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Evaluating Free Zone Industrial Plant Proposals Using a Combined Full Consistency Method-Grey-CoCoSo Model

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Abstract: Libya's strategic position at the crossroads of Europe and Africa offers access to abundant raw materials, labor, and extensive land for establishing free trade zones. The primary objective of this research is to determine the key advantages and opportunities that Libya could potentially leverage as a transit trade hub in the Mediterranean region through the establishment of free trade zones. This study investigates the extent to which Libya facilitates the expansion of commerce between Europe and Africa via initiatives related to free trade zones. Six criteria were employed in the present research, including economic, social, financial, environmental, quality, and demand factors. A panel of experts evaluated these criteria. The Full Consistency Method (FUCOM) was utilized to derive the criteria weights, with the economic criterion identified as the most significant. The Grey-CoCoSo (Combined Compromise Solution) methodology was applied to rank the industries eligible for investment within Libya's free zones. According to the findings, the food sector holds the highest importance in relation to investment.

Keywords: MCDM; Grey theory; FUCOM; CoCoSo; Free zones

1 Introduction

Free zones (FZ) often serve as significant cornerstones of a country's industrial-economic growth, attracting substantial international investment, generating employment, and facilitating knowledge transfer [1]. To encourage industrial clusters where investors can benefit from synergies between related businesses and gain access to real estate and other facilities within the FZ at a competitive cost, the necessary infrastructure is established. Investors are enticed by various FZ benefits, such as a lenient regulatory environment that enables the swift and successful launch of businesses, tax and customs duty exemptions, the absence of currency restrictions, an abundant supply of affordable energy, efficient transportation and distribution infrastructure, and high levels of administrative and recruitment support [2, 3].

The challenge of selecting the optimal subset of plant proposals submitted to any local FZ is faced by community leaders, necessitating the development of a comprehensive approach that evaluates and assesses proposals based on suitable metrics that maximize benefits to local communities and ensure investor success. Several factors contribute to the complexity of this decision [4]:

•Difficulty in gathering facts and data, as projects are in the planning stage within a volatile environment
•Conflicting objectives, such as sustainability and economic growth

Investors also want to know the criteria that will be used to evaluate their proposals in advance. Previous research has either focused on economic analysis for private sector businesses, where the primary goal is to make a profit, or on the public good without taking investors' interests into account. Since both public and private interests are interdependent in the case of industrial plants, a compromise should be reached where both interests are balanced. Therefore, a variety of factors should be considered when choosing a proposal, including economic analysis, financial resources, environmental consequences, social implications, and product quality.

The present study focuses on the assessment of the significance of free trade zones in Libya concerning the expansion of commercial activities between the African and European regions. Libya's unique geographic position encompasses a land area of 1.76 million square kilometers and a coastal expanse exceeding 1900 kilometers along the Mediterranean Sea, facing the European coastline [3, 5]. This location serves as a gateway to North Africa, connecting Southern Europe with Sub-Saharan African countries and Eastern and Western Arabic countries. For centuries, this remarkable location has functioned as a trade route for convoys between the sea and the desert, as well as between eastern and western regions [3, 5]. Extensive archaeological evidence found in cities and villages along historical trade routes and their hubs in North Africa supports this claim.

Given the contemporary global economic shifts observed worldwide, globalization has become a pervasive phenomenon across various domains, particularly in economic activities, communication systems, and transportation [2, 6, 7]. This has eliminated numerous regional and national barriers, facilitating closer connections between destinations and removing obstacles that may have impeded economic collaborations and mutual benefits. Consequently, there is a proposal to revive Libya as a crucial hub for fostering domestic, regional, and transcontinental commerce among Mediterranean countries and other global entities through maritime channels and overland pathways traversing the South Sahara region into Africa. The delay in implementing this measure can be attributed to a multitude of factors at the local, regional, and international levels, including conflicting political and economic interests [2, 6, 7].

Libya has sought to revitalize its economy and diversify revenue streams by forging partnerships and engaging in bilateral and regional agreements, aiming to reduce the country's dependence on oil as the sole source of income, which currently finances 95% of its expenditures [2, 3]. The nation's security has been affected by the volatility of oil prices and external factors beyond its control, as well as security and political instability within the region. In the late 1990s, efforts were made to stimulate both domestic and international investments in Libya, following several decades of political, economic, and commercial isolation due to the country's adoption of a social-economic system and direct state control and intervention in its economy [2, 5].

The primary endeavor of significance was the determination to establish free trade zones, leveraging Libya's abundant capabilities, particularly its noteworthy natural resources and strategic geographical location, which renders it suitable for the construction of multiple free trade zones. This phenomenon can be attributed to the economic changes that have occurred in Libya, as well as its neighboring regions and the international community, particularly in relation to African nations and the European continent [5–7]. The aim of this research is to evaluate the industries that can be invested in the Misurata Free Zone using multi-criteria decision-making methods.

2 Methodology

In this study, a multi-criteria decision-making approach is deployed. The first step involves determining the weights of the criteria via the FUCOM. Subsequently, in the second step, the CoCoSo method is employed to arrange the industries.

2.1 FUCOM Method

The exploration of Multi-Criteria Decision Making (MCDM) has engendered notable consideration among researchers spanning various disciplines in the past years [8–10]. The Full Consistency Method (FUCOM) emerges as a contemporary model, which, akin to the Analytical Hierarchy Process (AHP) and Best Worst Method (BWM), capitalizes on the principles of pairwise comparison and validates results through an assessment of deviation from maximum consistency. It is observed that FUCOM mitigates some deficiencies associated with BWM and AHP models, thereby highlighting its potential advantages. FUCOM, with n-1 pairwise criterion comparisons, provides a streamlined method for determining criterion weights, and further ensures result verification through the measurement of deviation from maximum consistency.

FUCOM allows the confirmation of transitivity in pairwise criterion comparisons, albeit the subjective nature of the model, akin to AHP and BWM, leads to decision-maker influence on final criteria weights. Despite this, FUCOM presents minimal deviations in achieved criteria weight values from the optimal values when compared to other subjective models. Moreover, the methodological approach of FUCOM effectively addresses duplicity in pairwise evaluations of criteria, which remains a concern in some subjective models. Applications of FUCOM span diverse areas such as healthcare waste incinerator selection [11] and site selection [12, 13].

In a multi-criteria model, let n evaluation criteria be represented as w_j, where $\mathrm{j} = 1, 2, \ldots, \mathrm{n}$. Their weight coefficients are to be determined. The utilization of subjective models for ascertaining weights requires decision-makers to gauge the influence of criterion i on criterion j. The following section presents the FUCOM algorithm [12].

Algorithm: FUCOM
Input: Expert pairwise comparison of criteria **Output**: Optimal values of the weight coefficients of criteria/sub-criteria
Step 1: Expert ranking of criteria/sub-criteria. *Step 2*: Determining the vectors of the comparative significance of evaluation criteria. *Step 3*: Defining the restrictions of a non-linear optimization model. Restriction 1: The ratio of the weight coefficients of criteria is equal to the comparative significance among the observed criteria, i.e. $w_k/w_{k+1} = \varphi_{k/(k+1)}$. Restriction 2: The values of weight coefficients should satisfy the condition of mathematical transitivity, i.e. $\varphi_{k/(k+1)} \otimes \varphi_{(k+1)/(k+2)} = \varphi_{k/(k+2)}$. *Step 4*: Defining a model for determining the final values of the weight coefficients of evaluation criteria: $\min \chi$ s.t. $\left\| \frac{w_{j(k)}}{w_{j(k+1)}} - \varphi_{k/(k+1)} \right\| \leq \chi, \forall j$ $\left\| \frac{w_{j(k)}}{w_{j(k+2)}} - \varphi_{k/(k+1)} \otimes \varphi_{(k+1)/(k+2)} \right\| \leq \chi, \forall j$ $\sum_{j=1}^{n} w_j = 1, \forall j$ $w_j \geq 0, \forall j$ *Step 5*: Calculating the final values of evaluation criteria/sub-criteria $(w_1, w_2, \ldots, w_n)^T$.

2.2 Grey-COCOSO Model

Moving forward, the discussion transitions to the Grey-CoCoSo model. The Grey systems theory, proposed by Deng in the early 1980s, offers a structured method for dealing with incomplete information or small samples [14]. The theory mines and derives useful information from accessible data to manage uncertain systems. It posits that intricate systems are governed by internal laws that can be discerned with minimal data. To reflect the complexity of such systems, a color scheme comprising black, grey, and white is employed. A grey number is a type of numerical representation that represents the range of possible values for unknown quantities, signifying the inherent ambiguity.

The incorporation of Grey Systems Theory into decision-making processes has been found to be highly effective. The combined compromise solution (CoCoSo) method, proposed by Yazdani et al. [15, 16], blends the simple additive weighting and exponentially weighted product model, and provides a compendium of compromise solutions. The grey-CoCoSo model involves several steps, including the assessment of alternatives based on their attributes using linguistic or verbal variables, the construction and normalization of the Grey Decision Matrix, and the computation of total weighted comparability sequences and the sum of weighted comparability sequences for each alternative.

The determination of the final ranking of alternatives is executed through the use of three assessment scoring methods, as detailed in the methodology section. It is worth noting that the adoption of the Grey-CoCoSo model could bring significant advancements to decision-making processes in diverse fields, despite the inherent complexity.

Thus, this methodological approach amalgamating FUCOM and the Grey-CoCoSo model brings forth a comprehensive approach in tackling complex decision-making processes, underlining its significance in the realm of academia and beyond.

The grey-CoCoSo model consists of the following steps:

Step 1. The alternatives are assessed by the decision makers based on their attributes using linguistic or verbal variables. $\otimes G_{ij}^{K}, (i = 1, 2, \ldots, m; j = 1, 2, \ldots, n)$ represents the attribute value assigned by the kth decision maker to a particular attribute of an alternative. In grey system theory, this value is denoted as $\otimes G_{ij}^{K} = [\underline{G}_{ij}^{K}, \bar{G}_{ij}^{K}]$ and is calculated as:

$$\otimes G_j = \frac{1}{K} \left[\otimes G_j^1 + \otimes G_j^2 + \cdots + \otimes G_j^K \right]$$

Step 2. The Grey Decision Matrix G is constructed.

$$G=\begin{bmatrix} \otimes G_{11} & \otimes G_{12} & \cdots & \cdots & \otimes G_{1n} \\ \otimes G_{21} & \otimes G_{22} & \cdots & \cdots & \otimes G_{2n} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ \otimes G_{m1} & \otimes G_{m2} & \cdots & \cdots & \otimes G_{mn} \end{bmatrix} \tag{1}$$

Step 3. The Decision Matrix G is normalized to D^*

$$D^*=\begin{bmatrix} \otimes G^*_{11} & \otimes G^*_{12} & \cdots & \cdots & \otimes G^*_{1n} \\ \otimes G^*_{21} & \otimes G^*_{22} & \cdots & \cdots & \otimes G^*_{2n} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ \otimes G^*_{m1} & \otimes G^*_{m2} & \cdots & \cdots & \otimes G^*_{mn} \end{bmatrix} \tag{2}$$

For a benefit attribute $\otimes G^*_{ij}$ is expressed as
$\otimes G^*_{ij}=\left[\frac{G_{ij}}{G_j^{\max}},\frac{\bar{G}_{ij}}{G_j^{\max}}\right]$ where $G_j^{\max}=\max_{1<i<m}\left\{\bar{G}_{ij}\right\}$ and for a cost attribute $\otimes G^*_{ij}$ is expressed as
$\otimes G^*_{ij}=\left[\frac{G_j^{\min}}{\bar{G}_{ij}},\frac{G_j^{\min}}{\underline{G}_{ij}}\right]$ where $G_j^{\min}=\min_{1<i<m}\left\{\underline{G}_{ij}\right\}$.

Step 4. The weighted normalized Grey Decision Matrix D^*_W is obtained by weighting the normalized D^* matrix using:

$$\otimes V_{ij}=\otimes G^*_{ij}X\otimes W_j$$

$$D^*_W=\begin{bmatrix} \otimes V_{11} & \otimes V_{12} & \cdots & \cdots & \otimes V_{1n} \\ \otimes V_{21} & \otimes V_{22} & \cdots & \cdots & \otimes V_{2n} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ \otimes V_{m1} & \otimes V_{m2} & \cdots & \cdots & \otimes V_{mn} \end{bmatrix} \tag{3}$$

Step 5. The total weighted comparability sequence (S_i) and the sum of the weighted comparability sequences (P_i) for each alternative are calculated as:

$$S_i=\sum_{j=1}^{n}(w_j r_{ij}) \tag{4}$$

This S_i value is achieved based on grey relational generation approach:

$$P_i=\sum_{j=1}^{n}(r_{ij})^{w_j} \tag{5}$$

Step 6. The relative weights of the alternatives are determined through the following aggregation strategies. At this stage, three assessment scoring methods are employed to generate comparative values for the alternative options. These values are calculated using the formulas below:

$$k_{ia}=\frac{P_i+S_i}{\sum_{i=1}^{m}(P_i+S_i)} \tag{6}$$

$$k_{ib}=\frac{S_i}{\min_i S_i}-\frac{P_i}{\min_i P_i} \tag{7}$$

$$k_{ic}=\frac{\lambda(S_i)+(1-\lambda)(P_i)}{(\lambda\max_i S_i+(1-\lambda)\max_i P_i)};\quad 0\le\lambda\le 1 \tag{8}$$

Step 7. The final ranking of the alternatives is determined using the formula below:

$$k_i=(k_{ia}k_{ib}k_{ic})^{\frac{1}{3}}+\frac{1}{3}(k_{ia}+k_{ib}+k_{ic}) \tag{9}$$

3 Results

The qualitative criteria utilized for the plant selection in this study were economic feasibility, financial viability, social acceptability, environmental sustainability, product quality, and market demand. A survey was developed and distributed to a group of four experts employed within free trade zones. Cost was deemed to be a cost criterion, while the remaining criteria were deemed to be benefit criteria. Experts were invited to participate in the evaluation of the significance of each criterion. Table 1 lists the criteria employed in this study [4].

Table 1. List of criteria used

No.	Criteria	Description
C1	Economic	Economic criterion includes factors like investment required, benefit/ cost ratio, and payback period
C2	Financial	This criterion refers to % of self-finance of the project
C3	Social	Social criterion refers to local employment opportunities, and the percentage of available local resources
C4	Environment	Refers to environmental aspects such as energy consumption, water consumption, and waste generation
C5	Quality	Describes quality indicators such as percentage of quality investment to the total investment
C6	Demand	Demand criterion describes the market properties such as total expected demand, and competitors

The procedure for evaluating the criteria weights was conducted using the following steps:

Step 1. The decision makers ranked the criteria in the following order: C1 $>$ C4 $>$ C2 $>$ C6 $>$ C3 $>$ C5.

Step 2. The decision maker conducted pairwise comparisons of the ranked criteria established in Step 1 relative to Cl criterion. The analysis was conducted using a standardized scale [1, 9]. Table 2 presents the obtained priorities of all criteria ranked in Step 1.

Table 2. Priorities of criteria

Criteria	C_1	C_4	C_2	C_6	C_3	C_5
$\varpi_{C_{j(k)}}$	1.0	1.5	2.0	2.5	3.0	4.0

The weight coefficients were determined by defining the final model using Eq. (3).

$\min \chi$

$$\text{s.t}\begin{cases} \left|\frac{\omega_1}{\omega_4}-1,5\right| \le \chi, \left|\frac{\omega_4}{\omega_2}-1,33\right| \le \chi, \left|\frac{\omega_2}{\omega_6}-1,25\right| \le \chi \\ \left|\frac{\omega_6}{\omega_3}-1,20\right| \le \chi, \left|\frac{\omega_3}{\omega_5}-1,33\right| \le \chi, \left|\frac{\omega_1}{\omega_2}-2,00\right| \le \chi \\ \left|\frac{\omega_4}{\omega_6}-1,67\right| \le \chi, \left|\frac{\omega_2}{\omega_3}-1,5\right| \le \chi, \left|\frac{\omega_6}{\omega_5}-1,60\right| \le \chi \\ \sum_{j=1}^{6} \omega_j = 1, \omega_j \ge 0, \forall j \end{cases}$$

The weight coefficients and DFC with a value of $\chi = 0.00$ were obtained by solving the model. Figure 1 illustrates the significance of the criteria based on the initial ratings assigned. The solution for the model was obtained using the MS Excel solver. Based on the results, it can be concluded that Cl was deemed the most significant criterion, while C4 was deemed the second most significant criterion.

Table 3 shows the industry classification employed in this study. This classification was adopted following discussion with experts, as these industries were deemed most appropriate in terms of expected market demand, industry complexity, and availability of resources and skilled labor. Currently, investments in the Misurata free zone focus on service activities such as the import and export of goods, with the exception of a medical consumables factory. The Misurata Free Zone promotes investment in the areas indicated in the table.

Table 4 presents the linguistic assessment and associated grey values.

Table 5 shows the linguistic assessment of the industrial plants conducted by the experts. The linguistic variables were transformed into grey numbers according to the grey number scales (as shown in Table 4) and Eq. (3).

Tables 6 and 7 present the normalized decision matrix and weighted normalized decision matrix, respectively. Table 8 shows the ranking of the alternatives.

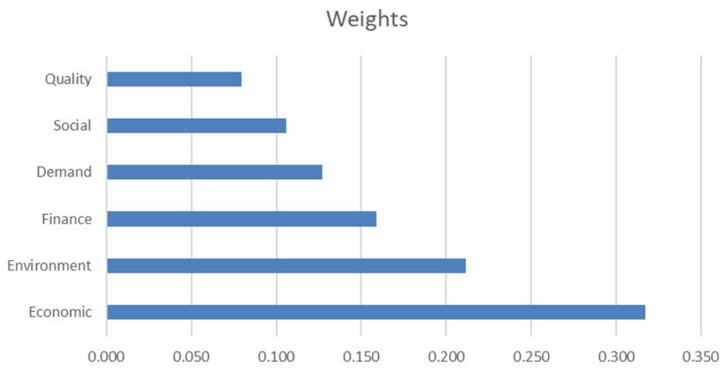

Figure 1. The value of decision criteria

Table 3. Industry classification used in the research

No.	Type
A1	Food and beverages
A2	Textiles and footwear
A3	Pulp, paper, printing and publishing
A4	Chemical, rubber, and plastics
A5	Basic metals and fabricated metals
A6	Electrical and optical equipment

Table 4. Linguistic assessment and the associated grey values

Performance	Abbreviation	Scale of grey number $\otimes W$
Very Poor	VP	$[0.0, 1.0]$
Poor	P	$[1.0, 3.0]$
Medium Poor	MP	$[3.0, 4.0]$
Fair	F	$[4.0, 5.0]$
Medium Good	MG	$[5.0, 6.0]$
Good	G	$[6.0, 8.0]$
Very Good	VG	$[8.0, 10.0]$

Table 5. Experts' views on industrial plants selection criterion

C_j	Industry (Ai)	Expert #1	Expert #2	Expert #3	Expert #4	$\otimes G_{ij}$
C_1	A1	G	P	F	P	[3.00 4.75]
	A2	F	P	F	P	[2.50 4.00]
	A3	F	F	P	P	[2.50 4.00]
	A4	F	F	F	P	[3.25 4.50]
	A5	F	F	P	P	[2.50 4.00]
	A6	F	P	F	P	[2.50 4.00]
C_2	A1	MP	G	P	MG	[3.75 5.25]
	A2	G	G	P	G	[4.75 6.75]
	A3	G	G	P	G	[4.75 6.75]
	A4	G	F	P	G	[4.25 6.00]
	A5	G	G	F	G	[5.50 7.25]
	A6	G	G	F	G	[5.50 7.25]
C_3	A1	G	F	MP	VG	[5.25 6.75]
	A2	G	G	MP	VG	[5.75 7.50]
	A3	G	F	MP	VG	[5.25 6.75]
	A4	G	F	MP	VG	[5.25 6.75]
	A5	G	G	G	VG	[6.50 8.50]
	A6	G	F	G	VG	[6.00 7.75]

Continued

C_j	Industry (Ai)	Expert #1	Expert #2	Expert #3	Expert #4	$\otimes G_{ij}$
C_4	A1	VG	VG	G	G	[7.00 9.00]
	A2	P	VG	G	G	[5.25 7.25]
	A3	G	VG	G	G	[6.50 8.50]
	A4	G	VG	G	F	[6.00 7.75]
	A5	VG	VG	G	P	[5.75 7.75]
	A6	F	VG	G	MG	[5.75 7.25]
C_5	A1	VG	VG	F	VG	[7.00 8.75]
	A2	VG	VG	F	VG	[7.00 8.75]
	A3	VG	VG	F	VG	[7.00 8.75]
	A4	VG	VG	F	VG	[7.00 8.75]
	A5	VG	VG	F	VG	[7.00 8.75]
	A6	VG	VG	F	VG	[7.00 8.75]
C_6	A1	P	P	P	VG	[2.75 4.75]
	A2	P	P	P	P	[1.00 3.00]
	A3	MP	P	P	F	[2.25 3.75]
	A4	P	P	P	F	[1.75 3.50]
	A5	VP	P	P	VG	[2.50 4.25]
	A6	VG	P	P	VG	[4.50 6.50]

Table 6. Normalised decision-making matrix

	C1	C2	C3	C4	C5	C6
A1	1.000	0.000	0.000	1.000	1.000	0.500
A2	0.000	0.667	0.417	0.000	1.000	0.000
A3	0.000	0.667	0.000	0.765	1.000	0.286
A4	1.000	0.333	0.000	0.439	1.000	0.179
A5	0.000	1.000	1.000	0.342	1.000	0.393
A6	0.000	1.000	0.583	0.223	1.000	1.000

Table 7. Weighted normalised decision-making matrix

	C1	C2	C3	C4	C5	C6
A1	0.317	0.000	0.000	0.212	0.079	0.064
A2	0.000	0.106	0.044	0.000	0.079	0.000
A3	0.000	0.106	0.000	0.162	0.079	0.036
A4	0.317	0.053	0.000	0.093	0.079	0.023
A5	0.000	0.159	0.106	0.073	0.079	0.050
A6	0.000	0.159	0.062	0.047	0.079	0.127

Table 8. Relative weights of the alternatives for different industries

	P_i	$S_i + P_i$	k_{ia}	k_{ib}	k_{ic}	k_i	rank
A1	3.916	4.587	0.169	4.305	0.856	2.631	**1**
A2	2.849	3.078	0.113	2.000	0.575	1.403	**6**
A3	3.735	4.119	0.152	2.984	0.769	2.005	**5**
A4	4.483	5.048	0.186	4.038	0.942	2.614	**2**
A5	4.685	5.151	0.190	3.680	0.962	2.486	**4**
A6	4.672	5.146	0.190	3.708	0.961	2.497	**3**

The results demonstrate the application of the multi-criteria decision-making approach and grey systems theory to evaluate and rank industry alternatives for a free trade zone based on multiple qualitative criteria. The criteria weights were ascertained using the FUCOM method, while the Grey-CoCoSo model was employed to rank the industry alternatives. The rankings obtained consider both the importance of the criteria as well as the performance of the alternatives with respect to those criteria.

4 Discussion

The Libyan economy remains heavily dependent on oil and gas. In an effort to diversify, the Libyan government sees free zones as a viable alternative to options such as foreign direct investment. Free zones represent an attractive option, as they create employment opportunities for local workers, enhance skills and knowledge, and introduce new technologies and management methods that not only strengthen the national economy but also facilitate overall societal growth. Decision makers should develop a clear strategy for approving new investments. The model proposed in this study was based on six criteria for evaluating industrial investments in free zones. The results indicated that the economic criterion was the most significant, followed by the environmental criterion. This suggests that decision makers should focus primarily on the economic aspects of any investment without neglecting environmental aspects, which are increasingly emphasized in current Libyan legislation. Although quality is finally being considered as a criterion, the differences between the criteria weights remain relatively acceptable. In terms of target industries, the results showed that the food industry ranked first. This decision can be understood given that most of the country's food needs are imported and that many food industries are not overly complicated, enabling the creation of local industries. Another contributing factor is the existence of successful local experiences in the food industry, some of which even export products outside the country.

5 Conclusions

The combined FUCOM-Grey-CoCoSo methodology proposed in this study provides a means of selecting proposals for industrial plants in free zones. The proposed methodology assesses proposals based on their public benefit across six distinct criteria: economic feasibility, financial viability, social impact, product quality, environmental impact, and market demand. The proposed model was effectively employed to determine optimal proposals through the evaluation of input from experts in the relevant field. The findings suggest that economic and environmental factors are of significant importance in maximizing investment benefit.

The results demonstrate the application of a multi-criteria decision-making approach and grey systems theory to evaluate and rank industry alternatives for a free trade zone based on qualitative criteria. The criteria weights were determined using the FUCOM method, while the Grey-CoCoSo model was used to rank the industry alternatives. The rankings obtained considered both the importance of the criteria as well as the performance of the alternatives with respect to those criteria. The model provides decision support for approving industrial investments by considering key sustainability factors.

While interesting results were obtained, the model could be further enhanced. The number of experts surveyed could be increased to improve the robustness and generalizability of the results. Quantitative factors could also be incorporated as criteria to provide a more comprehensive decision framework. The model could additionally be expanded to consider interactions and potential trade-offs between the criteria. Such improvements would strengthen the decision support provided to approving authorities for industrial investments.

The implications of this research relate to the potential diversification of the Libyan economy through strategic investments in free trade zones. The model developed provides a structured methodology for evaluating such investment proposals against key public benefit criteria. Approving investments that rate highly against these criteria could facilitate economic growth, job creation, skills and technology transfer, and environmental sustainability over the long term.

Author Contributions

Conceptualization, I.B. and Ž.S.; methodology, I.B. and Ž.S. and M.B.; validation, Ž.S.; formal analysis, I.B. and Ž.S.; investigation, I.B and M.B.; writing—original draft preparation, I.B and M.B.; visualization, Ž.S. All authors have read and agreed to the published version of the manuscript.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

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