Innovative Approaches to Green Strategy Formulation with a Novel Hybrid AI-Spherical Fuzzy Framework

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***Abstract*—This study aims to establish prioritized strategies for businesses to adopt green strategies. In this framework, literature-based criteria are analyzed through a three-stage model. In the first stage of the analysis, an artificial intelligence (AI)-based decision matrix is created. In the second stage, factors affecting green business strategies are weighted by the Spherical Fuzzy (et SF) Entropy method. In the last stage, the strategies are ranked using the SF ARAS method. The novelty of this study is the integration of AI with SF numbers. Expert opinions can be evaluated by AI with different coefficients according to the knowledge level and experience of the experts. The AI-based decision matrix enables expert weights to differ according to factors such as experience. The findings show that the most important criterion is cost efficiency (weight: 0.2219). According to the analysis results, investments in clean energy projects have a positive impact on this process (Ki:0.9799).**

Keywords*—*Artificial intelligence; fuzzy decision-making; spherical fuzzy sets; ARAS; Entropy; green strategy

I. Introduction

Business methods and policies carried out by businesses for sustainability, environmental responsibility, and protection of ecological balance are called green strategies [1]. The main purpose of green strategies is to act by the principles of sustainability and optimize economic, social, and environmental benefits. In addition, reducing the carbon footprint and using natural resources more efficiently are important contributions of green strategies [2]. Also, increasing consumer awareness leads to a shift in customer expectations towards products that contribute to the environment. Therefore, it is necessary to adapt to green strategies to meet changing customer expectations [3]. Besides, government sanctions on environmental issues are also increasing. The business needs to pay attention to legal issues to continue production. Green strategies also contribute to cost savings and increase the brand value of the business [4].

However, there are many challenges for businesses to implement green strategies. These challenges need to be minimized for businesses to adopt green strategies. First, businesses need to consider market conditions. The change in consumer preferences over time also affects the products produced in the market. It should not be ignored that this change is towards environmentally friendly products [5]. Apart from this, cost efficiency is an important issue for businesses. Green strategies support energy efficiency, waste reduction, and reduced resource use. Therefore, even though the prevailing view is that green strategies increase costs in the first place, they contribute to cost efficiency in the long run [6]. Furthermore, legal restrictions on environmental sustainability are increasing day by day. Businesses need to comply with legal restrictions to avoid penalties and sanctions. Additionally, tax breaks, grants, and low-interest loans for green projects make it easier for businesses to adopt green strategies [7]. Finally, green strategies contribute to environmental sustainability and provide businesses with the opportunity to innovate and gain a competitive advantage [8].

Businesses need to adopt green strategies in terms of both sustainability and the environment. However, there are many factors affecting the adoption of green strategies by businesses. Managers cannot intervene in all these factors at the same time in terms of labor and economic terms. For example, investments in green-oriented technology may need to be increased to meet customer expectations. This indirectly contributes to the development of green innovation. Limited studies are addressing this issue in the literature. The studies mostly emphasize the importance of green strategies. Therefore, there is a need for a study that prioritizes the adoption of green strategies by businesses. With the help of this issue, the investors can take their strategic investment decisions in a more efficient way.

Accordingly, this study aims to evaluate the indicators affecting the green strategy adoption of organizations. The research question of this study is to identify the optimal strategies for businesses to adopt green strategies with an AI-based approach. For this purpose, a 3-stage analysis is conducted. In the first stage, an artificial intelligence-based decision matrix is created. In the second part, weighting is performed with the SF Entropy method. In the third section, the SF ARAS method is used to rank. In addition, SF numbers are used to minimize uncertainty. The main motivation for this study is the need for a new model. When the models used in the literature are examined, it is seen that expert opinions are taken equally. This situation is criticized by many authorities. This is because experts have different levels of accumulation on many

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points, such as experience and knowledge. Therefore, experts should be weighted according to these factors. With the AI model, this deficiency has been tried to overcome.

The main contributions of this manuscript are given below: 1) The equalization of expert weights in multi-criteria decision-making models has been criticized. Therefore, expert opinions should have different weights according to factors such as experience. Accordingly, the integration of AI and multi-criteria decision-making is important. 2) SF number sets cover more uncertainty than other fuzzy number sets. The SF number set incorporates the third component, hesitancy, into the analysis process. Therefore, the uncertainty in linguistic expressions is more inclusive than in other number sets. Thus, the analysis is performed on SF number sets. 3) The entropy method is considered an objective method among the weighting methods of multi-criteria decision-making techniques. Other weighting methods, such as DEMATEL and AHP, are subjective methods. Accordingly, the analysis process in these methods is based on binary comparisons. In the analysis with Entropy, the uncertainty within the criteria is also considered. This makes the Entropy method more superior to other methods. 4) Among the ranking methods used in the literature, such as TOPSIS, MAIRCA, and VIKOR, consider the metric distance to the optimal value. Since the expert opinion methods in the literature have an ordinal structure, the metric distance to the optimal value is criticized. The ARAS method, on the other hand, considers the similarity ratio to the optimal value instead of the metric distance in the analysis process. Therefore, using the ARAS method is a more reasonable option.

The following sections of the study provide details of the literature review, methodology, analysis results, discussion, and conclusion.

II. Literature Review

One of the most important reasons affecting the green strategy implementation of businesses is the cost efficiency of strategies [9]. Green strategy implementations aim to ensure energy efficiency. Accordingly, it is possible to achieve energy efficiency with green strategies [4]. Apart from that, green strategies also reduce the use of materials. In this way, it is possible to achieve resource efficiency for businesses [10]. Although green strategies are thought to increase operating costs in the first place, they provide cost efficiency to businesses in the long run. Zhen and Yu [11] conducted a study to develop green strategies for the recycling of electric vehicle batteries. It is argued that green initiatives should be increased despite the high cost of batteries in the recycling process. Rani et al. [12] discussed green strategies for converting agricultural waste into sustainable energy. It is underlined that green strategies are the most cost-effective way to get rid of waste. Liu et al. [13] and Yang et al. [14] emphasized the importance of cost in green strategy development processes.

Another important factor affecting green strategy processes is innovative practices [15]. Green strategies are the basis for developing environmentally friendly products and services. Therefore, the business endeavors to develop innovative products [10]. Apart from this, businesses that adopt green strategies can also pave the way for technological innovations. Some of these technologies include prioritizing renewable energy technologies, waste management, and recycling technologies [16]. Le et al. [17] examined the mediating role of green innovation in the relationship between corporate sustainability and corporate social responsibility in small-medium enterprises in Vietnam. It is emphasized that innovative ventures positively affect the process. Bhat et al. [18] investigated the impact of green strategies and innovation on environmental performance. The results of the study with 500 respondents from 10 industrial organizations in Delhi show that green strategies and innovative approaches have a significant impact on performance.

Legal regulations are another important criterion affecting the adoption of green strategies by businesses [19]. Businesses must comply with the regulations of their environment [20]. Accordingly, measures such as reducing carbon emissions and acting against air and water pollution are taken. In addition, encouraging environmentally friendly practices through legislation facilitates the transition of businesses to green strategy practices [21]. Chen et al. [22] conducted a study to develop green business strategies through environmental regulation. The results of the study show that environmental regulations make companies adopt green business strategies. Zhang et al. [23] examined how environmental regulations affect green technology innovation in enterprises. It is emphasized that environmental regulations contribute positively to the process when they are properly coordinated. Xu et al. [24] state that the right legal regulations encourage green strategies.

Market conditions are another important factor affecting the orientation of businesses towards green strategies [25]. One of the significant factors determining market conditions is consumer demand. If consumer demands focus on environmentally friendly products and services, the business needs to meet these demands [8]. In addition, understanding environmentally friendly products and services increases customer loyalty. This provides a competitive advantage against competitors in the market. Therefore, green strategy practices allow businesses to adapt to market conditions more easily [26]. Agyeman and Lin [27] examined the impact of market conditions on innovation in the electricity industry. It is stated that market conditions significantly shape the electricity industry. Chen et al. [28] analyzed the green and digital transition processes of manufacturing companies. It is indicated that customer demands are an important part of this transition process.

The results of the literature review are given below. Green strategies provide businesses with many advantages, such as competitive advantage, cost savings, innovation, and customer satisfaction. However, there are many barriers to the transition of businesses to green strategies. In addition, businesses cannot address all these barriers at the same time. Intervening with all these barriers at the same time creates extra costs for the business. Apart from the cost, it requires a huge amount of labor and a great deal of time. Accordingly, it would be appropriate to determine the importance of these barriers by weighing them. However, the number of studies addressing this issue is quite limited. This study aims to determine the most important strategies for the transition of enterprises to green strategy practices. In this context, an analysis is conducted with SF Entropy and SF ARAS methods-based SF sets.

III. Methodology

A three-stage model is proposed for the selection of a green business strategy, which is the aim of the study. The First stage is about creating an artificial intelligence-based decision matrix. In the Second stage, factors effective in green business strategy are weighted with the SF Entropy method. In the Third stage, strategies are ranked using the SF ARAS method. Since SF ARAS methods are multi-criteria decision-making methods based on expert opinions, SF numbers are used to include the uncertainty in linguistic expressions in the analysis. Additionally, the differences in experts' experiences and knowledge levels are included in the analysis using the AI model. In other words, AI systems are used to obtain the decision matrix from expert opinions. The steps of the proposed three-stage model are summarized in Fig. 1.

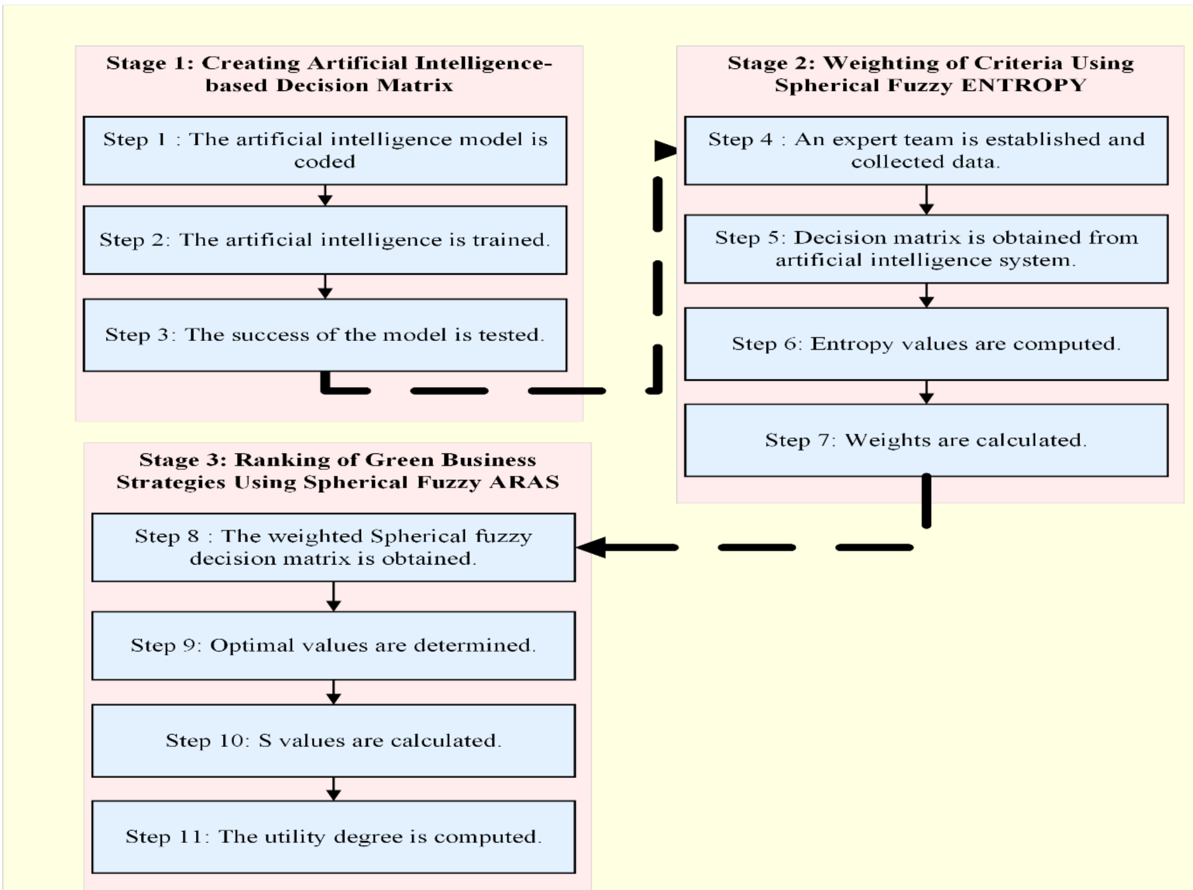

Fig. 1. Process of methodology.

Details of the mathematical steps of the methods are presented as subtitles.

A. *Artificial Intelligence-Based Decision Matrix*

With the AI system, the decision matrix is constructed by establishing a nonlinear and complex structure. Thus, experience periods can be added as a non-linear component in the process of obtaining an SF decision matrix from experts' linguistic expressions.

In Step 1, the AI model is coded in the Python software language. Layers, activation functions, neuron numbers, optimization algorithm and loss functions are defined with the help of Keras and TensorFlow libraries [29]. While the number of layers is determined as 7, 5 of them are determined as hidden layers. Additionally, 64 neurons are defined in each layer. Among the activation functions, the Sigmoid function given in Eq. (1) is preferred since its definition range is between 0 and 1. Thus, the definition range of fuzzy numbers is preserved.

$$S(x) = \frac{1}{1+e^{-ax}} \tag{1}$$

Adam Algorithm, which provides high efficiency in small data, is preferred as the optimization algorithm [29]. The stages of the Adam algorithm are given in Eq. (2) to Eq. (6):

$$W_{t+1} = W_t - \frac{a}{\sqrt{\hat{S}_t+\epsilon}}\hat{V}_t \tag{2}$$

$$\hat{V}_t = \frac{V_t}{1-\beta_1^t} \tag{3}$$

$$\hat{S}_t = \frac{S_t}{1-\beta_2^t} \tag{4}$$

$$V_t = \beta_1 V_{t-1} + (1-\beta_1)\frac{\partial L}{\partial w_t} \tag{5}$$

$$S_t = \beta_2 S_{t-1} + (1-\beta_2)\left[\frac{\partial L}{\partial w_t}\right]^2 \tag{6}$$

where, a demonstrates learning coefficient, w gives information about the weight, β indicates the degree to which past gradients are involved in the process and ∂L/∂wt refers to the gradient. S and V are also randomly determined initial values. Step 2 involves training the coded artificial intelligence. Expert opinions and experiences are generated randomly with the help of simulation. Then, the output variable is obtained with Eq. (7) and Eq. (8). The linguistic variables used in expert opinions are detailed in Table III (Appendix).

$$SWAM = \left\{[1 - \prod_{i=1}^{n}(1-\mu_i^2)^{w_i}]^{\frac{1}{2}}, \prod_{i=1}^{n} v_i^{w_i}, [\prod_{i=1}^{n}(1-\mu_i^2)^{w_i} - \prod_{i=1}^{n}(1-\mu_i^2-\pi_i^2)^{w_i}]^{\frac{1}{2}}\right\} \quad (7)$$

$$w_i = \frac{d_i}{\sum_{i=1}^{n} d_i} \quad (8)$$

In Eq. (7) and Eq. (8), the variable d represents the expert's years of experience, while μ, v, and π values signify the membership degree, non-membership degree, and hesitancy degree of the SF number, respectively. Then, machine learning is achieved by using input and output variables. Linguistic variables are explained in Table III [30].

Machine learning is performed with the specified iteration (epoch). In Step 3, the success of the model is tested as a result of machine learning. The MSE value given by Eq. (9) is calculated. The value in question must be close to 0.

$$MSE = \frac{1}{m}\sum_{i=1}^{m}(Y_i - \hat{Y}_i)^2 \quad (9)$$

B. Spherical Fuzzy Entropy

In Step 4, an expert team is established with 3 people. Experience and evaluations are collected from experts. In Step 5, a SF decision matrix (D) in Eq. (10) is obtained from the AI system with the data collected from experts.

$$D = \begin{bmatrix} \langle \mu_{11}, v_{11}, \pi_{11}\rangle & \cdots & \langle \mu_{1n}, v_{1n}, \pi_{1n}\rangle \\ \vdots & \ddots & \vdots \\ \langle \mu_{m1}, v_{m1}, \pi_{m1}\rangle & \cdots & \langle \mu_{mn}, v_{mn}, \pi_{mn}\rangle \end{bmatrix} \quad (10)$$

Step 6 is about computing the SF Entropy value (E) using Eq. (11):

$$E_j = \frac{1}{n}\sum_{i=1}^{n}\left(1 - \frac{4}{5}\left[\left|\mu_{ij}^2 - v_{ij}^2\right| + \left|\pi_{ij}^2 - 0.25\right|\right]\right) \quad (11)$$

In Step 7, criterion weights (w) are calculated with Eq. (12):

$$w_j = \frac{1-E_j}{\sum_{j=1}^{m} 1-E_j} \quad (12)$$

C. Spherical Fuzzy ARAS

In Step 8, considering the SF decision matrix in Eq. (10), the weighted SF decision matrix is obtained with Eq. (13) and Eq. (14). The weighted SF decision matrix is shared in Eq. (15).

$$X = w.D \quad (13)$$

$$w\widetilde{D}_s = \begin{Bmatrix} \left(1 - \left(1 - \mu_{\widetilde{D}_s}^2\right)^w\right)^{\frac{1}{2}}, \\ v_{\widetilde{D}_s}^{\lambda}, \left(\left(1 - \mu_{\widetilde{D}_s}^2\right)^w - \left(1 - \mu_{\widetilde{D}_s}^2 - \pi_{\widetilde{D}_s}^2\right)^w\right)^2 \end{Bmatrix} \quad (14)$$

$$X = \begin{bmatrix} \langle X\mu_{11}, Xv_{11}, X\pi_{11}\rangle & \cdots & \langle X\mu_{1n}, Xv_{1n}, X\pi_{1n}\rangle \\ \vdots & \ddots & \vdots \\ \langle X\mu_{m1}, Xv_{m1}, X\pi_{1m1}\rangle & \cdots & \langle X\mu_{mn}, Xv_{mn}, X\pi_{mn}\rangle \end{bmatrix} \quad (15)$$

Step 9 involves determining the optimal values. For benefit criteria, the largest value in Eq. (16) is taken, while for cost criteria, the smallest value is determined as the optimal value.

$$core = (\mu - \pi)^2 - (v - \pi)^2 \quad (16)$$

In Step 10, the optimality values (S) of each alternative and the optimal solution are calculated with Eq. (17). Then, these values are defuzzied with Eq. (16).

$$\tilde{S}_{Si} = \sum_{i=1}^{m}\left((\mu_1, v_1, \pi_1) + (\mu_2, v_2, \pi_2) + \cdots + (\mu_m, v_m, \pi_m)\right) \quad (17)$$

In Step 11, the utility degree (Ki) is computed by Eq. (18):

$$K_i = \frac{S_i}{S_0} \quad (18)$$

In this equation, Si is the S value of the ith alternative, while S0 is the S value of the optimal value.

IV. Analysis Results

Seven criteria influencing five green business strategies are identified from the literature. An analysis is performed that includes weighting these criteria and ranking the strategies. The results of the analysis made with the 3-stage proposed model are shared under subtitles.

A. Creating AI-Based Decision Matrix

In Step 1, the AI model is coded using Eq. (1) to Eq. (6) on Python software. Here, the Sigmoid function suitable for fuzzy set theory is preferred. Additionally, a structure with 5 hidden layers with 64 neurons each is constructed. The Adam algorithm is used to optimize the structure of the AI model. In Step 2, the AI model is trained. For this purpose, 1000 expert opinions and experience periods are randomly obtained with the simulation technique. Then, the output variable is obtained using Eq. (7) and Eq. (8). Machine learning is performed via input-output variables in 100 epochs. The results of the loss function for the last 20 epochs are given in Table IV (Appendix).

In Step 3, the learning success of the model is tested using Eq. (9). The MSE value of the AI model with all data is calculated as 0.02. Since the value is very close to 0, it is stated that the model is successful.

B. Weighting of Criteria Using Spherical Fuzzy Entropy

Step 4 is about establishing the expert team and obtaining their opinions. A team consisting of senior managers with 19, 23, and 21 years of field experience is established. Experts' opinions are tabulated in Table V (Appendix).

Step 5 covers obtaining the SF decision matrix from the AI system. Table III and the experience periods of the expert team are given to the model as input. Based on the inputs, D in Eq. (10) is estimated with AI model. D values are presented in Table VI (Appendix).

In Step 6, the SF Entropy value of each criterion is computed using Eq. (11). In Step 7, the weights of the criteria are calculated using Eq. (12). The results are summarized in Table I.

TABLE I. ENTROPY VALUES AND WEIGHTS OF CRITERIA

Criteria	SF Entropy	Weights
MARKET	.4650	.1600
COST	.2581	.2219
ORGANIZATION	.5666	.1296
LAW	.6399	.1077
GOVERMENT	.7210	.0834
PUBLIC	.7311	.0804
INNO	.2745	.2170

According to Table I, the weight value for the Cost Efficiency criterion is 0.2219. Since this value is the greatest value, it has the most important role in determining green business strategies. The second criterion in determining green business strategies is Innovative.

C. Ranking of Green Business Strategies Using Spherical Fuzzy ARAS

The SF ARAS method is performed with the values in Table IV. In Step 8, the weighted SF decision matrix is calculated using Eq. (13) to Eq. (15). Table VII (Appendix) exhibits the values of the weighted SF decision matrix.

Step 9 involves determining the optimal values. Score values are obtained with Eq. (16). Since the criteria are beneficial, the SF value of the alternative corresponding to the largest score values is determined as the optimal value. In Step 10, the S values of each alternative and the optimal value are computed. All S values are defuzzified with Eq. (16). In Step 11, criterion weights are calculated with Eq. (18). The utility degree values are given in Table II.

TABLE II. THE UTILITY DEGREE VALUES

Alternatives	Si			Kİ
Limiting Saving	.881	.118	.129	.304
Pollution Prevention	.670	.365	.235	.376
Product Stewardship	.755	.255	.292	.203
Clean Energy Investment-Project	.631	.402	.265	.979
Corporate Social Responsibility	.875	.125	.130	.410

According to the Ki values in Table II, the alternative with the highest value was determined as Clean Energy Investment - Projects. In other words, the most appropriate green business strategy has been determined as businesses that support clean energy investments and projects. The second alternative in the ranking is corporate social responsibility. The last strategy is product stewardship. Because the lowest Ki value belongs to this strategy.

V. DISCUSSION

The results of the analysis show that cost efficiency is the most important criterion affecting the enterprises' tendency towards green strategies. Cost efficiency shows how effectively an enterprise uses its resources in the production process. Green strategies also aim to contribute to the sustainability of the business by using fewer resources. In addition, green strategies contribute to cost efficiency as they include processes such as energy saving, waste management, and recycling. Panda [1] examined the interaction between the concepts of green identity and green strategy. The results of the study conducted in India show that costs have a significant impact on both green strategies and green identity. Nersesian et al. [31] propose a model for supply chains to reduce the carbon emissions of firms. While it is argued that green strategies should be adopted to reduce carbon emissions, it is also stated that costs should be considered.

Innovation is found to be the second most important criterion affecting the integration of businesses into green processes. Businesses need to respond to changing customer demands. Changing customer demands focus on more environmentally friendly and sustainable products and services. Therefore, it is important to produce innovative products and services to meet these demands. Accordingly, innovation power is seen as an important factor for businesses to integrate into green strategies. Piwowar-Sulej et al. [32] examined the link between internal communication, organizational culture, and environmental strategies. It is argued that the implemented environmental strategies should be innovative. Lafuente and Vaillant [33] carried out the relationship between green orientation and innovation. The results of the study conducted through 734 firms from OECD countries show that green orientation has an increasing effect on innovation.

The results of the analysis show that the most supportive aspect of green strategy development is investing in clean energy projects. Investing in clean energy projects provides a number of advantages to businesses. These advantages include reducing energy costs, reducing carbon emissions, increasing sustainability and improving brand reputation. Therefore, it can be said that investing in clean energy projects is an important green strategy. Chung et al. [34] examined the impact of having a renewable energy certificate on firm value. The results of the study conducted in Taiwan show that green strategies and renewable energy investments are parallel. Kumar et al. [35] stated that renewable energy investments and green strategy implementations are related.

VI. CONCLUSION

This study aims to develop a prioritized strategy for businesses to adopt green strategies. In this context, literature-based criteria affecting the adoption of green strategies by businesses are identified. The decision matrix of these factors is created with an artificial intelligence-based approach. SF ARAS and SF Entropy approaches are used to weight the criteria. Cost efficiency is the criterion with the highest weight. Also, investing in clean energy projects contributes significantly to this process. In addition, although investing in clean energy projects is seen as costly, it provides significant contributions in the long run.

The main novelty of this work is the integration of AI with fuzzy decision-making methodology. In this way, expert weights can be differentiated according to factors such as experience. Another novelty of this study is that it presents a set of criteria that influence businesses to adopt green strategies. However, the main theoretical limitation is that the assessment in this study is made with all businesses in mind. Future studies could be conducted in the health, automobile, or banking sectors. This would allow different sectors to be compared with each other. One of the limitations of this study is that the analysis is carried out with non-numerical data. The use of multi-criteria decision-making techniques based on expert opinions in the analysis process is the main limitation of this study. In future studies, it is recommended to perform the analysis with an econometric model using numerical data. The proposed model also same limitation. ARAS method does not calculate with the distance metric. This leads to a departure from the optimal value. Therefore, it has been highly criticized in the literature. There is a need to develop new ranking technique that take these criticisms into account.

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APPENDIX

TABLE III. LINGUISTIC VARIABLES

	μ	**v**	**π**
1 (Absolutely low importance -ALI)	.1	.9	.1
2 (Very low importance-VLI)	.2	.8	.2
3(Low importance-LI)	.3	.7	.3
4 (Slightly low importance-SLI)	.4	.6	.4
5 (Equally importance-EI)	.5	.5	.5
6 (Slightly more importance-SMI)	.6	.4	.4
7 (High importance-HI)	.7	.3	.3
8 (Very high importance-VHI)	.8	.2	.2
9 (Absolutely more importance-AMI)	.9	.1	.1

TABLE IV. THE VALUES OF LOSS FUNCTION OF LAST 20 EPOCHS

Epoch	**MSE**
81	.15
82	.04
83	.03
84	.08
85	.14
86	.1
87	.08
88	.12
89	.11
90	.15
91	.09
92	.07
93	.06
94	.07
95	.14
96	.03
97	.15
98	.13
99	.12
100	.05

TABLE V. EXPERT'S OPINIONS

Expert 1							
	MARKET	**COST**	**ORGANIZATION**	**LAW**	**GOVERMENT**	**PUBLIC**	**INNO**
Limiting Saving	1	9	2	3	5	6	8
Pollution Prevention	6	9	5	5	7	6	8
Product Stewardship	2	8	2	3	4	5	8
Clean Energy Investment -Projects	9	9	8	9	8	8	9
Corporate Social Responsibility	7	8	7	6	5	4	9
Expert 2							
	MARKET	**COST**	**ORGANIZATION**	**LAW**	**GOVERMENT**	**PUBLIC**	**INNO**
Limiting Saving	2	8	3	3	5	5	8
Pollution Prevention	5	9	5	5	6	6	8
Product Stewardship	3	8	2	3	3	5	8
Clean Energy Investment -Projects	9	9	8	9	8	8	9
Corporate Social Responsibility	6	8	6	5	4	4	9
Expert 3							
	MARKET	**COST**	**ORGANIZATION**	**LAW**	**GOVERMENT**	**PUBLIC**	**INNO**
Limiting Saving	1	9	3	4	4	6	7
Pollution Prevention	5	9	5	5	7	6	9
Product Stewardship	2	8	2	3	4	5	8
Clean Energy Investment -Projects	9	8	9	9	8	8	9
Corporate Social Responsibility	6	8	4	5	6	3	9

TABLE VI. SPHERICAL FUZZY DECISION MATRIX

	MARKET			**COST**			**ORGANIZATION**			**LAW**			**GOVERMENT**			**PUBLIC**			**INNO**		
Limiting Saving	.14	.87	.10	.87	.13	.10	.27	.73	.20	.34	.66	.30	.47	.53	.50	.57	.43	.40	.77	.23	.20
Pollution Prevention	.54	.46	.40	.90	.10	.10	.50	.50	.50	.50	.50	.50	.67	.33	.30	.60	.40	.40	.84	.16	.21
Product Stewardship	.24	.77	.20	.80	.20	.20	.20	.80	.20	.30	.70	.30	.37	.63	.40	.50	.50	.50	.80	.20	.20
Clean Energy Investment -Projects	.90	.10	.10	.87	.13	.10	.84	.16	.21	.90	.10	.10	.80	.20	.20	.80	.20	.20	.90	.10	.10
Corporate Social Responsibility	.64	.36	.30	.80	.20	.20	.59	.42	.30	.54	.46	.40	.51	.49	.50	.37	.63	.40	.90	.10	.10

TABLE VII. WEIGHTED SPHERICAL FUZZY DECISION MATRIX

	MARKET			**COST**			**ORGANIZATION**			**LAW**			**GOVERMENT**			**PUBLIC**			**INNO**		
Limiting Saving	.06	.98	.04	.52	.63	.09	.10	.96	.08	.11	.96	.11	.14	.95	.18	.18	.93	.14	.42	.73	.14
Pollution Prevention	.23	.88	.19	.56	.60	.09	.19	.91	.22	.17	.93	.20	.22	.91	.12	.19	.93	.15	.48	.67	.16
Product Stewardship	.10	.96	.08	.45	.70	.14	.07	.97	.07	.10	.96	.11	.11	.96	.13	.15	.95	.18	.45	.71	.14
Clean Energy Investment -Projects	.48	.69	.08	.52	.63	.09	.38	.79	.13	.40	.78	.07	.29	.87	.09	.28	.88	.09	.55	.61	.09
Corporate Social Responsibility	.28	.85	.16	.45	.70	.14	.23	.89	.14	.19	.92	.16	.16	.94	.18	.11	.96	.13	.55	.61	.09