Managing Resources Based on Influential Indicators for Sustainable Economic Development: A Case Study in Serbia

Mimica R. Milošević 1,*, Miloš M. Nikolić 2, Dušan M. Milošević 3 and Violeta Dimić 4

Abstract: The balance between resource consumption and the ability of natural systems to meet the needs of future generations emerges as a prerequisite of sustainability. Sustainability means aligning economic growth and development with the interest of the environment and social development. Decision-making is a significant responsibility in an environment and the business world because decisions affect the ecology and business performance. It is necessary to adopt new approaches in decision-making to find an appropriate method for assessing and setting priority goals. Various methods for multi-criteria decision-making have been developed, including the Analytic Hierarchy Process (AHP). The paper deals with the management of natural and human resources for the sustainable economic development of Serbia by selecting influential factors, relying on a multi-criteria decision-making framework. Appropriate methods have been applied: AHP and several fuzzy AHP (FAHP) approaches. These methods’ application enables the analysis of results from different aspects of expert opinion. Through a case study, this paper investigates the AHP method from several facets in which the identification of decision criteria is based on the perception of experts of different profiles. The findings of this research can be a guideline for decision-makers in resource management to enhance sustainable economic development. The case study confirms that the stability of the business environment and business sectors is the most influential indicator in all scenarios.

Keywords: managing; economic development; resources; analytic hierarchy process (AHP); fuzzy AHP

1. Introduction and Literature Review

The sustainable economic development of each state is conditioned primarily by natural (but also human) potentials, which are usually the backbone of the development of the region and the state [1]. Using these potentials while shaping them according to needs, people have survived and developed concerning economic and overall progress. At the same time, technical-technological development and especially the development of ICT has certainly improved everyday life and work without which it is impossible to imagine a modern way of functioning of people and economy, but it has also led to faster exploitation of the human environment, faster depletion of available natural resources [2]. Natural resources are a baseline for development and wealth creation. There is a possibility that the natural regeneration of resources can’t keep pace with industry progress. The enrichment of human potential can have a technological impact on increasing the contribution of natural resources to economic growth [3].

Serbia is a territorially small country, but it has quality natural and human resources. The best promotion of socially, environmentally, and economically sustainable growth
is an issue that is increasingly at the center of interest [4]. In economic terms, Serbia has characterized by developed regions in the north and underdeveloped ones in the south. The basic premise of profitable and overall socio-economic development is balanced economic prosperity [5]. The management of natural and human resources and the implementation of sustainable development have imposed the need to pay more attention to profit-making aspects in the future [6,7]. Excessive exploitation of natural resources creates many interrelated problems that affect the health of ecosystems and social well-being in different regions.

The starting point is that further economic growth has based on resources’ smart exploitation [8,9]. The development of the Serbian economy in a sustainable direction can look only on achieving economic growth, primarily knowledge-based, information, people, education, and the quality of connections between people and institutions [10]. Sustainable economic development is needed based on the growth of a group of key economic indicators (GDP growth, employment, foreign trade, competitiveness and exports, investment, household standards) with a reduction in the solvent burden of external debt, as well as achieving lasting macroeconomic stability, the better quality of life, ecological condition and general well-being of society [11].

The population creates significant pressure on the capital, whose area is constantly expanding and prevents the balanced development of other cities and regions in the country. The challenges of Serbia’s spatial development are, among other things, a consequence of the late transition [12]. The key to the transition period was the privatization of state property with the return to a market-oriented economy. These have been mostly affected the economy due to reduced budget inflows, job losses, and shortages in the manufacturing sector. Some municipalities have already made progress in creating a stimulating business climate, and some have yet to work hard and intensively to realize their potential.

Lately, there has often been talking of a knowledge-based economy. The European Union, with Lisbon Strategy, and Serbia, with Sustainable Development Strategy, plan further economic development through an economy that bases economic prosperity 3 on education and knowledge [13].

The new phase of social processes is facing the public consciousness of citizens with the problem of determining the additional path of development, given that there is a need to review the accumulated experience and the appropriate transformation of the economic management system towards sustainable development. In a systematic approach to the sustainable development of the country as a whole, and especially the underdeveloped regions of Serbia, elements such as the state, society, people with their knowledge and skills, economy, ICT, ecology are precisely those elements that need to be included and viewed in a complex way [14]. Namely, these elements have been combined in the institutional sense known as a public-private partnership (PPP). It is necessary to develop new efficient decision-making models to improve the quality of social life. Through these models, one can create an economically sustainable development strategy, anticipate possible risk events, and minimize them in innovative PPP projects [15].

The naturally available wealth and human resources are the backbones of sustainable economic development [16]. Excessive exploitation of natural resources creates many interrelated problems that affect the health of ecosystems and social well-being in different regions.

The region’s sustainable economic development strategy includes the planned development achievements definition [17]. The region’s economy is an unfavorable economic structure with weak financial, natural, and technological resources and needs sustainable restructuring with an increase in gross domestic product, development of foreign trade, employment rate, investment, and competitiveness on the international market [18]. To use all the potential, serious work, strong leadership, and a clear vision have been necessary [19]. Strong leadership, setting investments as priorities for municipal activities, with focused work and energy can make a difference, as shown by the examples of some successful municipalities [20].
The strategic management in regional economic development should enable a timely and rational response of the region’s economy to all changes in the economic environs in which the region’s entities operate [21]. It is necessary to implement pre-planned steps such as analysis of the economic environment, the economic orientation of the district, formulation of the plan of economic development, implementation of the defined strategy, and implementation of strategic control [22].

The paper contains five sections. The introduction provides elementary remarks on the subject area in the framework of managing natural and human resources for the sustainable economic development of the region and literature review. The Section 2 provides the conceptual framework. The methodology, which consists of AHP, and fuzzy triangular AHP methods, is given in the Section 3. After them in this section, indicators are chosen within four different groups. Section 4 part presents the ranking results and comparison of the results of the given algorithms with the discussion. Concluding remarks and future research goals have been presented in the last Section 5.

2. Conceptual Framework

One of the basic concepts of the economics of natural resources and the environment is the concept of sustainable development. Despite the different interpretations that can be found in the literature, this concept today has a central place in considering the long-term perspective of the survival and progress of human race in aligning economic growth and development with the interests of environmental protection and social development.

The research process adopted in this paper is realized as Figure 1 shows.

![Figure 1](image_url)

**Figure 1.** Five steps in the research process.

The paper presents the factors that influence the managing natural and human resources for the economic development of Serbia through four groups (a framework for strengthening participation in the development, human social resources, economic potentials, and natural resources). Modeling a framework for supporting participation and managing resources in the sustainable economic development of Serbia is considered in this research from the aspect of crisp AHP and fuzzy approaches of method AHP to single out influential factors. Managers show interest in creating and implementing reliable modus for decision-making in the present and the future. Achieving sustainable development requires developing an appropriate strategy to achieve sustainable development by applying maintenance performance measurements [23]. The method Analytic Hierarchy Process (AHP)
was introduced by Thomas L. Saati in 1980 [24,25]. It is a method for solving multi-criteria decision-making (MCDM) problems. After a comprehensive evaluation of several criteria, it points to the final choice of the best solution in the analyzed problem [26]. The AHP method is widely used, despite the need for consistency testing, primarily because of its flexibility and ease of use [27]. Many methods and applications of fuzzy AHP are expressed by numerous researchers [28,29]. In applying the Fuzzy Analytic Hierarchy Process (FAHP) method, we used Chang’s Extent analysis method (EAM) approach and the three-level optimism approach [30,31]. The results obtained by explained methods are compared with the results given by Interval AHP (IAHP) as in the paper [28].

More details about MCDM methods can be seen in the papers [32–34].

The goal is to single out influential factors obtained by methods application and compare the results. The task of the paper is to compare the extent to which these approaches can influence the decision choice of influencing factors. The methods used are given in Figure 2.

Figure 2. Schematic representation of methods.

3. Materials and Methods

AHP is a structured technique that enables the organization and analysis of complex decisions based on subjective assessment. Using multiple criteria for easy to understand and efficient dealing with qualitative and quantitative data are the main advantages of AHP.

Definition 1. AHP is a multi-criteria decision-making technique to highlight the advantages among different criteria in the decision-making, compare decision-making alternatives for each criterion, and obtain the final ranking of decision alternatives. The outcome in AHP is deciding on the best of the decision alternatives.

The AHP method is realized through the following steps [35]:

1. Establishing a hierarchy by decomposing the problem of decision-making.
2. Creating comparison matrices by performing pairwise comparisons.
3. Calculation of weights and consistency of comparisons.
4. Aggregation of weights to obtain results and ranking of alternatives.

AHP has been used in various domains like business, industry, and engineering. Developing countries should use AHP for complex economic problems solutions from different development perspectives [36]. The essence of the AHP method is to pair the available options according to all evaluation criteria [37]. In the real world, data or information obtained from experts mainly includes uncertainty and ambiguity conditioned primarily by inaccuracies in human reasoning and decision-making environment uncertainty and incomplete details [38].
As a more powerful methodology for multi-criteria decision-making, the combined effect of fuzzy set theory and AHP is given by the FAHP. The FAHP method is applicable for solving the problem of multi-criteria analysis when accurately assessing (quantifying) the impact of indicators on the decision problem is not present. In addition, the introduction of the AHP or FAHP method allows minimizing subjective influences in decision-making.

3.1. Triangular Fuzzy Numbers and Fuzzy AHP Method

The fuzzy numbers are special fuzzy sets \( F = \{ (x, \mu_F(x)), x \in \mathbb{R} \} \), where \( \mu_F : \mathbb{R} \rightarrow [0, 1] \) is a continuous function. The triangular fuzzy number (TFN), denoted with \( \tilde{a} = (a, m, b) \), has membership function:

\[
\mu_{\tilde{a}}(x) = \begin{cases} 
\frac{x-a}{m-a}, & x \in [a, m) \\
\frac{b-x}{b-m}, & x \in [m, b] \\
0, & \text{otherwise}
\end{cases}
\] (1)

Definition 2. For two triangular fuzzy numbers \( \tilde{T}_1 = (a_1, m_1, b_1) \) and \( \tilde{T}_2 = (a_2, m_2, b_2) \), and scalar \( \lambda \in \mathbb{R} \) arithmetic operations are:

- **Addition:** \( \tilde{T}_1 \oplus \tilde{T}_2 = (a_1 + a_2, m_1 + m_2, b_1 + b_2) \),
- **Subtraction:** \( \tilde{T}_1 \ominus \tilde{T}_2 = (a_1 - b_2, m_1 - m_2, b_1 - a_2) \),
- **Multiplication:** \( \tilde{T}_1 \oslash \tilde{T}_2 = (a_1m_2, m_1b_2, b_1a_2) \),
- **Inverse:** \( T_1^{-1} = (a_1, m_1, b_1)^{-1} = (1/b_1, 1/m_1, 1/a_1) \),
- **Division:** \( \tilde{T}_1 \odot T_2^{-1} = (a_1/b_2, m_1/m_2, b_1/a_2) \),
- **Scalar multiplication:** \( \lambda \tilde{T}_1 = (\lambda a_1, \lambda m_1, \lambda b_1) \).

Denotations and meaning of the triangular fuzzy numbers (TFNs) are: \( \tilde{1} = (1, 1, 3) \) is equal importance (both elements have the same impact); \( \tilde{3} = (1, 3, 5) \) is moderate importance (one element has a slight advantage over the other); \( \tilde{5} = (3, 5, 7) \) strong importance (strong advantage of one element over the other); \( \tilde{7} = (5, 7, 9) \) very strong or demonstrated importance (very strong advantage of one element over the other); \( \tilde{9} = (7, 9, 9) \) extreme importance (extreme (full) advantage of one element over the other).

Intermediate values are \( \tilde{2} = (1, 2, 3), \tilde{4} = (3, 4, 5), \tilde{6} = (5, 6, 7) \) and \( \tilde{8} = (7, 8, 9) \).

In recent decades, the fuzzy AHP method, based primarily on triangular fuzzy numbers, has proven suitable in a wide range of engineering, environment, industry, economy, etc. Since fuzzy weights are not as easy to calculate as crisp weights, most Fuzzy AHP applications use the extent analysis method proposed by Chang [30]. Like AHP, FAHP facilitates decompositions and comparisons in pairs, provides a hierarchical structure, and generates priority vectors while reducing in-consistencies. Also, fuzzy AHP can be used to solve different problems and different contexts.

The applied method consists of the following:

1. Establishing the main goal and the criteria and sub-criteria contributing to the overall goal; developing the problem hierarchy.
2. Obtaining the fuzzy comparison matrices. A pairwise comparison has been made using a fuzzified evaluation scale. Using triangular fuzzy numbers, we form a comparison matrix \( \tilde{C} = (\tilde{c}_{ij})_{n \times n} \) for a fuzzy comparison of criteria by pairs, where \( \tilde{c}_{ij} \) is a fuzzy value that expresses the relative importance of one criterion to another. At the diagonal, the fuzzy values \( \tilde{c}_{ii} \) express the relative importance of the criterion to itself. Because of that, we put that \( \tilde{c}_{ii} = (1, 1, 1) \). The aggregation of different experts’ opinions is calculated by the averaging method. Based on the corresponding linguistic assessments of \( k \) experts \((a_i, m_i, b_i)\), aggregated crisp value has been obtained by \( 1/k \sum_{i=1}^{k} m_i \) rounding to the nearest integer. The corresponding fuzzy number value of the aggregate opinion is then obtained.
(3) Examination of the comparison matrix \( \tilde{C} \) consistency. We calculate the consistency index CI and consistency ratio CR for matrix \( \tilde{C} = (\tilde{c}_{ij})_{n \times n} \) by \( CI = \frac{\lambda_{\text{max}} - n}{n - 1}, CR = \frac{CI}{RI} \), where \( \lambda_{\text{max}} \) represents the maximal eigenvalues, and RI is an accepted random index of a matrix \( \tilde{C} \). The value \( CR \leq 0.10 \) implies that we accept evaluated fuzzy elements of the matrix, while otherwise, we must remove the reasons for undesirably high estimations and repeat comparison in pairs until the degree of consistency belongs to desirable limits.

(4) The fuzzy synthetic extents determination. The synthetic triangular fuzzy numbers have been calculated, according to Chang’s extent analysis method, by using triangular fuzzy numbers from the matrix \( \tilde{C} = (\tilde{c}_{ij})_{n \times n} \):

\[
\tilde{S}_i = \sum_{j=1}^{n} \tilde{c}_{ij} \odot \left( \sum_{j=1}^{n} \sum_{i=1}^{n} \tilde{c}_{ij} \right)^{-1}, i = 1, \ldots, n. \tag{2}
\]

First approach, Extent analysis method (EAM) \[30\]: The obtained synthetic triangular fuzzy numbers can be compared one with each other by calculating the degree of possibility that convex fuzzy number \( \tilde{S}_i \) exceeds convex fuzzy number \( \tilde{S}_j \):

\[
P(\tilde{S}_i \geq \tilde{S}_j) = \sup_{x,y} \left[ \min \left( \mu_{\tilde{S}_i}(x), \mu_{\tilde{S}_j}(y) \right) \right]. \tag{3}
\]

This probability \( P \) has been approximated by the ordinate of the intersection point with abscise \( d \) (see Figure 3).

![Figure 3. Intersection between membership functions \( \mu_{\tilde{T}_1} \) and \( \mu_{\tilde{T}_2} \).](image)

By calculating ordinate of this intersection point, we obtain

\[
P(\tilde{T}_1 \geq \tilde{T}_2) = \text{hgt}(\tilde{T}_1 \cap \tilde{T}_2) = \begin{cases} 
1, & \text{if } m_1 \geq m_2 \\
0, & \text{if } a_2 \geq b_1 \\
\frac{a_2 - b_1}{(m_1 - b_1) - (m_2 - a_2)}, & \text{otherwise}.
\end{cases} \tag{4}
\]

The degree of possibility that convex fuzzy number \( \tilde{T} \) is greater than \( k \) convex fuzzy numbers \( \tilde{T}_i, i = 1, \ldots, k \) is

\[
P(\tilde{T} \geq \tilde{T}_1, \ldots, \tilde{T}_k) = \min_{i=1}^{k} P(\tilde{T} \geq \tilde{T}_i), \text{ for } i = 1, \ldots, k. \tag{5}
\]

Let \( d'(C_i) = \min_{j} P(S_i \geq S_j), \text{ for } k = 1, \ldots, n, k \neq i \). The weight vector is \( \mathcal{W}' = (d'(C_1), d'(C_2), \ldots, d'(C_n))^T \), where \( C_i, i = 1, \ldots, n \) are elements. The normalized weight vector is a non-fuzzy number:

\[
\mathcal{W} = (d(C_1), d(C_2), \ldots, d(C_n))^T, \tag{6}
\]

which we can denote \( \mathcal{W} = (\omega_1, \omega_2, \ldots, \omega_n)^T \).

Second approach: Based on total integral values calculated by \[39\],
\[
\omega'_i \left( \tilde{S}_i \right) = 0.5 (\nu b_i + m_i + (1 - \nu) a_i), \quad i = 1, n, \quad \nu \in [0, 1],
\]
(7)

We compare obtained TFNs: \( \tilde{S}_i = (a_i, m_i, b_i) \). Real constant \( \nu \) represents an optimism index, which explains the decision maker’s attitude toward the risk. The smaller values mean a higher degree of risk and a lower degree of optimism. In our research we have used values: \( \nu = 0 \) (pessimistic viewpoints), \( \nu = 0.5 \) (balanced viewpoints), and \( \nu = 1 \) (optimistic viewpoints).

By normalization, we obtain the weight vector: \( W = (\omega_1, \omega_2, \ldots, \omega_n)^T \).

### 3.2. Considering Indicators for the Sustainable Economic Development

Factors influencing the implementation of the concept of natural and human resources management for the economic development of Serbia are expressed through four groups of criteria: a framework for strengthening participation in development, human resources, economic potential, natural resources, and are shown in Table 1.

**Table 1.** The overview of adopted indicators for the sustainable economic development.

| S  | Strengthening participation in the development [40]                                                                                       | E  | Economic potentials [53]                                                                                           |
|----|-----------------------------------------------------------------------------------------------------------------------------------------|----|------------------------------------------------------------------------------------------------------------------|
| S1 | Economic development strategy based on knowledge and innovation [41, 42]                                                                 |
|    | S11—Development of a stimulating entrepreneurial environment [43]                                                                         |
|    | S12—Targeted investment attraction [44]                                                                                                   |
|    | S13—Development of potentials for the needs of the labor market                                                                          |
| S2 | Sustainable mobility and interactive city development [45, 46]                                                                            |
|    | S21—Increased accessibility of the city                                                                                                  |
|    | S22—Sustainable mobility of the central city zone [47]                                                                                     |
|    | S23—Development of economic zones and logistics                                                                                           |
|    | S24—Compliance of the traffic system with the needs of citizens                                                                         |
|    | S25—Increasing the share of pedestrians in cyclists as road users [48]                                                                       |
|    | S26—Improved safety conditions for all road users                                                                                          |
| S3 | Improvement and development infrastructure services of citizens [49]                                                                       |
|    | S31—Improving the quality of communal infrastructure                                                                                       |
|    | S32—Creating a framework for high-quality utilities                                                                                       |
|    | S33—Improving the level of information and communication with citizens                                                                     |
| S4 | Energy capital as a development opportunity [50]                                                                                           |
|    | S41—Improvement of energy infrastructure                                                                                                  |
|    | S42—Improving energy efficiency                                                                                                            |
|    | S43—Institutional environment for the development of energy systems and the provision of quality services [51]                             |
|    | S44—Achieved in the billing system according to the energy consumed                                                                      |
|    | S45—Diversified, accessible, and quality social services                                                                                   |
|    | S46—Improving the content of culture, sports, and tourism                                                                              |
|    | S47—Improving social development infrastructure                                                                                                |
|    | S48—A single record system for users of social rights and services has been established                                                   |
|    | S49—City Housing Strategy adopted                                                                                                          |
|    | S50—Implementation of investment plans in facilities and equipment of primary health care institutions                                    |
| S5 | Improved social cohesion [52]                                                                                                           |
|    | S51—Diversified, accessible, and quality social services                                                                                   |
|    | S52—Improving the content of culture, sports, and tourism                                                                               |
|    | S53—Improving social development infrastructure                                                                                           |
|    | S54—A single record system for users of social rights and services has been established                                                   |
|    | S55—City Housing Strategy adopted                                                                                                          |
|    | S56—Implementation of investment plans in facilities and equipment of primary health care institutions                                    |
| E1 | Increasing competitiveness [54, 55]                                                                                                         |
|    | E11—Stability of business environment and business sector [56]                                                                            |
|    | E12—Global response to the COVID-19 pandemic [57]                                                                                            |
| E2 | Suppression of the gray economy [58]                                                                                                       |
|    | E21—Reducing the degree of the gray economy in GDP [59]                                                                                     |
|    | E22—Reduction of the share of unregistered economic entities                                                                               |
|    | E23—Relative reduction of VAT                                                                                                             |
| E3 | Public-private partnership in support of local economic development and foreign direct investment (FDI) [60]                             |
|    | E31—Increase in efficiency and economy [61]                                                                                               |
|    | E32—Reducing the pressure of public investment on the budget [62]                                                                           |
|    | E33—Increasing the level of foreign direct investment (FDI)                                                                              |
Table 1. Cont.

| N—Natural resources [63] | N11—Implementation of the National Strategy on the Use and Protection of Natural Resources and Goods |
|--------------------------|---------------------------------------------------------------------------------------------------|
| N12—Strategic environmental impact assessment of plans and programs |
| N13—Environmental impact assessment of projects |
| N14—Integrated prevention and control of environmental pollution |
| N2—Management of renewable natural resources and non-renewable natural resources [65] | N21—Reconciliation of the relationship between the degree of exhaustion of natural resources and their regeneration rate [66] |
| N22—Design of available resources by quality, structure, amount, and capital investments |
| N23—Direction of ecological aspects in the interest of the population of the local area |
| N3—Protection of resources and ecosystems through the principles of sustainable development [67] | N31—Creating ability of the environment to accept a certain amount of pollutants per unit of time and space so that there is no irreversible damage to the environment; |
| N32—The impact of a product/service or system on the environment |
| N33—Effective preservation of ecosystems and resources themselves [68] |
| N34—Transparency-information of the wider local community |

| H—Human resources [69] | H1—Employment and labor market [70] |
|------------------------|-------------------------------------|
| H11—Support for the development of local and inter-municipal employment policies |
| H12—Increasing the impact of employment policy measures on the hard-to-employ |
| H13—Suppression of the informal economy |
| H2—Improving the quality and accessibility of health services [71] | H21—Promoting the health and well-being of all citizens |
| H22—Preventive care |
| H23—Strengthening the operational capacity of the health system in line with EU standards data |
| H3—Education [72] | H31—Improving the quality and importance of secondary vocational education and adult education within the National Qualifications Framework |
| H32—Ensuring access to and reaching higher levels of education for children at risk [73] |
| H33—Education for all |
| H4—Social inclusion [74] | H41—Support for social inclusion through a more diverse offer of social services in the local community |
| H42—Support for the transition from social assistance to work (“welfare-to-work”) through activation |
| H5—Technical assistance | H51—Announcement of new calls for cross-border cooperation programs |
| H52—Finalization of the Operational Program Human Resources Development |
| H53—Negotiations with individual bilateral donors, discussions on a new EU financial perspective [75] |

4. Results and Discussion

In this section, the outlined algorithms have been applied. A group of experts in the area of economy, natural resources, and human resources rated the identification of decision criteria. Expert opinions are expressed based on the meaning and denotation of TFNs in Table 2. Expert assessments are aggregated based on the algorithm explanation in step (2). Experts agreed that some groups should retain a number of sub-criteria.

Table 3 shows a matrix comparing the primary criteria, and Figure 4 shows the corresponding weights.

Tables A1–A20 with triangular fuzzy comparison matrices of sub-criteria and the corresponding weights for applied methods are in Appendix A.

The final rank of sub-sub-criteria, and their final weight for each sub-criterion, are in Table 4. The indicators are ranked according to the optimistic, balanced, and pessimistic views (\(\nu = 1, \nu = 0.5, \nu = 0\)), the extent analysis method (EAM) on FAHP and AHP.
Table 2. Meaning and denotation of the TFNs.

| Description TFNs         | TFNs   | Inverse TFNs | Denotation of TFNs | Denotation of Inverse TFNs |
|--------------------------|--------|--------------|--------------------|---------------------------|
| Equally important        | $\mathbf{1} = (1, 1, 3)$ | $\mathbf{1} - 1 = (1/3, 1, 1)$ | $E$                | $1/E$                     |
| Equally to weakly important | $2 = (1, 2, 3)$ | $2 - 1 = (1/3, 1/2, 1)$ | $EW$               | $1/EW$                    |
| Weakly important         | $3 = (1, 3, 5)$ | $3 - 1 = (1/5, 1/3, 1)$ | $W$                | $1/W$                     |
| Weakly to strongly important | $4 = (3, 4, 5)$ | $4 - 1 = (1/5, 1/4, 1/3)$ | $WS$               | $1/WS$                    |
| Strong important         | $5 = (3, 5, 7)$ | $5 - 1 = (1/7, 1/5, 1/3)$ | $S$                | $1/S$                     |
| Strong to very strongly important | $6 = (5, 6, 7)$ | $6 - 1 = (1/7, 1/6, 1/5)$ | $SV$               | $1/VS$                    |
| Very strongly important  | $7 = (5, 7, 9)$ | $7 - 1 = (1/9, 1/7, 1/5)$ | $V$                | $1/V$                     |
| Very strongly to absolutely important | $8 = (7, 8, 9)$ | $8 - 1 = (1/9, 1/8, 1/7)$ | $VA$               | $1/VA$                    |
| Absolutely important     | $9 = (7, 9, 9)$ | $9 - 1 = (1/9, 1/9, 1/7)$ | $A$                | $1/A$                     |

Table 3. Triangular fuzzy compare matrix of primary criteria.

|       | F      | S      | N      | H      |
|-------|--------|--------|--------|--------|
| F     | $\mathbf{1}$ | $\mathbf{1}$ | $2$    | $4$    |
| S     | $\mathbf{1} - 1$ | $\mathbf{1}$ | $2$    | $4$    |
| N     | $2 - 1$ | $2 - 1$ | $\mathbf{1}$ | $3$    |
| H     | $4 - 1$ | $4 - 1$ | $3 - 1$ | $1$    |

Figure 4. Corresponding weights for Chang’s approach, different degrees of optimism in FAHP and crisp AHP ($CI = 0.006, CR = 0.007$).

The final sequence of influencing factors (with weights) in managing natural and human resources for economic and regional development can be seen in Figure 5.

The results obtained by applying classical AHP and FAHP methods, whether they are different degrees of optimism or Chang’s approach, are favored as the most influential factor stability of the environment and business sector.

Based on the obtained final weights that represent the optimistic attitudes of decision-makers, the following are significant reductions in the pressure of public investment on the budget, efficient conservation of ecosystems and resources, and the global response to the COVID-19 pandemic. In the pessimistic scenario, the following indicators stand out: the development of a stimulating entrepreneurial environment, reducing the pressure of public investment on the budget, and global response to the COVID-19 pandemic. In the balanced scenario, the development of a stimulating entrepreneurial environment, reducing the pressure of public investments on the budget, efficient preservation of ecosystems and resources, as well as the global response to the COVID-19 pandemic are still important indicators.

Differences can be seen in the second factor of influence Chang’s approach and optimistic attitude favor reducing the pressure of public investment on the budget, and
moderate and pessimistic stances, as well as the AHP method, emphasize the development of a stimulating entrepreneurial environment.

In both scenarios, the same group of indicators stands out by the dominant factor being the stability of the business environment and the business sector. However, the development of a stimulating entrepreneurial environment is not among the significant factors in the optimistic scenario, unlike the pessimistic one. On the other hand, efficient conservation of ecosystems and resources themselves resource-related environmental factors are not so significant in this scenario.

Table 4. Ranking of indicators with final weights by triangular fuzzy AHP method, AHP method and IAHP method (\( \omega \) = interval weight, \( p \) is probability).

| \( \omega_{SAM} \) | \( \omega_{AHP} \) | \( \omega_{IAHP} \) | \( \omega \) | \( p \) | \( \sigma_{AHP} \) |
|------------------|-----------------|-----------------|--------|------|---------|
| E1 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [1.81144, 4.34561] | 0.5 | S1 | 0.026944 |
| E2 | 0.025130 | S2 | 0.204780 | 0.019420 | E1 | [2.80168, 4.44448] | 0.5 | E1 | 0.033541 |
| E3 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [3.76737, 6.77311] | 0.5 | E1 | 0.032694 |
| E4 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [4.60482, 5.90676] | 0.5 | S1 | 0.032694 |
| E5 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [5.59890, 5.57196] | 0.5 | S1 | 0.032694 |
| E6 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [6.45622, 6.14209] | 0.5 | S1 | 0.032694 |
| E7 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [7.37752, 6.77311] | 0.5 | S1 | 0.032694 |
| E8 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [8.21273, 1.11839] | 0.5 | E1 | 0.032694 |
| E9 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [9.15557, 1.78696] | 0.5 | E1 | 0.032694 |
| E10 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [10.03371, 1.38021] | 0.5 | S1 | 0.032694 |
| E11 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [11.04013, 1.34627] | 0.5 | H3 | 0.031126 |
| E12 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [12.04322, 1.82867] | 0.5 | S1 | 0.031126 |
| E13 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [13.05589, 1.11730] | 0.5 | S1 | 0.031126 |
| E14 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [14.06524, 1.92029] | 0.5 | S1 | 0.031126 |
| E15 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [15.07546, 1.48038] | 0.5 | S1 | 0.031126 |
| E16 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [16.08407, 2.13122] | 0.5 | S1 | 0.031126 |
| E17 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [17.09381, 2.82697] | 0.5 | S1 | 0.031126 |
| E18 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [18.09725, 3.41919] | 0.5 | S1 | 0.031126 |
| E19 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [19.09650, 4.05314] | 0.5 | S1 | 0.031126 |
| E20 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [20.08956, 4.70329] | 0.5 | S1 | 0.031126 |
| E21 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [21.07929, 5.35596] | 0.5 | S1 | 0.031126 |
| E22 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [22.06986, 6.35596] | 0.5 | S1 | 0.031126 |
| E23 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [23.05261, 7.35596] | 0.5 | S1 | 0.031126 |
| E24 | 0.025130 | S2 | 0.204780 | 0.019420 | S1 | [24.03486, 8.35596] | 0.5 | S1 | 0.031126 |

Sustainability 2022, 14, 4795
Although sustainable development has three dimensions: economic, environmental, and social, we have included in this study another dimension of the framework for strengthening participation in development to establish the extent to which indicators that stand out within this group affect economic growth and regional development. The optimistic scenario includes only one of these factors as the dominant ones, the targeted attraction of investments. The results obtained using the IAHP method favor precisely the indicators from this dimension because the estimates given using the interval method defined wider intervals that favored this group of factors. Thus, the most significant indicators by IAHP are the development of a stimulating entrepreneurial environment, targeted investment attraction, reducing the degree of the gray economy in GDP, effective preservation of ecosystems and resources themselves.

The measure chosen for the realization of comparative analysis of criterion weighting methods presented in this research is one of the most frequently used rank correlation coefficients used today to solve the problem of MCDM. Spearman’s correlation coefficient represents the measure of the strength and direction of the correlation between two ranked criteria [76]. This coefficient is given by (8)

$$S_c = -\frac{6\sum_{i=1}^{n}(r_{x_i} - r_{y_i})^2}{n(n^2 - 1)},$$

where \( r_{x_i} \) and \( r_{y_i} \) are ranks of the element \( i \) in the compared rankings, \( n \) is the number of elements in the ranking.

WS method rank correlation coefficient is new, and was introduced in [77]. The main goal of this coefficient is to choose indicators that are closer to the top of the considered ranking. It provides a typical ranking scenario where the first three places are the most significant and targets differences in the given ranks depending on what changes in positions are observed. This coefficient is used in many decision-making problems and coefficient is calculated as shown in (9)

$$WS = 1 - \sum_{i=1}^{n} \left( 2^{-r_{x_i}} - \frac{|r_{x_i} - r_{y_i}|}{\max\{|1 - r_{x_i}|, |n - r_{x_i}|\}} \right).$$

A comparative analysis of the similarity of the methods is given in Table 5.

Figure 5. Graphical representation of final weights of influential indicators by AHP and FAHP with Chang approach and different degrees of optimism.
Table 5. Comparison similarity analysis of methods.

| Method       | FAHP $\nu = 1$ | FAHP $\nu = 0.5$ | FAHP $\nu = 0$ | AHP     | IAHP     |
|--------------|----------------|------------------|----------------|---------|----------|
| FAHP $\nu = 1$ | $Sc = 0.997$   | $Sc = 0.988$     | $Sc = 0.877$   | $Sc = 0.989$ | $Sc = 0.836$ |
|              | $WS = 0.964$   | $WS = 0.964$     | $WS = 0.991$   | $WS = 0.964$ | $WS = 0.837$ |
| FAHP $\nu = 0.5$ | $Sc = 0.995$   | $Sc = 0.995$     | $Sc = 0.871$   | $Sc = 0.995$ | $Sc = 0.845$ |
|              | $WS = 0.997$   | $WS = 0.999$     | $WS = 0.991$   | $WS = 0.999$ | $WS = 0.877$ |
| FAHP $\nu = 0$ | $Sc = 0.852$   | $Sc = 0.852$     | $Sc = 0.852$   | $Sc = 0.856$ | $Sc = 0.838$ |
|              | $WS = 0.986$   | $WS = 0.997$     | $WS = 0.986$   | $WS = 0.991$ | $WS = 0.865$ |
| FAHP Chang   |                |                  |                | $Sc = 0.847$ | $Sc = 0.836$ |
|              |                |                  |                | $WS = 0.991$ | $WS = 0.837$ |
| AHP          |                |                  |                | $Sc = 0.850$ | $WS = 0.882$ |

Figure 5 highlights the most influential indicators for AHP, fuzzy AHP with Chang’s (EAM) approach and the three-level optimism approach and Figure 6 shows the most influential factors singled out as measures by AHP and FAHP.

**Optimistic scenario (FAHP)**
- Stability of business environment and business sector
- Reducing the pressure of public investment on the budget
- Effective preservation of ecosystems and resources themselves
- Global response to the COVID-19 pandemic
- Targeted investment attraction
- Creating ability of the environment to accept a certain amount of pollutants per unit of time and space so that there is no irreversible damage to the environment
- Reconciliation of the relationship between the degree of exhaustion of natural resources and their regeneration rate.

**Pessimistic scenario (FAHP)**
- Stability of the business environment and business sector
- The development of a stimulating entrepreneurial environment
- Reducing the pressure of public investment on the budget
- Effective conservation of ecosystems and resources themselves
- Global response to the COVID-19 pandemic
- Targeted investment attraction
- Creating ability of the environment to accept a certain amount of pollutants per unit of time and space so that there is no irreversible damage to the environment
- Increase in efficiency and economy.

**Balanced scenario (FAHP)**
- Stability of business environment and business sector
- The development of a stimulating entrepreneurial environment
- Reducing the pressure of public investment on the budget
- Effective conservation of ecosystems and resources themselves
- Global response to the COVID-19 pandemic
- Targeted investment attraction
- Creating ability of the environment to accept a certain amount of pollutants per unit of time and space so that there is no irreversible damage to the environment
- Increase in efficiency and economy.

**Chang approach (FAHP)**
- Stability of business environment and business sector
- The development of a stimulating entrepreneurial environment
- Reducing the pressure of public investment on the budget
- Effective conservation of ecosystems and resources themselves
- Global response to the COVID-19 pandemic
- Targeted investment attraction
- Creating ability of the environment to accept a certain amount of pollutants per unit of time and space so that there is no irreversible damage to the environment
- Increase in efficiency and economy.

**Crisp approach (AHP)**
- Stability of the business environment and business sector
- The development of a stimulating entrepreneurial environment
- Reducing the pressure of public investment on the budget
- Effective conservation of ecosystems and resources themselves
- Targeted investment attraction
- Global response to the COVID-19 pandemic
- Increase in efficiency and economy.

Figure 6. The most influential factors singled out as measures by AHP and FAHP.
5. Conclusions

Managing natural and human resources for economic and regional development is a global challenge that requires attention and importance in every society guided by the principles of sustainable development. Natural resources underpin economic activities in many ways. Issues about socially, environmentally, and economically sustainable promotion of growth in the best way have been increasingly at the heart of the interest. The strategy of economic development of the region includes defining a model for achieving the planned evolution of the state. Developing countries can apply a multi-criteria analysis in assessing and solving complex solvency problems from different perspectives. This paper examines the influential factors of sustainable economic development, taking into account the naturally available wealth also human resources as the backbone of the development of the region’s economy. The paper discusses indicators divided into four groups a framework for strengthening participation in development, human social resources, economic potential, and natural resources. In recent decades, the FAHP method, based primarily on triangular fuzzy numbers, was proven suitable in a wide range of fields of engineering, environment, industry, economy, etc. The approach in the indicators’ evaluation, given by unclear numbers, was significantly influenced the final results from the determination of influencing factors. Using methods, AHP and triangular fuzzy AHP, 57 different sub-criteria are ranked for identifying priorities in resource management and economic regional development. The triangular fuzzy of the AHP indicates the importance of the stability of the environment and the business sector for different degrees of optimism, namely the Chang approach and the classic AHP. The IAHP approach indicates the importance of stimulating entrepreneurial environment development. The analysis of the similarity of the results gives a generally satisfactory degree of similarity, although the second indicator already differs in some scenarios. The proposed model offers five scenarios, and it is up to the managers to decide on the most acceptable option. Such a proposal provides enough flexibility for the decision-maker. In future research, we intend to apply the spherical fuzzy analytic hierarchy process to find the best model to support IoT influence factors of entrepreneurship.

Author Contributions: Conceptualization, M.R.M. and M.M.N.; methodology, M.R.M. and D.M.M.; software, D.M.M.; validation, M.R.M. and D.M.M.; formal analysis, M.R.M. and D.M.M.; investigation, M.R.M. and M.M.N.; resources, M.M.N. and V.D.; data curation, M.R.M. and M.M.N.; writing—original draft preparation, M.R.M.; writing—review and editing, M.R.M. and D.M.M.; visualization, M.R.M. and V.D.; supervision, M.R.M. and D.M.M.; project administration, M.R.M., M.M.N. and V.D.; funding acquisition, M.M.N. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Page: 15Not applicable.

Acknowledgments: The authors express gratitude to the Ministry of Education, Science, and Technological Development of Serbia for providing partial support for this paper.

Conflicts of Interest: The authors declare no conflict of interest.
Appendix A

Table A1. Triangular fuzzy comparison matrix of the criteria S and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP (CI = 0.014, CR = 0.012).

|    | S1  | S2  | S3  | S4  | S5  | \(\omega_{EAM}\) | \(\omega_{v=1}\) | \(\omega_{v=0.5}\) | \(\omega_{v=0}\) | \(\omega_{AHP}\) |
|----|-----|-----|-----|-----|-----|-----------------|-----------------|-----------------|----------------|----------------|
| S1 | E   | W   | W   | W S | S   | 0.372998        | 0.407067        | 0.412316        | 0.426412        | 0.458904       |
| S2 | 1/w | E   | E   | EW  | W   | 0.24581         | 0.217634        | 0.211868        | 0.196386        | 0.184391       |
| S3 | 1/w | 1/e | E   | EW  | W   | 0.225686        | 0.192363        | 0.191169        | 0.187963        | 0.184391       |
| S4 | 1/s | 1/e | EW  | 1/EW | E   | 0.114065        | 0.110957        | 0.113216        | 0.119281        | 0.106287       |
| S5 | 1/s | 1/w | 1/w | 1/EW | E   | 0.041441        | 0.071978        | 0.071430        | 0.069958        | 0.0660273      |

Table A2. Triangular fuzzy comparison matrix of the sub-criteria S1 and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP (CI = 0.004, CR = 0.007).

|    | S11 | S12 | S13 | \(\omega_{EAM}\) | \(\omega_{v=1}\) | \(\omega_{v=0.5}\) | \(\omega_{v=0}\) | \(\omega_{AHP}\) |
|----|-----|-----|-----|-----------------|-----------------|-----------------|----------------|----------------|
| S11| E   | EW  | W   | 0.469703        | 0.529412        | 0.521753        | 0.502793        | 0.539615       |
| S12| 1/E | E   | EW  | 0.335539        | 0.298349        | 0.303927        | 0.317737        | 0.296961       |
| S13| 1/w | 1/EW| E   | 0.194758        | 0.172240        | 0.174320        | 0.179469        | 0.163424       |

Table A3. Triangular fuzzy comparison matrix of the sub-criteria S2 and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP (CI = 0.008, CR = 0.006).

|    | S21 | S22 | S23 | S24 | S25 | S26 | \(\omega_{EAM}\) | \(\omega_{v=1}\) | \(\omega_{v=0.5}\) | \(\omega_{v=0}\) | \(\omega_{AHP}\) |
|----|-----|-----|-----|-----|-----|-----|-----------------|-----------------|-----------------|----------------|----------------|
| S21| E   | 1/EW| W   | EW  | E   | 1/EW| 0.185275        | 0.176969        | 0.172707        | 0.161515        | 0.153574       |
| S22| EW  | E   | WS  | W   | EW  | E   | 0.235335        | 0.261599        | 0.262923        | 0.266398        | 0.273782       |
| S23| 1/w | 1/WS| E   | 1/EW| 1/w | 1/WS| 0.049273        | 0.058989        | 0.059074        | 0.059296        | 0.056289       |
| S24| 1/EW| 1/W | EW  | E   | 1/EW| 1/W | 0.117913        | 0.101658        | 0.100503        | 0.097470        | 0.088998       |
| S25| 1/E | 1/EW| 1/w | 1/EW| E   | 1/EW| 0.176870        | 0.158077        | 0.157289        | 0.155218        | 0.153574       |
| S26| 1/EW| 1/E | WS  | 1/W | W   | E   | 0.235335        | 0.242707        | 0.247505        | 0.260101        | 0.273782       |

Table A4. Triangular fuzzy comparison matrix of the sub-criteria S3 and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP (CI = 0.006, CR = 0.007).

|    | S31 | S32 | S33 | S34 | \(\omega_{EAM}\) | \(\omega_{v=1}\) | \(\omega_{v=0.5}\) | \(\omega_{v=0}\) | \(\omega_{AHP}\) |
|----|-----|-----|-----|-----|-----------------|-----------------|-----------------|----------------|----------------|
| S31| E   | W   | 1/EW| 1/EW| 0.263272        | 0.236521        | 0.225833        | 0.203452        | 0.199916       |
| S32| 1/w | E   | 1/WS| 1/WS| 0   | 0.081199        | 0.083232        | 0.087490        | 0.081531       |
| S33| EW  | WS  | E   | E   | 0.368364        | 0.361858        | 0.361721        | 0.361435        | 0.359276       |
| S34| EW  | WS  | 1/E | E   | 0.368364        | 0.320422        | 0.329213        | 0.347623        | 0.359276       |

Table A5. Triangular fuzzy comparison matrix of sub-criteria S4 and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP (CI = 0.003, CR = 0.003).

|    | S41 | S42 | S43 | S44 | \(\omega_{EAM}\) | \(\omega_{v=1}\) | \(\omega_{v=0.5}\) | \(\omega_{v=0}\) | \(\omega_{AHP}\) |
|----|-----|-----|-----|-----|-----------------|-----------------|-----------------|----------------|----------------|
| S41| E   | 1/EW| 1/EW| EW  | 0.225915        | 0.190410        | 0.194622        | 0.206108        | 0.18906        |
| S42| EW  | E   | E   | W   | 0.312898        | 0.367517        | 0.361595        | 0.345444        | 0.350913       |
| S43| EW  | 1/E | E   | W   | 0.312898        | 0.321785        | 0.324043        | 0.330201        | 0.350913       |
| S44| 1/EW| 1/w | 1/w | E   | 0.148289        | 0.120288        | 0.119741        | 0.118247        | 0.109114       |
| $S_{S1}$ | $S_{S2}$ | $S_{S3}$ | $S_{S4}$ | $S_{S5}$ | $S_{S6}$ | $\omega_{EAM}$ | $\omega_{\lambda=1}$ | $\omega_{\lambda=0.5}$ | $\omega_{\lambda=0}$ | $\omega_{AHP}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| E 1/EW | EW | EW | W | S | 0.250825 | 0.235493 | 0.231698 | 0.222953 | 0.232901 |
| EW | E | W | WS | SV | 0.309864 | 0.313714 | 0.317928 | 0.327637 | 0.366723 |
| 1/EW | 1/W | E | EW | WS | 0.179803 | 0.161625 | 0.161192 | 0.160196 | 0.138193 |
| 1/EW | 1/W | 1/E | E | 1/EW | WS | 0.159103 | 0.145126 | 0.148022 | 0.154696 | 0.138193 |
| 1/W | 1/WS | 1/EW | 1/EW | E | W | 0.101304 | 0.106154 | 0.102018 | 0.092487 | 0.0838608 |
| 1/s | 1/sv | 1/WS | 1/WS | 1/W | E | 0 | 0.037887 | 0.039141 | 0.042030 | 0.0401283 |

**Table A6.** Triangular fuzzy comparison matrix of the sub-criteria $S_{S}$ and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP ($CI = 0.020$, $CR = 0.016$).

| $E_{1}$ | $E_{2}$ | $E_{3}$ | $\omega_{EAM}$ | $\omega_{\lambda=1}$ | $\omega_{\lambda=0.5}$ | $\omega_{\lambda=0}$ | $\omega_{AHP}$ |
|---|---|---|---|---|---|---|---|
| $E_{1}$ | EW | E | 0.394737 | 0.445455 | 0.433884 | 0.409091 | 0.4 |
| $E_{2}$ | 1/EW | E | 0.210526 | 0.200000 | 0.203857 | 0.212121 | 0.2 |
| $E_{3}$ | 1/E | EW | E | 0.394737 | 0.354545 | 0.362259 | 0.378788 | 0.4 |

**Table A7.** Triangular fuzzy comparison matrix of the criteria $E$ and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP ($CI = 0$, $CR = 0$).

| $E_{11}$ | $E_{12}$ | $\omega_{EAM}$ | $\omega_{\lambda=1}$ | $\omega_{\lambda=0.5}$ | $\omega_{\lambda=0}$ | $\omega_{AHP}$ |
|---|---|---|---|---|---|---|
| $E_{11}$ | EW | E | 0.692308 | 0.666667 | 0.658163 | 0.642857 | 0.666667 |
| $E_{12}$ | 1/EW | 1/E | 0.307692 | 0.333333 | 0.341837 | 0.357143 | 0.333333 |

**Table A8.** Triangular fuzzy comparison matrix of the sub-criteria $E_{1}$ and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP ($CI = 0$, $CR = 0$).

| $E_{21}$ | $E_{22}$ | $E_{23}$ | $E_{24}$ | $\omega_{EAM}$ | $\omega_{\lambda=1}$ | $\omega_{\lambda=0.5}$ | $\omega_{\lambda=0}$ | $\omega_{AHP}$ |
|---|---|---|---|---|---|---|---|---|
| $E_{21}$ | EW | WS | S | 0.504296 | 0.449824 | 0.453298 | 0.460482 | 0.491839 |
| $E_{22}$ | 1/EW | E | WS | 0.391579 | 0.331107 | 0.327465 | 0.319933 | 0.305571 |
| $E_{23}$ | 1/WS | 1/W | EW | 0.104125 | 0.144724 | 0.142439 | 0.137713 | 0.124793 |
| $E_{24}$ | 1/s | 1/WS | 1/EW | 0 | 0.074344 | 0.076798 | 0.081871 | 0.0777981 |

**Table A9.** Triangular fuzzy comparison matrix of the sub-criteria $E_{2}$ and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP ($CI = 0.0161203$, $CR = 0.0179114$).

| $E_{31}$ | $E_{32}$ | $E_{33}$ | $\omega_{EAM}$ | $\omega_{\lambda=1}$ | $\omega_{\lambda=0.5}$ | $\omega_{\lambda=0}$ | $\omega_{AHP}$ |
|---|---|---|---|---|---|---|---|
| $E_{31}$ | EW | EW | 0.335539 | 0.298349 | 0.298349 | 0.317737 | 0.296961 |
| $E_{32}$ | EW | E | 0.469703 | 0.529412 | 0.529412 | 0.502793 | 0.539615 |
| $E_{33}$ | 1/EW | 1/W | 0.194758 | 0.172240 | 0.172240 | 0.179469 | 0.163424 |

**Table A10.** Triangular fuzzy comparison matrix of the sub-criteria $E_{3}$ and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP ($CI = 0.004$, $CR = 0.007$).

| $N_{1}$ | $N_{2}$ | $N_{3}$ | $\omega_{EAM}$ | $\omega_{\lambda=1}$ | $\omega_{\lambda=0.5}$ | $\omega_{\lambda=0}$ | $\omega_{AHP}$ |
|---|---|---|---|---|---|---|---|
| $N_{1}$ | EW | EW | 0.194758 | 0.172242 | 0.174324 | 0.179469 | 0.163424 |
| $N_{2}$ | EW | E | 0.335539 | 0.298349 | 0.309327 | 0.317737 | 0.296961 |
| $N_{3}$ | W | EW | 0.469703 | 0.529412 | 0.521753 | 0.502793 | 0.539615 |

**Table A11.** Triangular fuzzy comparison matrix of the criteria $N$ and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP ($CI = 0.004$, $CR = 0.007$).
Table A12. Triangular fuzzy comparison matrix of the sub-criteria $N_1$ and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP ($CI = 0.006, CR = 0.007$).

| $N_1$   | $N_2$ | $N_3$ | $N_4$ | $\omega_{EAM}$ | $\omega_{r=1}$ | $\omega_{r=0.5}$ | $\omega_{r=0}$ | $\omega_{AHP}$ |
|---------|-------|-------|-------|-----------------|-----------------|-----------------|----------------|----------------|
| $N_{11}$ | E     | EW    | W     | 0.368364       | 0.361858        | 0.361721        | 0.361435       | 0.359276       |
| $N_{12}$ | E     | EW    | W     | 0.368364       | 0.320422        | 0.329213        | 0.347623       | 0.359276       |
| $N_{13}$ | 1/EW  | 1/EW  | E     | 0.263272       | 0.236521        | 0.225833        | 0.203452       | 0.199916       |
| $N_{14}$ | 1/WS  | 1/WS  | 1/W   | 0              | 0.081199        | 0.083232        | 0.087490       | 0.081531       |

Table A13. Triangular fuzzy comparison matrix of the sub-criteria $N_2$ and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP ($CI = 0.004, CR = 0.007$).

| $N_2$   | $N_3$ | $N_4$ | $\omega_{EAM}$ | $\omega_{r=1}$ | $\omega_{r=0.5}$ | $\omega_{r=0}$ | $\omega_{AHP}$ |
|---------|-------|-------|-----------------|-----------------|-----------------|----------------|----------------|
| $N_{21}$ | E     | EW    | W               | 0.469703        | 0.529412        | 0.521753        | 0.502793       | 0.539615       |
| $N_{22}$ | 1/EW  | E     | EW              | 0.335539        | 0.296834        | 0.303927        | 0.317737       | 0.296961       |
| $N_{23}$ | 1/W   | 1/EW  | E               | 0.194758        | 0.17224         | 0.17432         | 0.179469       | 0.163424       |

Table A14. Triangular fuzzy comparison matrix of the sub-criteria $N_3$ and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP ($CI = 0.016, CR = 0.017$).

| $N_3$   | $N_4$ | $\omega_{EAM}$ | $\omega_{r=1}$ | $\omega_{r=0.5}$ | $\omega_{r=0}$ | $\omega_{AHP}$ |
|---------|-------|-----------------|-----------------|-----------------|----------------|----------------|
| $N_{31}$ | E     | W               | 0.391579        | 0.331107        | 0.327465        | 0.319933       | 0.305571       |
| $N_{32}$ | 1/W   | E               | 0.104125        | 0.144724        | 0.142439        | 0.137713       | 0.124793       |
| $N_{33}$ | EW    | WS              | E               | 0.504296        | 0.449824        | 0.453298        | 0.460482       | 0.491839       |
| $N_{34}$ | 1/WS  | 1/s             | E               | 0               | 0.074344        | 0.076798        | 0.081871       | 0.077798       |

Table A15. Triangular fuzzy comparison matrix of the criteria H and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP ($CI = 0.024, CR = 0.022$).

| $H_1$   | $H_2$ | $H_3$ | $H_4$ | $\omega_{EAM}$ | $\omega_{r=1}$ | $\omega_{r=0.5}$ | $\omega_{r=0}$ | $\omega_{AHP}$ |
|---------|-------|-------|-------|-----------------|-----------------|-----------------|----------------|----------------|
| $H_{11}$ | E     | W     | S     | 0.302687        | 0.278976        | 0.2728          | 0.259174       | 0.265205       |
| $H_{21}$ | 1/w   | E     | 1/WS  | 1/EW          | 0.121185        | 0.132675        | 0.12679        | 0.113806       | 0.10256        |
| $H_{31}$ | EW    | WS    | E     | 0.375703        | 0.357825        | 0.366489        | 0.386064       | 0.420131       |
| $H_{41}$ | 1/EW  | EW    | 1/w   | 1/S            | 0.200425        | 0.183401        | 0.185608       | 0.190476       | 0.163751       |
| $H_{51}$ | 1/S   | 1/w   | 1/WS  | 1/S            | 0               | 0.047122        | 0.048313       | 0.050949       | 0.048552       |

Table A16. Triangular fuzzy comparison matrix of the sub-criteria $H_1$ and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP ($CI = 0.019, CR = 0.033$).

| $H_{11}$ | $H_{12}$ | $H_{13}$ | $\omega_{EAM}$ | $\omega_{r=1}$ | $\omega_{r=0.5}$ | $\omega_{r=0}$ | $\omega_{AHP}$ |
|---------|----------|----------|-----------------|-----------------|-----------------|----------------|----------------|
| $H_{11}$ | E        | W        | S                | 0.573349        | 0.588534        | 0.591657        | 0.599821       | 0.636986       |
| $H_{12}$ | 1/S      | 1/w      | E                | 0.375448        | 0.307359        | 0.303666        | 0.282085       | 0.238285       |
| $H_{13}$ | 1/WS     | 1/W      | E                | 0.0512038       | 0.104107        | 0.107977        | 0.118094       | 0.104729       |

Table A17. Triangular fuzzy comparison matrix of the H_2 and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP ($CI = 0.009, CR = 0.015$).

| $H_{21}$ | $H_{22}$ | $H_{23}$ | $\omega_{EAM}$ | $\omega_{r=1}$ | $\omega_{r=0.5}$ | $\omega_{r=0}$ | $\omega_{AHP}$ |
|---------|----------|----------|-----------------|-----------------|-----------------|----------------|----------------|
| $H_{21}$ | E        | W        | 1/EW            | 0.423486        | 0.369599        | 0.35333         | 0.319177       | 0.319618       |
| $H_{22}$ | 1/W      | E        | 1/WS            | 0               | 0.125255        | 0.127978        | 0.133695       | 0.121957       |
| $H_{23}$ | EW       | WS       | E                | 0.576514        | 0.505146        | 0.518692        | 0.547127       | 0.558425       |
Table A18. Triangular fuzzy comparison matrix of the sub-criteria $H_3$ and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP ($CI = 0.009$, $CR = 0.015$).

| $H_{31}$ | $H_{32}$ | $H_{33}$ | $\omega_{\text{EAM}}$ | $\omega_{\nu=1}$ | $\omega_{\nu=0.5}$ | $\omega_{\nu=0}$ | $\omega_{\text{AHP}}$ |
|----------|----------|----------|------------------------|-----------------|-----------------|-----------------|-----------------|
| $H_{31}$ | E        | WS       | W                      | 0.686499        | 0.603569        | 0.60215         | 0.598899        | 0.625013        |
| $H_{32}$ | $t/\nu$  | E        | E                      | 0               | 0.129365        | 0.135136        | 0.147250        | 0.1365          |
| $H_{33}$ | $t/W$    | EW       | E                      | 0.313501        | 0.266935        | 0.262714        | 0.253851        | 0.238487        |

Table A19. Triangular fuzzy comparison matrix of the sub-criteria $H_4$ and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP ($CI = 0, CR = 0$).

| $H_{41}$ | $H_{42}$ | $H_{43}$ | $\omega_{\text{EAM}}$ | $\omega_{\nu=1}$ | $\omega_{\nu=0.5}$ | $\omega_{\nu=0}$ | $\omega_{\text{AHP}}$ |
|----------|----------|----------|------------------------|-----------------|-----------------|-----------------|-----------------|
| $H_{41}$ | E        | S        | 1                      | 0.848684        | 0.836219        | 0.813956        | 0.833333        |
| $H_{42}$ | $t/S$    | $t/E$    | 0                      | 0.151316        | 0.163781        | 0.186404        | 0.151316        |

Table A20. Triangular fuzzy comparison matrix of the sub-criteria $H_5$ and its weights for Chang’s approach (EAM), different degrees of optimism in FAHP, and crisp AHP ($CI = 0.038$, $CR = 0.065$).

| $H_{51}$ | $H_{52}$ | $H_{53}$ | $\omega_{\text{EAM}}$ | $\omega_{\nu=1}$ | $\omega_{\nu=0.5}$ | $\omega_{\nu=0}$ | $\omega_{\text{AHP}}$ |
|----------|----------|----------|------------------------|-----------------|-----------------|-----------------|-----------------|
| $H_{51}$ | E        | WS       | V                      | 0.904283        | 0.651202        | 0.644745        | 0.634569        | 0.695523        |
| $H_{52}$ | $t/WS$   | E        | WS                     | 0.0957168       | 0.27877         | 0.281051        | 0.284647        | 0.229048        |
| $H_{53}$ | $t/V$    | WS       | E                      | 0               | 0.070028        | 0.074204        | 0.074204        | 0.0754292       |

References

1. Tolstykh, T.; Gamidullaev, L.; Shmeleva, N.; Lapygin, Y. Regional Development in Russia: An Ecosystem Approach to Territorial Sustainability Assessment. *Sustainability* 2020, 12, 6424. [CrossRef]
2. Aksentijević, K.N.; Ježić, Z.; Zaninović, P.A. The Effects of Information and Communication Technology (ICT) Use on Human Development—A Macroeconomic Approach. *Economies* 2021, 9, 128. [CrossRef]
3. Stofkova, Z.; Sukalova, V. Sustainable Development of Human Resources in Globalization Period. *Sustainability* 2020, 12, 7681. [CrossRef]
4. Directorate-General for Research and Innovation. In *Innovating for Sustainable Growth: A Bioeconomy for Europe*; European Commission: Brussels, Belgium, 2012.
5. Petrović, R. Policy of balanced regional development of the Republic of Serbia from 2000 to 2018. *Megatrend Rev.* 2020, 17, 45–62. [CrossRef]
6. Stahl, G.K.; Brewster, C.J.; Collings, D.G.; Hajro, A. Enhancing the role of human resource management in corporate sustainability and social responsibility: A multi-stakeholder, multidimensional approach to HRM. *Hum. Resour. Manag. Rev.* 2020, 30, 100708. [CrossRef]
7. Jimenez, C.; Moncada, L.; Ochoa-Jimenez, D.; Ochoa-Moreno, W. Kuznets Environmental Curve for Ecuador: An analysis of the impact of economic growth on the environment. *Sustainability* 2019, 11, 5896. [CrossRef]
8. Dimić, V.; Milošević, M.; Milošević, D.; Stević, D. Adjustable Model of Renewable Energy Projects for Sustainable Development: A Case Study of the Nišava District in Serbia. *Symmetry* 2018, 10, 775. [CrossRef]
9. Madžarević, A.R.; Ivezić, D.D.; Tanasijević, M.L.; Živković, M.A. The Fuzzy–AHP Synthesis Model for Energy Security Assessment of the Serbian Natural Gas Sector. *Symmetry* 2020, 12, 908. [CrossRef]
10. Meyer, D.F.; Meyer, N. The relationship between the creation of an enabling environment and economic development: A comparative analysis of management at local government sphere. *Pol. J. Manag. Stud.* 2016, 14, 150–160. [CrossRef]
11. Tiba, S.; Omri, A. Literature survey on the relationships between environment, energy and economic growth. *Renew. Sustain. Energy Rev.* 2017, 69, 1129–1146. [CrossRef]
12. Mitić-Radulović, A.; Lalović, K. Multi-Level Perspective on Sustainability Transition towards Nature-Based Solutions and Co-Creation in Urban Planning of Belgrade, Serbia. *Sustainability* 2021, 13, 7576. [CrossRef]
13. Širá, E.; Vavrek, R.; Kravčáková Vozárová, I.; Kotulič, R. Knowledge Economy Indicators and Their Impact on the Sustainable Competitiveness of the EU Countries. *Sustainability* 2020, 12, 4172. [CrossRef]
14. Milošević, D.; Milošević, M.; Simjanović, D. A Comparative Study of FAHP with Type-1 and Interval Type-2 Fuzzy Sets for ICT Implementation in Smart Cities. In *Intelligent and Fuzzy Techniques for Emerging Conditions and Digital Transformation; Kahraman, C., Cebi, S., Cevik Onar, S., Oztaysi, B., Tolga, A.C., Sari, I.U., Eds.; INFUS 2021. Lecture Notes in Networks and Systems; Springer: Cham, Switzerland, 2022; Volume 308, pp. 845–852.*
15. Mert, A. Sustainable Development Partnerships in the UN System. In Networks for Prosperity: Advancing Sustainability through Partnerships; Fuentes Cardona, J., Kitaoka, K., Pirca Garcia, I., Eds.; United Nations Industrial Development Organization (UNIDO) Vienna International Centre: Vienna, Austria, 2015; pp. 55–67. ISBN 978-3-200-03916-2.

16. Dang, V.T.; Wang, J.; Dang, W.V.-T. An Integrated Fuzzy AHP and Fuzzy Topsis Approach to Assess Sustainable Urban Development in an Emerging Economy. Int. J. Environ. Res. Public Health 2019, 16, 2902. [CrossRef]

17. Saleh, H.; Surya, B.; Arnisa Ahmad, D.N.; Manda, D. The Role of Natural and Human Resources on Economic Growth and Regional Development: With Discussion of Open Innovation Dynamics. J. Open Innov. Technol. Mark. Complex. 2020, 6, 103. [CrossRef]

18. Berend, T.I. From the Soviet Bloc to the European Union: The Economic and Social Transformation of Central and Eastern Europe since 1973; Cambridge University Press: Cambridge, UK, 2009.

19. Faulks, B.; Song, Y.; Waiganjo, M.; Obrenovic, B.; Godinic, D. Impact of Empowering Leadership, Innovative Work, and Organizational Learning Readiness on Sustainable Economic Performance: An Empirical Study of Companies in Russia during the COVID-19 Pandemic. Sustainability 2021, 13, 12465. [CrossRef]

20. Local Economic Leadership© OECD 2015. Available online: https://www.oecd.org/cfe/leed/OECD-LEED-Local-Economic-Leadership.pdf (accessed on 20 January 2022).

21. Krasniqi, I. Strategic Management for Regional Economic Development and Business Sustainability: Countries in Transition. Int. J. Econ. Bus. Adm. 2019, 7, 47–67. [CrossRef]

22. Nikolić, M. Strategic Management of Natural Resources of Pčinj District for the Purpose of Economic and Ecological Development—Case Study of the City of Vranje. Ph.D. Thesis, Faculty of Management—Megatrend University, Belgrade, Serbia, 2019; pp. 1–203. (In Serbian).

23. Otić, G.; Momčilović, O.; Radovanović, L.; Jovanov, G.; Radosav, D.; Pekez, J. Mathematical Analysis of Criteria for Maintenance of Technical Systems in the Function of Achieving Sustainability. Sustainability 2021, 13, 1680. [CrossRef]

24. Saaty, T.L. The Analytic Hierarchy Process; McGraw-Hill: New York, NY, USA, 1980.

25. Saaty, T.L. Analytic Network Process—Decision Making with Dependence and Feedback; RWS publications: Pittsburgh, PA, USA, 1996; ISBN 0-9620317-9-8.

26. Milošević, D.M.; Milošević, M.R.; Simjanović, D.J. Implementation of Adjusted Fuzzy AHP Method in the Assessment for Reuse of Industrial Buildings. Mathematics 2020, 8, 1697. [CrossRef]

27. Aguaron, J.; Escobar, M.T.; Moreno-Jiménez, J.M.; Turón, A. AHP-Group Decision Making Based on Consistency. Mathematics 2019, 7, 242. [CrossRef]

28. Milošević, M.R.; Milošević, D.M.; Stanojević, A.D.; Stević, D.M.; Simjanović, D.J. Fuzzy and Interval AHP Approaches in Sustainable Management for the Architectural Heritage in Smart Cities. Mathematics 2021, 9, 304. [CrossRef]

29. Milošević, M.R.; Milošević, D.M.; Stanojević, A.D. Managing Cultural Built Heritage in Smart Cities Using Fuzzy and Interval Multi-criteria Decision Making. In Intelligent and Fuzzy Techniques: Smart and Innovative Solutions. INFIS 2020. Advances in Intelligent Systems and Computing; Kahraman, C., Cevik Onar, S., Oztaysi, B., Sarı, I., Cebi, S., Tolga, A., Eds.; Springer: Cham, Switzerland, 2021; Volume 1197, pp. 599–607.

30. Chang, D.Y. Applications of the extent analysis method on fuzzy AHP. Eur. J. Oper. Res. 1996, 95, 649–665. [CrossRef]

31. Stanojević, A.D.; Milošević, M.; Milošević, D.; Turnšek, B.A.; Jevremović, L.L. Developing multi-criteria model for the protection of built heritage from the aspect of energy retrofitting. Energy Build. 2021, 250, 111285. [CrossRef]

32. Narayananmoorthy, S.; Ramya, L.; Kalaiselvan, S.; Kureethara, J.V.; Kang, D. Use of DEMATEL and COPRAS method to select best alternative fuel for control of impact of greenhouse gas emissions. Socio-Econ. Plan. Sci. 2021, 76, 10099.

33. Geetha, S.; Narayananmoorthy, S.; Kang, D. Extended hesitant fuzzy SWARA techniques to examine the criteria weights and VIKOR method for ranking alternatives. In Proceedings of the AIP Conference Proceedings 2261 of Advances in Applicable Mathematics—ICAAM2020, Coimbatore, India, 21–22 February 2020.

34. Narayananmoothy, S.; Ramya, L.; Kang, D. Normal wiggly hesitant fuzzy set with multi-criteria decision making problem. In Proceedings of the AIP Conference Proceedings 2261 of Advances in Applicable Mathematics—ICAAM2020, Coimbatore, India, 21–22 February 2020.

35. Zahedi, F. The analytic hierarchy process—a survey of the method and its applications. Interfaces 1986, 16, 96–108. [CrossRef]

36. Canco, I.; Kruja, D.; Iancu, T. AHP, a Reliable Method for Quality Decision Making: A Case Study in Business. Sustainability 2021, 13, 13932. [CrossRef]

37. Lešniak, A.; Kubek, D.; Plebankiewicz, E.; Zima, K.; Belniak, S. Fuzzy AHP Application for Supporting Contractors’ Bidding Decision. Symmetry 2018, 10, 642. [CrossRef]

38. Kahraman, C. Multi-criteria decision making methods and Fuzzy sets. In Fuzzy Multicriteria Decision Making: Theory and Applications with Recent Development, 1st ed.; Kahraman, C., Ed.; Springer US: Istanbul, Turkey, 2008; Volume 1, pp. 1–18.

39. Liou, T.S.; Wang, M.J. Ranking fuzzy numbers with integral value. Fuzzy Sets Syst. 1992, 50, 247–256. [CrossRef]

40. Flacke, J.; Shrestha, R.; Aguilar, R. Strengthening Participation Using Interactive Planning Support Systems: A Systematic Review. ISPRS Int. J. Geo-Inf. 2020, 9, 49. [CrossRef]

41. Weber, A.S. The role of education in knowledge economies in developing countries. Procedia Soc. Behav. Sci. 2011, 15, 2589–2594. [CrossRef]
71. Senayah, E.A.; Mprah, W.K.; Opoku, M.P.; Edusei, A.K.; Torgbenu, E.L. The accessibility of health services to young deaf adolescents in Ghana. *Int. J. Health Plan. Manag.* 2018, 34, 634–645. [CrossRef]

72. Gylfason, T. Natural resources, education, and economic development. *Eur. Econ. Rev.* 2001, 45, 847–859. [CrossRef]

73. Kundu, A. Toward a framework for strengthening participants’ self-efficacy in online education. *Asian Assoc. Open Univ. J.* 2020, 15, 351–370. [CrossRef]

74. Novo-Corti, I.; Tîrcă, D.-M.; Ziolo, M.; Picatoste, X. Social Effects of Economic Crisis: Risk of Exclusion. An Overview of the European Context. *Sustainability* 2019, 11, 336. [CrossRef]

75. Bossuyt, J.; Sherriff, A.; de Tollenaere, M.; Veron, P.; Sayós Monràs, M.; Di Ciommo, M. Strategically financing an effective role for the EU in the world: First reflections on the next EU budget. In *Investing in Europe’s Global Role: The Must-Have Guide for the negotiations of the Multiannual Financial Framework 2021–2027*; Sherriff, A., Ed.; The European Centre for Development Policy Management (ECDPM): Maastricht, The Netherlands, 2019; ISBN 978-90-72908-506.

76. Ceballos, B.; Lamata, M.T.; Pelta, D.A. A comparative analysis of multi-criteria decision-making methods. *Prog. Artif. Intell.* 2016, 5, 315–322. [CrossRef]

77. Salabun, W.; Urbaniak, K. A new coefficient of rankings similarity in decision-making problems. In Proceedings of the International Conference on Computational Science, Amsterdam, The Netherlands, 3–5 June 2020; Springer: Cham, Switzerland, 2020; pp. 632–645.