets in green finance by demonstrating that leadership and financial incentives are crucial elements in implementing sustainable finance. This supports prior theories linking leadership to the successful adoption of green practices, emphasizing the role of leader motivation and commitment in driving corporate sustainability transformations. Furthermore, the concept of financial incentives as a catalyst for implementing environmentally friendly innovations is reinforced, especially in the context of developing countries like Indonesia.

For managers and corporate leaders, these results highlight the need for strong leadership commitment to promote the implementation of green finance. Proactive leadership that supports green policies and allocates sufficient resources can serve as a catalyst for organizational change. Additionally, it is crucial for managers to understand and leverage government-offered incentives or regulations to mitigate the high initial costs associated with green investments. Socialization programs and training related to sustainability regulations and green technologies can further strengthen this commitment and enhance awareness and adoption of sustainable financial practices within the business environment.

This study has several limitations. First, the use of N-Soft Sets as an analytical tool has limitations in capturing the complex social and political dynamics related to green finance implementation. Second, the study's scope may not be broad enough to cover all industrial sectors in Indonesia, which exhibit varying levels of green finance adoption. Moreover, the study is limited to respondents with a basic understanding of green finance, which may not reflect the broader perspectives of all industry players.

Future studies could delve deeper into the impact of leadership and financial incentives on the successful implementation of green finance using qualitative approaches to explore the social and cultural factors involved. Subsequent research could also utilize larger samples and include various industrial sectors to gain a more comprehensive understanding of green finance adoption in Indonesia. Additionally, analyses of government support and additional incentive policies, including sustainability regulation socialization programs, should be considered to provide better insights for the development of sustainable finance policies.

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