Decision Making: Applications in Management and Engineering
ISSN: 2560-6018
eISSN: 2620-0104
DOI: https://doi.org/10.31181/dmame06012023k

EVALUATION OF THE SOCIAL-CULTURAL COMPETITIVENESS OF CITIES BASED ON SUSTAINABLE DEVELOPMENT APPROACH

Hossein Komasi[1], Sarfaraz Hashemkhani Zolfani [1*] and Alireza Nemati[2]

[1] School of Engineering, Universidad Catolica del Norte, Larrondo 1281, Coquimbo, Chile,
[2] Department of Industrial Engineering and Management Systems, Amirkabir University of Technology (Tehran Polytechnic), Tehran 15875-4413, Iran

Received: 8 March 2022;
Accepted: 8 November 2022;
Available online: 5 January 2023.

Original scientific paper

Abstract: *The terms of competitiveness at the level of places and sustainable development were created in the 1980s and 1990s. In the beginning, most researchers emphasized the dimension of economic competitiveness, but in recent decades, other aspects of competitiveness, such as socio-cultural and environmental, have been highlighted. The aim of the present research is evaluation the social-cultural competitiveness in the city of Kermanshah based on a sustainable development approach. This research is descriptive and analytical, the TOPSIS model was used for data analysis, and Entropy was used to weight the indicators. After applying the weight of the indicators in the TOPSIS model, The research findings showed that the city of Kermanshah in the TOPSIS model, ranks 15th with a coefficient of 0.209; in the MABAC model, ranks 14th with a coefficient of -0.116 and in the EDAS model, ranks 14th with a coefficient of 0.122579271 is in the last and 14th position of socio-cultural competitiveness. The results showed that; Considering the nature of urban competitiveness, which is multidimensional, it is necessary to avoid a one-sided approach in urban competitiveness planning and to consider the socio-cultural, environmental, and security dimensions of urban competitiveness in an integrated manner. To improve the competitiveness of Iranian cities, while paying attention to the internal competitive advantages of the 15 studied cities, special attention should be paid to the fields of economic, environmental, socio-cultural, and security competitiveness. Each of these cities concerns their competitive role in transnational dimensions. This requires special attention to the national macro-plans.*

Keywords: *Urban competitiveness; Urban development; Social-cultural competitiveness; Sustainable development; Development approach, Entropy method, TOPSIS, MABAC, EDAS.*

* Corresponding author.
E-mail addresses: komasi1366@gmail.com (H. Komasi), sarfaraz.hashemkhani@ucn.cl (S. Hashemkhani Zolfani, alirezanemati@aut.ac.ir (A. Nemati)

1. Introduction

Nowadays, in the world, about 55 percent of the population lives in urban areas, and it predicts this amount will increase by 1.5 times by 2045, adding 2 billion urban residents to 6 billion (The World Bank, 2020). Cities account for almost 80% of the world's GDP (Benites & Simoes, 2021). This increase in the urban population causes urban managers and governments (Haider Zaidi et al., 2021) to try to be in a more favorable position than other cities in the framework of sustainable development and to use the maximum capacity of their cities. Competitiveness is a complex concept and has different dimensions (Fantechi & Fratesi, 2022). Generally, it implies that a place, country, region, or city has factors that increase fertility and well-being (Martínez & Poveda, 2022). Various dimensions of competitiveness have been the attention of planners, policymakers, and researchers, and most researchers have emphasized the economic dimension (Grassia, 2022).

Today, urban competitiveness is not only related to economic competitiveness. It also includes socio-cultural and environmental competitiveness. Socio-cultural factors are considered one of the most important aspects of competitiveness and sustainability. This factor can also affect other aspects of competitiveness and sustainability (economic, environmental, etc.) (Tafuro et al., 2019). In the other way, considering that sustainable development also includes economic(Royo et al., 2022), social (Luczak & Just, 2021), and environmental (Li et al., 2022) dimensions, different aspects of the competitiveness index should be coordinated with the goals of sustainable development. Because, sustainable development is the development that provides the needs of the present generation without creating a risk for the future generation(De Andrade, 2021), In other words, focusing on the interactions and relationship between nature and humans are goals of sustainable development (Obaideen et al., 2021). Therefore, competitiveness should not threaten the future generation.

Globalization, an increase in urban population, and demographic changes have caused cultural and social changes. Various factors affect the cultural development of countries. Some of these factors are management and depend on the performance of urban managers and policymakers, such as facilities affecting the society's culture, such as a number of libraries, cinemas, religious sites, etc. Some other factors include individual and family factors, for example, men's literacy rate, women's literacy rate, etc.

Iran has high competitiveness capacities in the economic, socio-cultural, and environmental sectors, but these capacities have not been used well, and also Position of Iran's international competitiveness is not in a good state - According to the Global Competitiveness Report in 2016-2017, compared to the previous report that was conducted in 2015-2016 and with the presence of 140 countries, the country of Iran has dropped two ranks to the 76th place in the world (ICCIMA, 2017)- and also has not been successful in various aspects of sustainable development (Taghvaee et al., 2022). One of the most important cities in Iran in terms of population, human and natural potential is Kermanshah city. City of Kermanshah had a population of 946,651 in 2016. This city is the second largest city in the west and northwest of Iran (after Tabriz city) (Komasi et al., 2022). Kermanshah city has a lot of capabilities in natural and human capacities, especially in the tourism sector. But this city, with a 15.7% of the unemployment rate, is the most unemployed in Iran. Based on this, the main issue of this research is this: evaluation of the social-cultural competitiveness in the city of Kermanshah based on

a sustainable development approach among cities with a population of more than 500 thousand people in Iran (15 cities).

2. Literature Review

Before the 1990s, the theory of competitive advantages used to be considered only at the level of the microeconomy (enterprise unit). But in the 1990s, it was raised at the level of places (country level, etc.) (Sharifzadegan & Nedaetousi, 2015; Sgambati & Gargiulo, 2021). Some definitions consider competitiveness as the degree that places can produce goods and services (Required at the regional, national and international level) and improve the income, employment, quality of life of citizens, and sustainable development (EC, 1999; Krugman, 2003). Different dimensions of urban competitiveness are shown in Figure 1.

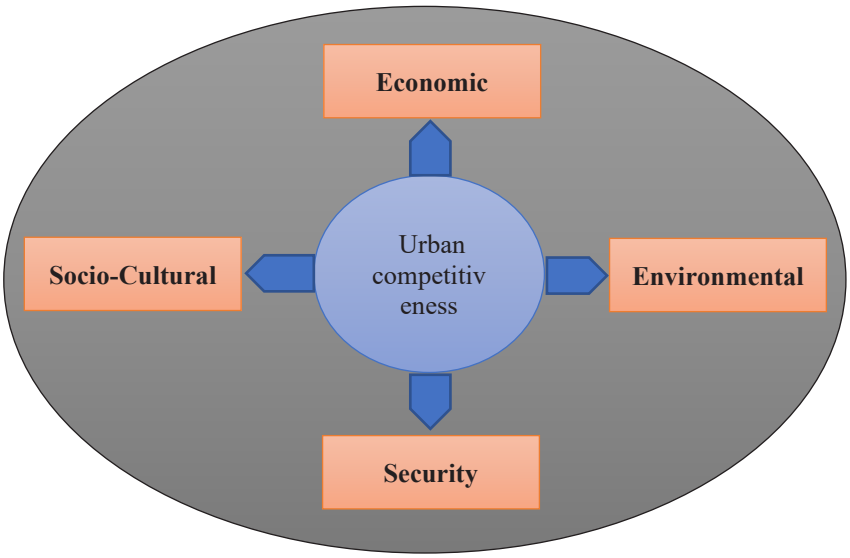

Figure 1. dimensions of urban competitiveness

Different researchers have tried to measure competitiveness in economic, social, and environmental dimensions and evaluate it at the city, regional and international levels. Some researchers have also examined a combination of factors:

Wang and Shen (2017) compared urban competitiveness in the period 2000–2010 between the Yangtze River Delta (YRD) and Pearl River Delta (PRD) in China. The results of their research show that in the period 2000–2010, economic competitiveness, among the four aspects of urban competitiveness (economic, social, environmental, and connectivity), had the highest correlation with the overall urban competitiveness, and environmental competitiveness was less consistent. The results of research by Song and Xie (2021) show that for cities, economic development has the greatest impact on city competitiveness, and the impact of quality of life on city competitiveness is low. Dou et al. (2000), based on modern competitive advantage theory for evaluating Chinese cities, constructed an index system. Their findings show that four factors are influential on the competitiveness of cities: capital, urban infrastructure, industrial performance and structure, and degree of market openness.

Competitiveness and sustainability are complex and multidimensional indexes that are measured by multiple indicators (Bilbao-Terol et al., 2019). Some researchers have emphasized that maintaining the sustainable growth of competitiveness is also one of the crucial aspects of competitiveness (Tang et al., 2022). Therefore, sustainable development should be considered in urban competitiveness studies. The term "sustainable development" for the first time in 1987 by the United Nations, according to the Brundtland Commission report "Our Common Future", was mentioned (Yadav & Prakash, 2022).

Many studies by scholars have investigated different dimensions of sustainable development; Amoushahi et al. (2022), have localized sustainable urban development indicators for Iran. Their results showed that the provinces of Iran have significant differences in sustainable urban development indicators. Foroozesh et al. (2022) have studied the development sustainability of Karaj. Their findings showed that the employment sub-criterion and socioeconomic criterion were the most important among other criteria. In the study by Zhang et al. (2021), In research on the impacts of tunnel infrastructure development on urban sustainability, for development to model urban sustainability, an integrated system includes social, economic, and environmental sub-systems.

Factors affecting competitiveness are complex and various. Some researchers measure competitiveness using a combination of economic, social, and environmental factors (Ni et al., 2017). Table (1) presents the variables of the socio-cultural dimension of the competitiveness index that has been used in different researches.

Table 1. Variables of the socio-cultural dimension of the competitiveness index

Row	Indicators	code	References
1	Number of libraries per 10,000 population	C1	Du et al., 2014; Jiang and Shen 2010; Bruneckiene et al., 2010; Liu et al., 2016; Guo et al., 2018; Wang et al., 2021; Ghahramanpouri et al., 2015; Salami et al., 2021; Beickmohammadi et al., 2017
2	Number of cinemas per 100,000 population	C2	Du et al., 2014; Jiang and Shen 2010; Bruneckiene et al., 2010; Liu et al., 2016; Guo et al., 2018; Wang et al., 2021; Ghahramanpouri et al., 2015; Salami et al., 2021; Beickmohammadi et al., 2017
3	Number of religious sites per 10,000 population	C3	Ghahramanpouri et al., 2015; Beickmohammadi et al., 2017
4	Number of cultural and art exhibitions in a year	C4	Liu et al., 2016; Guo et al., 2018; Wang et al., 2021; Ghahramanpouri et al., 2015; Salami et al., 2021
5	Amount of insured persons (percentage)	C5	Liu et al., 2016; Wang et al., 2021; Ghahramanpouri et al., 2015; Salami et al., 2021
6	Number of urban social service providers per 10,000	C6	Liu et al., 2016; Wang et al., 2021; Ghahramanpouri et al., 2015; Salami et al., 2021

Row	Indicators	code	References
	population		
7	Men's literacy rate	C7	Bruneckiene et al., 2010. Jiang and Shen, 2010; Liu et al., 2016; Wang et al., 2021; Salami et al., 2021
8	Women's literacy rate	C8	Yalcintas, 2008; Liu et al., 2016; Wang et al., 2021; Salami et al., 2021
9	Number of teaching staff compared to students	C9	Liu et al., 2016; Wang et al., 2021; Salami et al., 2021
10	Number of universities per 10,000 population	C10	Liu et al., 2016; Guo et al., 2018; Wang et al., 2021; Salami et al., 2021
11	Number of professors per student except Azad universities	C11	Liu et al., 2016; Guo et al., 2018; Wang et al., 2021; Salami et al., 2021
12	Students with higher education (percentage)	C12	Liu et al., 2016; Guo et al., 2018; Wang et al., 2021; Salami et al., 2021

3. Materials and Methods

3.1. Case Study

The study area of the present study is Kermanshah city. This city, with 34°18′45″ N 47°04′00″ E longitude of the Greenwich meridian, The city of Kermanshah is 1322 meters above sea level. The area of Kermanshah is 8796 hectares. Kermanshah has a suitable geographical location, as It's 525 km away from the capital of Iran (Metropolis of Tehran). This city is the second-largest and most populous city in the west and northwest of Iran (after Tabriz) and the largest city in Kermanshah province (Kermanshah Master Plan, 2004; Komasi et al., 2022). City of Kermanshah has five districts, four cities, and 13 villages. In this research, the competitive position of Kermanshah is compared with the other 15 cities with a population of more than 500 thousand people in Iran. The population size and their spatial distribution pattern are shown in Table 2 and Figure 2.

Table 2. cities with a population of more than 500 thousand people in Iran (2011)

City	Total population		Share of Regional population (Person)	population of the country's population these cities
Hamedan	23721884	100%	525794	2%
Arak			526182	2%
Kerman			534441	2%
Zahedan			560725	2%
Rasht			639951	3%
Urmia			667499	3%
Kermanshah			851405	4%
Qom			1074036	5%
Ahvaz			1112021	5%
Shiraz			1460665	6%
Tabriz			1494988	6%
Karaj			1614626	7%
Esfahan			1756126	7%
Mashhad			2749374	12%
Tehran			8154051	34%
	55576507		1758268	2%
			1413959	2%
			2938988	2%
			2534327	2%
			2480874	3%
			1945227	4%
			3080576	3%
			1151672	5%
			4531720	5%
			4596658	6%
			3724620	6%
			2412513	7%
			4879312	7%
			5944402	12%
			12183391	34%

Source:(Statistical Centre of Iran, 2016)

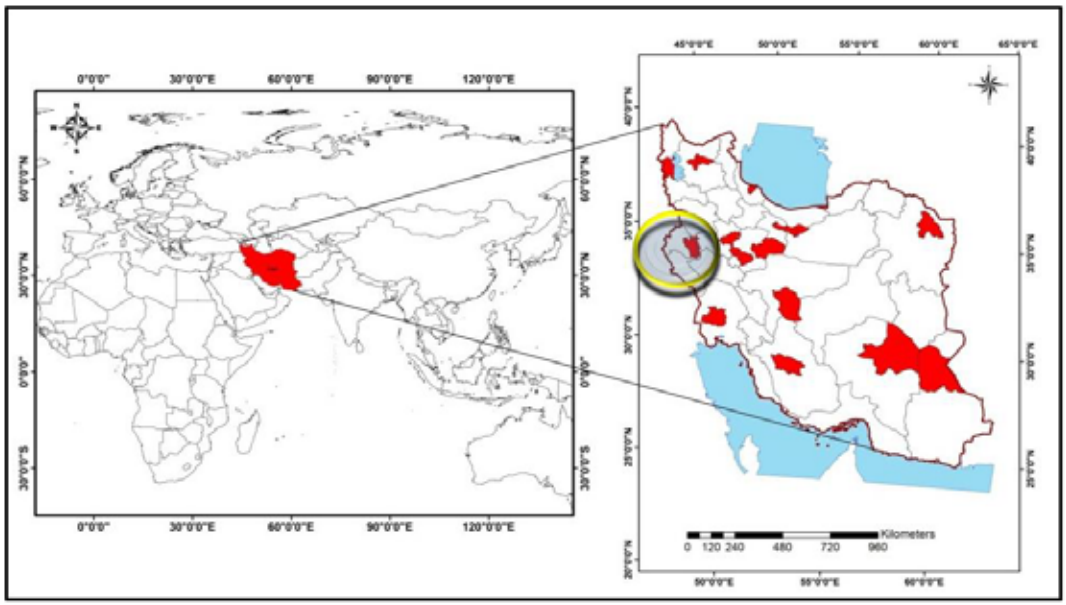

Figure 2. Location of Kermanshah city in Iran. Reference: Mapping Organization, 2016

3.2. Methods and Tools of Data Collection and Evaluation

This research is descriptive and analytical. Twelve variables were selected based on study background. The information on these variables was collected from 2011 to 2016 through library and document reviews. TOPSIS (Technique for Order Preference by Similarity to Ideal Solution), MABAC (Multi-Attributive Border Approximation area Comparison), and EDAS (Evaluation Based on Distance from Average Solution) were used for data analysis, and Entropy was used to weight the indicators.

3.2.1. Entropy weighting method

Shannon (Shannon, 1948) proposed the concept of entropy for dealing with insecure information and incomplete data. This method evaluates the criteria weights based on actual data examination.

Step 1. Create the initial decision matrix based on "m" alternatives and "n" criteria

$$F = [f_{ij}] = \begin{bmatrix} f_{11} & \cdots & f_{1n} \\ \vdots & \ddots & \vdots \\ f_{m1} & \cdots & f_{mn} \end{bmatrix}, i = 1, 2, \dots, m; j = 1, 2, \dots, n \quad (1)$$

Step 2. Normalize the initial decision matrix using Equation (2):

$$n_{ij} = \frac{f_{ij}}{\sum_{i=1}^{m} f_{ij}} \quad (2)$$

Step 3. Compute the entropy value for each criterion using the following Equation:

$$e_j = -\frac{1}{\ln(m)} \sum_{i=1}^{m} v_{ij} \ln(v_{ij}) \quad (3)$$

Step 4. Evaluate the diversification level of each criterion using Equation (4):

$$DIL_j = 1 - e_j, j \in [1, .., n] \quad (4)$$

Step 5. Obtain the final weights of criteria by implementing Equation (5):

$$w_{ij} = \frac{w_{ij}}{\sum_{i=1}^{m} w_{ij}} \quad (5)$$

3.2.2. TOPSIS

Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) is one of the most known MCDM methods to solve various problems. In this method, the best alternative is the one with the shortest Euclidean distance from the ideal solution and, simultaneously, the longest Euclidean distance from the anti-ideal solution (Hwang & Yoon, 1981). TOPSIS steps are described as follows:

Step 1. Establish the primary decision matrix based on "m" alternatives and "n" criteria

$$A = [a_{ij}] = \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{m1} & \cdots & a_{mn} \end{bmatrix}, i = 1, 2, \ldots, m; j = 1, 2, \ldots, n \quad (6)$$

a_{ij} Shows the performance of alternative (i) according to criterion (j).

Step 2. Normalize the primary decision matrix using Equation (54):

$$n_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^{m} a_{ij}^2}} \quad (7)$$

Step 3. Calculate the weighted normalized decision matrix T= $[\, t_{ij}]_{m\times n}$:

$$t_{ij} = n_{ij} \times w_j \quad (8)$$

Where w_j represents the weight of criterion j.

Step 4. Determine the ideal (S^+)and anti-ideal (S^-) solutions for each criterion based on their origin:

$$S_j^+ = max\ t_{ij}\ if\ j\ is\ a\ Benefit\ crierion\ /\ min\ t_{ij} if\ j\ is\ a\ Cost\ crierion.\ \forall j \in J \quad (9)$$

$$S_j^- = min\ t_{ij}\ if\ j\ is\ a\ Benefit\ crierion\ /\ max\ t_{ij}\ if\ j\ is\ a\ Cost\ crierion.\ \forall j \in J \quad (10)$$

Step 5. Calculate the Euclidean distance of each alternative values from the ideal and anti-ideal solutions:

$$ED_i^+ = \sqrt{\sum_{j=1}^{n} \left(t_{ij} - S_j^+\right)^2} \quad (11)$$

$$ED_i^- = \sqrt{\sum_{j=1}^{n} \left(t_{ij} - S_j^-\right)^2} \quad (12)$$

Step 6. Obtain the relative closeness to the positive the ideal solution:

$$R_i = \frac{ED_i^-}{ED_i^+ + ED_i^-} \quad (13)$$

Step 7. Rank the alternatives based on R_i values in decreasing order.

3.2.3. MABAC

The core objective of the MABAC method is to evaluate the distance of the criterion function of each alternative from the approximation region of the boundary (Pamucar & Cirovic, 2015). MABAC steps are as follows:

Step 1. Define the initial decision matrix based on "m" alternatives and "n" criteria

$$L = [l_{ij}] = \begin{bmatrix} l_{11} & \cdots & l_{1n} \\ \vdots & \ddots & \vdots \\ l_{m1} & \cdots & l_{mn} \end{bmatrix}, i = 1, 2, \ldots, m; j = 1, 2, \ldots, n \quad (14)$$

Step 2. Normalize the primary decision matrix based on the origin of each criterion:

$$n_{ij} = \frac{l_{ij} - min\ l_i}{max\ l_i - min\ l_i}\ for\ beneficial\ criterion \tag{15}$$

$$n_{ij} = \frac{l_{ij} - max\ l_i}{min\ l_i - max\ l_i}\ for\ non-beneficial\ criterion \tag{16}$$

Step 3. Obtain the weighted decision matrix using criteria weights and normalized values:

$$z_{ij} = w_j . n_{ij} + w_j \tag{17}$$

Step 4. Determine the Boundary Approximation Area matrix (*BAA*). *BAA* can be evaluated for each criterion using the following equation:

$$BAA_j = \left(\prod_{j=1}^{n} z_{ij} \right)^{\frac{1}{n}} \tag{18}$$

Step 5. Calculate the distance of each alternative from designated criteria *BAA* by utilizing Equation (19):

$$D = \begin{bmatrix} z_{11} - BAA_1 & \cdots & z_{1n} - BAA_n \\ \vdots & \ddots & \vdots \\ z_{m1} - BAA_1 & \cdots & z_{mn} - BAA_n \end{bmatrix} = \begin{bmatrix} d_{11} & \cdots & d_{1n} \\ \vdots & \ddots & \vdots \\ d_{m1} & \cdots & d_{mn} \end{bmatrix} \tag{19}$$

Then, the membership of ith alternative (L_i) to the considered approximation area is evaluated by utilizing the following equation:

$$L_i \in \begin{cases} G^+ & if\ d_{ij} > 0 \\ G & if\ d_{ij} = 0 \\ G^- & if\ d_{ij} < 0 \end{cases} \tag{20}$$

Step 6. Rank the alternatives according to their sum of distances (S_i) from approximation area:

$$S_i = \sum_{j=1}^{n} d_{ij}\ , i = 1, \dots, m\ , j =, i = 1, \dots, n \tag{21}$$

3.2.4. EDAS

Evaluation based on Distance from Average Solution (EDAS) is a recently developed MCDM method that uses the positive and negative distances from average solutions to rank the alternatives instead of defining the ideal and anti-ideal solutions (Keshavarz ghorbaee et al., 2015). EDAS steps are as follows:

Step 1. Set up the initial decision matrix considering "m" alternatives and "n" criteria:

$$E = \left[e_{ij}\right] = \begin{bmatrix} e_{11} & \cdots & e_{1n} \\ \vdots & \ddots & \vdots \\ e_{m1} & \cdots & e_{mn} \end{bmatrix}, i = 1\ , 2\ , \dots\ , m\ ; j = 1\ , 2\ , \dots\ , n \tag{22}$$

Where e_{ij} shows the performance of alternative (i) in relation to criterion (j).

Step 2. Calculate the average solution (AV_j) for each criterion:

$$AV_j = \frac{\sum_{i=1}^{m} e_{ij}}{m} \tag{23}$$

Step 3. Construct the positive distance from average solution (PDA_{ij}) and negative distance from average solution (NDA_{ij}) based on the origin of each criterion:

$$PDA = [PDA_{ij}]_{n\times m} \tag{24}$$

$$NDA = [NDA_{ij}]_{n\times m} \tag{25}$$

For beneficial criterion:

$$PDA_{ij} = \frac{\max\left(0, \left(e_{ij} - AV_j\right)\right)}{AV_j} \tag{26}$$

$$NDA_{ij} = \frac{\max\left(0, \left(AV_j - e_{ij}\right)\right)}{AV_j} \tag{27}$$

For non-beneficial criterion:

$$PDA_{ij} = \frac{\max\left(0, \left(AV_j - e_{ij}\right)\right)}{AV_j} \tag{28}$$

$$NDA_{ij} = \frac{\max\left(0, \left(e_{ij} - AV_j\right)\right)}{AV_j} \tag{29}$$

Step 4. Compute the weighted sum of the positive distance from average solution and negative distance from average solution:

$$SP_i = \sum_{j=1}^{m} w_j PDA_{ij} \tag{30}$$

$$NP_i = \sum_{j=1}^{m} w_j NDA_{ij} \tag{31}$$

Where w_j is the weight of jth criterion.

Step 5. Normalize the SP_i and NP_i values:

$$NSP_i = \frac{SP_i}{\max\left(SP_i\right)} \tag{32}$$

$$NSN_i = 1 - \frac{SP_i}{\max\left(SP_i\right)} \tag{33}$$

Step 6. Determine the appraisal score (AS_i) for each alternative:

$$AS_i = \frac{1}{2}\left(NSP_i + NSN_i\right) \tag{34}$$

Where $0 \le AS_i \le 1$.

Step 7. Rank the alternatives based on their (AS) values in descending order.

4. Results & Discussion

Table 3 shows the quantitative values of different indicators of the socio-cultural competitiveness index of Kermanshah city compared to other cities with a population of more than 500 thousand people in Iran, in a comparative comparison.

The data in this table shows the unequal and unfair development of socio-cultural competitiveness factors in most of these cities, but these differences are not severe and are noticeable only in a few indicators.

The average number of libraries, as one of the essential factors of socio-cultural competitiveness, for all cities with a population of more than 500 thousand people in Iran is 0.56 libraries per ten thousand people. This number in the city of Kermanshah is 0.19 libraries per ten thousand people, which is three, ten, and seven times less compared to the average of the selected cities as well as the cities of Hamedan and Mashhad, which have the largest number of libraries, respectively. The lowest number of libraries in proportion to the population is in the capital city of Iran, i.e., Tehran, where there are only 0.09 libraries per ten thousand people. Likewise, the number of religious places in Kermanshah is 2.91 per ten thousand people, which is 6.84 places less than the average of selected cities in the country, which is 9.75. The cities of Kerman, Tabriz, and Urmia have the highest number of religious places with 19.60, 16.49, and 14.51 places, respectively.

It is noteworthy about the religious cities of Mashhad and Shiraz that the number of religious places is less than the average of selected cities in the country. Tehran and Karaj, with 1.76 and 2.13 places, respectively, have the lowest number of religious places per ten thousand people. Socio-cultural competitiveness is largely influenced by human factors, which are partly managerial and related to the national, regional, and local planning system. Another part is related to the cultural diversity of residents in different regions of Iran.

Table 3. Status of indicators of socio-cultural competitiveness index

Cities	C1	C2	C3	C4	C5	C6
Tehran	0.09	0.6	1.76	0.009	21.71	0.04
Mashhad	1.33	0.87	6.46	0.72	16.71	0.03
Esfahan	0.99	0.51	9.28	0.02	19.03	1.78
Karaj	0.3	0.24	2.13	0.01	7.95	1.36
Tabriz	0.26	0.46	16.49	1.15	14.18	1.61
Shiraz	0.32	0.54	7.81	0.88	50.63	1.21
Ahvaz	0.21	0.34	9.28	0.2	42.21	5.1
Qom	0.62	0.83	11.07	0.24	27	0.83
Kermanshah	0.19	0.23	2.91	0.48	14.52	1.32
Urmia	0.32	0.44	14.51	0.52	17.72	1.05
Rasht	0.25	0.62	11.01	0.37	22.59	5.2
Zahedan	0.23	0.17	12.46	1.17	10.92	3.58
Kerman	0.78	0.56	19.6	3.19	24.16	2.76
Arak	0.72	0.76	10.83	3.49	21.9	2.47
Hamedan	1.86	0.57	10.72	2.2	11.18	1.05
Average	0.56	0.51	9.75	0.97	21.49	1.95
Cities	C7	C8	C9	C10	C11	C12
Tehran	92.32	88.57	27.89	0.03	41	37.22
Mashhad	89.43	83.18	13.92	0.08	78	10.14
Esfahan	90.7	84.75	17.11	0.11	81	11.18
Karaj	92.14	88.26	27.24	0.01	105	13.75
Tabriz	87.38	76.67	32.62	0.09	49	13.66
Shiraz	89.26	83.34	13.94	0.07	62	9.85
Ahvaz	92.4	91.9	23.84	0.05	78	7.16
Qom	90	83	23.36	0.17	81	16.69

Cities	C1	C2	C3	C4	C5	C6
Kermanshah	86.61	76.7	18.79	0.08	101	6.56
Urmia	85.6	71.9	22.47	0.13	82	7.52
Rasht	88.5	80.1	20.93	0.14	64	10.55
Zahedan	77	64	22.62	0.08	59	9.24
Kerman	84.6	79.76	19.61	0.22	69	9.9
Arak	88.1	79.48	27.02	0.07	86	3.72
Hamedan	87.13	77.97	31.56	0.13	77	6.06
Average	88.07	80.63	22.86	0.09	74.2	11.54

Source: (Statistics Center of Iran 2011 to 2016, Ministry of Science, Research and Technology 2016)

The TOPSIS method has been used To calculate the position of Kermanshah city among other Iranian metropolises (in terms of socio-cultural competitiveness index). For this purpose, first, the weight of each index is calculated by the entropy weight method, and then the results are presented in Table 4. As can be seen in this table, the male literacy rate (C7) and female literacy rate (C8) has the most significant importance in the socio-cultural competitiveness of cities with a population of more than 500 thousand people in Iran, and after that, the student-teacher ratio has the highest role and contribution, except for Islamic Azad universities (C11). On the other hand, the number of cultural and artistic exhibitions (C4) has the lowest weight in the competitiveness of these cities.

Table 4. Weight of indicators of socio-cultural competitiveness index

Crit.	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}
weight	0.0810	0.0845	0.0835	0.0769	0.0839	0.0808	0.0858	0.0857	0.0853	0.0834	0.0854	0.0832

The position of Kermanshah among cities with more than 500 thousand population in Iran in the socio-cultural competitiveness index is shown in Table 5. After applying the weight of the indicators to the TOPSIS model, the city of Kermanshah ranked 15th (coefficient of 0.209). It is in the last position of socio-cultural competitiveness. Kermanshah is lower than the average of selected cities in Iran in 92% of socio-cultural factors. Only the student-teacher ratio, except for Islamic Azad universities, with 74.2 students / 101 teachers ratio, is higher than the average of Iranian cities with a population of more than 500 thousand people in Iran (Table 4-6).

Compared to Hamedan, which has a coefficient of 0.478, Kermanshah in four factors) has a better position by a slight difference. These differences are (the number of insured people (percentage), the number of centers providing urban social services per population of ten thousand people, the student-teacher ratio except for Islamic Azad universities, students with higher education (percentage.

In other factors, such as (the number of libraries per population of ten thousand people and the number of religious places per population of thousand population) it is about ten and three and a half times lower than the city of Hamadan, respectively.

The city of Kerman, with a coefficient of 0.553, has the first rank of socio-cultural competitiveness among the cities with a population of more than 500 thousand

people in Iran. Compared to Kerman city, Kermanshah city has a higher advantage in only two factors of male literacy rate and the student-teacher ratio, except for Islamic Azad universities, and it has a lower advantage in other factors. As an indicator of the number of religious places per ten thousand people, Kerman city has an advantage of nearly seven times more than Kermanshah.

Despite the concentration of all academic and artistic activities, Tehran's metropolis ranks eighth in socio-cultural competitiveness with a coefficient of 0.364. The placement of cities with a population of more than one million people in Iran, including Ahvaz, Mashhad, Tehran, Tabriz, Shiraz, and Isfahan, respectively, in rank six to eleven, and cities with a population of fewer than one million people, including Kerman, Arak, and Hamedan in ranks one to three, shows the disproportionate distribution of socio-cultural factors in the network system of the country's cities, whose real manifestation is evident in the socio-cultural competitiveness position of Shiraz and Isfahan.

Table 5. Ranking of cities according to socio-cultural competitiveness

Cities	TOPSIS coefficient	TOPSIS ranking	MABAC coefficient	MABAC ranking	EDAS coefficient	EDAS ranking
Tehran	0.364	8	-0.0115	11	0.249793156	13
Mashhad	0.365	7	0.0112	9	0.434985703	9
Esfahan	0.345	11	0.0268	7	0.447031988	8
Karaj	0.225	14	-0.0357	13	0.099309297	15
Tabriz	0.353	9	0.0168	8	0.466787614	7
Shiraz	0.352	10	-0.0063	10	0.415248805	10
Ahvaz	0.387	6	0.0964	5	0.477839177	6
Qom	0.413	5	0.1194	3	0.601225122	4
Kermanshah	0.209	15	-0.116	14	0.122579271	14
Urmia	0.313	13	-0.0341	12	0.364956649	11
Rasht	0.416	4	0.0611	6	0.576546979	5
Zahedan	0.324	12	-0.1577	15	0.331896105	12
Kerman	0.553	1	0.1536	1	0.955594355	1
Arak	0.46	3	0.1318	2	0.751732294	2
Hamedan	0.478	2	0.1171	4	0.748311852	3

Figure 3 illustrates the ranking comparison of TOPSIS, EDAS, and MABAC.

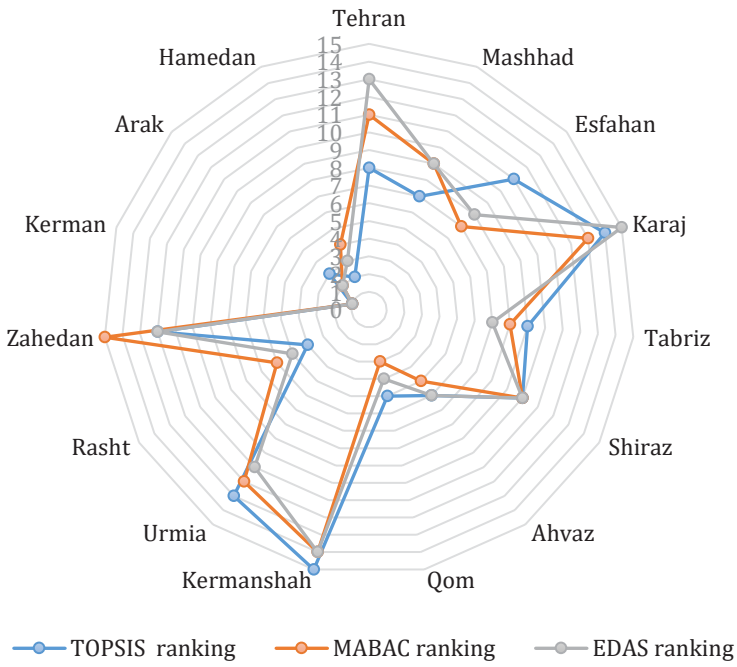

Figure 3. Cities' priorities according to their Social-Cultural competitiveness using three MCDM methods

Figure 4 shows the cities of Iran in three groups based on the index and rank of socio-cultural competitiveness. The first rank is related to highly competitive cities, including Kerman, Hamedan, Arak, Rasht, and Qom. The cities of Ahvaz, Mashhad, Tehran, Tabriz, and Shiraz are at the second rank with a moderate competitiveness position. Finally, the cities of Isfahan, Zahedan, Urmia, Karaj, and Kermanshah are at the lowest rank in socio-cultural competitiveness. The geographical distribution of the socio-cultural competitiveness levels of the cities shows that there is a correlation between the border and the socio-cultural competitiveness of the cities, and the border cities do not have a favorable position.

A clear example of this is the city of Kermanshah, which ranks 15th and is in the last position of socio-cultural competitiveness. On the other hand, the border cities of Ahvaz and Zahedan are ranked sixth and twelfth with coefficients of 0.387 and 0.324, respectively. Having a border, political power at the national level, accessibility, religious diversity, and ethnicity, along with the ruling system of Iran's planning, are among the factors that have caused Kermanshah's unfavorable position in terms of socio-cultural competitiveness. In this dimension, the northwestern cities, including Tabriz and Urmia, are located in the second and third groups of the rank of socio-cultural competitiveness.

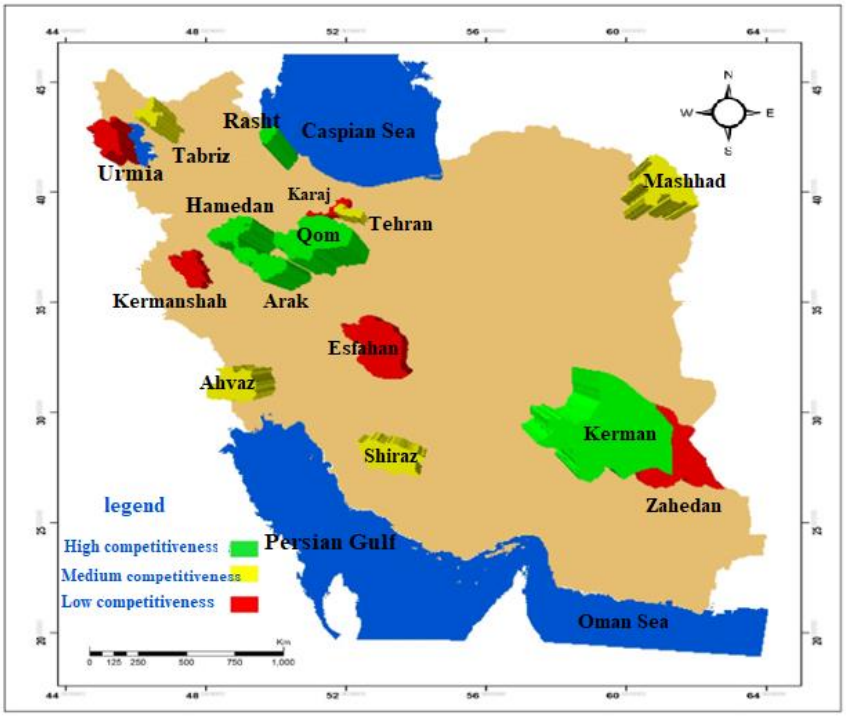

Figure 4. Spatial distribution and ranking system of (cities with a population of more than 500 thousand people in Iran) in terms of socio-cultural competitiveness

Furthermore, Spearman's correlation test is utilized to validate the obtained ranks based on TOPSIS, EDAS, and CODAS. Table 6 illustrates the results:

Table 6. Spearman's correlation test results

Methods	TOPSIS	MABAC	EDAS
TOPSIS	1	0.9	0.9071
MABAC	0.9	1	0.9571
EDAS	0.9071	0.9571	1

The results indicate that rankings of all three MCDM techniques are highly correlated, and research outcomes are reliable.

5. Conclusion

Considering the nature of urban competitiveness, which is multidimensional, it is necessary to avoid a one-sided approach in urban competitiveness planning and to consider the socio-cultural, environmental, and security dimensions of urban competitiveness in an integrated manner.

In addition, since local futures form national and global futures, in the transnational dimension, for competitiveness with other competitors, the position and role of each city should be determined based on its relative capacity. Because improving the level of competitiveness of each city will ultimately lead to the improvement of regional competitiveness as well as international competitiveness.

Economic competitiveness is considered the main foundation and dimension in urban, regional, national, and international competitiveness studies, but considering that many factors influence the competitiveness of places and especially economic competitiveness, it is necessary to consider other aspects of urban competitiveness in addition to the economic dimension of competitiveness, including environmental, socio-cultural, security, political, technological, etc. in a special manner.

According to the objectives of the vision document of Iran on the horizon of 2026, paying attention to the competitive advantages of places is one of the most important measures to achieve national competitiveness and reach the first regional position. However, the comparison of the socio-cultural competitiveness of Kermanshah city among other cities of Iran (cities with a population of more than 500 thousand people in Iran) shows the ineffectiveness of policies and the executive system of national, regional, and local planners.

The city of Kermanshah, despite having great potential in the fields of agriculture, industry, natural resources, geographical location, tourism, etc., due to the weakness in the management structure, the feeble political power at the national level, today it has been placed in an unfavorable position of socio-cultural competitiveness. Special attention should be paid to improving the competitiveness of Iranian cities while paying attention to the internal competitive advantages and in to the fields of economic, environmental, socio-cultural, and security competitiveness in transnational dimensions. This requires special attention to the national macro-plans.

Socio-cultural competitiveness and its constituent factors are largely influenced by human factors, which are partly managerial and related to the national, regional, and local planning system, and another part is related to the cultural diversity of residents in different regions of Iran. Considering the nature and effects of socio-cultural factors on the structure of society, the use of socio-cultural capacities of places can affect the aspects of economic, security, and even environmental competitiveness.

Kermanshah city has many ethnic, religious, etc., potentials for the development of domestic and foreign tourism and accordingly improving the position of socio-cultural competitiveness. But the competitiveness of Kermanshah, due to issues such as the unwillingness of the central government structure on the socio-cultural competitiveness of the border cities, the socio-cultural competitiveness position of Kermanshah has become unfavorable.

Lack of plans regarding the development of socio-cultural issues, along with the economic backwardness, causes the forced migration of citizens due to unemployment. And as a result, cultural movements to other large population cities, especially the metropolis of Tehran, will cause to weaken native-local cultures as well as cultural issues for the source and destination communities.

Some of the limitations of this research are: access to data; the wideness of the studied area and also the competitiveness issue is multifaceted and should be studied together.

Recommended subjects for future researchers: research on different dimensions of competitiveness; future studies and competitiveness; Identifying the key drivers of competitiveness; regional competitiveness.

Author Contributions: Conceptualization, H.K. and S.H.Z; methodology, H.K. and A.N; validation, H.K and S.H.Z; formal analysis, S.H.Z and A.N.; investigation, H.K.; writing—original draft preparation, H.K.; writing—review and editing, S.H.Z; supervision, S.H.Z;

Funding*:* This research received no external funding.

Conflicts of Interest*:* The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Amoushahi, S., Salmanmahiny, A., Moradi, H., Mikaeili Tabrizi, A.R., & Galan, C. (2022). Localizing sustainable urban development (SUD): Application of an FDM-AHP approach for prioritizing urban sustainability indicators in Iran provinces. Sustainable Cities and Society, 77, 103592.

Beickmohammadi, H., Karimi Ghotbabadi, F., & Shokohi, Sh. (2017). Analysis of the cultural development indices (case study: counties of province fars). Journal of the Studies of Human Settlements Planning, Spring, 12, 1(38), 53-68.

Benites, A. J., & Simoes, A. F. (2021). Assessing the urban sustainable development strategy: An application of a smart city services sustainability taxonomy. Ecological Indicators, 127, 107734.

Bilbao-Terol, A., Arenas-Parra, M., & Onopko-Onopko, V.(2019). Measuring regional sustainable competitiveness: a multi-criteria approach. Operational Research, 19, 637–660, https://doi-org.ezproxy2.ucn.cl/10.1007/s12351-017-0367-9.

Bruneckiene, J., Guzavicius, A., & Cincikaite, Re. (2010). Measurement of Urban Competitiveness in Lithuania. Inzinerine Ekonomika -Engineering Economics, 21(5), 493-508.

Commission of the European Communities, European Commission. Directorate-General for Regional Policy, & Cohesion. (1999). Sixth Periodic Report on the Social and Economic Situation and Development of the Regions of the European Union. Office for Official Publications of the European Communities.

De Andrade, L.C., Borges-Pedro, J.P., Gomes, M.C.R.L., Tregidgo, D.J., Silva do Nascimento, A.C., Pozzan Paim, F., Marmontel, M., Benitz, T., Pucci Hercos, A., & Valsecchi de Amaral, J. (2021). The sustainable development goals in two sustainable development reserves in central amazon: achievements and challenges. Discover Sustainability, 2, 54. https://doi-org.ezproxy2.ucn.cl/10.1007/s43621-021-00065-4

Dou, W. Z., Li, G. P., Gan, Y. J., Wang, L. M., & Yang, K. Z. (2000). Urban competitive pattern and its changes in China. Chinese Geographical Science, 10(2), 105-112.

Du, Q., Wang, Y., Ren, F., Zhao, Z., Liu, H., Wu, C., ... & Shen, Y. (2014). Measuring and analysis of urban competitiveness of Chinese provincial capitals in 2010 under the constraints of major function-oriented zoning utilizing spatial analysis. Sustainability, 6(6), 3374-3399.

Fantechi, F., & Fratesi, U. (2022). Measuring competitiveness differentials inside the same region: a propensity-score matching approach. Social Indicators Research, 1-27. https://doi.org/10.1007/s11205-022-02908-7.

Foroozesh, F., Monavari, S. M., Salmanmahiny, A., Robati, M., & Rahimi, R. (2022). Assessment of sustainable urban development based on a hybrid decision-making approach: Group fuzzy BWM, AHP, and TOPSIS–GIS. Sustainable Cities and Society, 76, 103402.

Ghahramanpouri, A., Abdullah, A. S., Sedaghatnia, S., & Lamit, H. (2015). Urban social sustainability contributing factors in Kuala Lumpur streets. Procedia-Social and Behavioral Sciences, 201, 368-376.

Grassia, M. G., Marino, M., Mazza, R., Misuraca, M., Zavarrone, E., & Friel, M. (2022). Regional Competitiveness: A Structural-Based Topic Analysis on Recent Literature. Social Indicators Research, 1-26. https://doi.org/10.1007/s11205-022-02951-4.

Guo, H., Yang, C., Liu, X., Li, Y., & Meng, Q. (2018). Simulation evaluation of urban low-carbon competitiveness of cities within Wuhan city circle in China. Sustainable Cities and Society, 42, 688-701.

Hwang, C. L., & Yoon, K. (1981). Methods for multiple attribute decision making. In Multiple attribute decision making (pp. 58-191). Springer, Berlin, Heidelberg.

Iran Chamber of Commerce, Industries, Mines and Agriculture (ICCIMA). (2017).

Jiang, Y., & Shen, J. (2010). Measuring the urban competitiveness of Chinese cities in 2000. Cities, 27(5), 307-314.

Kermanshah Master Plan; Ministry of Housing and Urbanization. (2004). (In Persian)

Keshavarz Ghorabaee, M., Zavadskas, E. K., Olfat, L., & Turskis, Z. (2015). Multi-Criteria Inventory Classification Using a New Method of Evaluation Based on Distance from Average Solution (EDAS). Informatica, 26, 435-451.

Komasi, H., Hashemkhani Zolfani, S., Prentkovskis, O., & Skačkauskas, P. (2022). Urban Competitiveness: Identification and Analysis of Sustainable Key Drivers (A Case Study in Iran). Sustainability, 14(13), 7844. https://doi.org/10.3390/su14137844.

Krugman, P. (2003). Growth on the periphery: Second wind for industrial regions, Fraser Allander Institute, Glasgow, UK.

Li, X., Xiao, L., Tian, C., Zhu, B., & Chevallier, J. (2022). Impacts of the ecological footprint on sustainable development: Evidence from China. Journal of Cleaner Production, 352, 131472.

Liu, X., Guo, H., Li, Y., Li, Y., & Pan, W. (2016). Measuring the urban competitiveness of Chinese cities based on multi-attribute decision making approach. International Journal of Sustainable Development, 19(4), 315.

Łuczak, A., & Just, M. (2021). Sustainable development of territorial units: MCDM approach with optimal tail selection. Ecological Modelling, 457, 109674.

Martínez, C. I. P., & Poveda, A. C. (2022). The effects of environmental performance on competitiveness and innovation: a stochastic frontier approach for Colombia. Environment Systems and Decisions, 42(1), 51-62.

Ni, P., Kamiya, M., & Ding, R. (2017). Global urban competitiveness: Theoretical framework. In Cities Network Along the Silk Road (pp. 15-29). Springer, Singapore.

Obaideen, K., AlMallahi, M. N., Alami, A. H., Ramadan, M., Abdelkareem, M. A., Shehata, N., & Olabi, A. G. (2021). On the contribution of solar energy to sustainable developments goals: Case study on Mohammed bin Rashid Al Maktoum Solar Park. International Journal of Thermofluids, 12, 100123.

Pamučar, D., & Ćirović, G. (2015). The selection of transport and handling resources in logistics centers using Multi-Attributive Border Approximation area Comparison (MABAC). Expert systems with applications, 42(6), 3016-3028.

Royo, M. G., Diep, L., Mulligan, J., Mukanga, P., & Parikh, P. (2022). Linking the UN Sustainable Development Goals and African Agenda 2063: Understanding overlaps and gaps between the global goals and continental priorities for Africa. World Development Sustainability, 1, 100010.

Salami, S. F., Isah, A. D., & Muhammad, I. B. (2021). Critical indicators of sustainability for mixed-use buildings in Lagos, Nigeria. Environmental and Sustainability Indicators, 9, 100101.

Shannon, C.E. A Mathematical Theory of Communication. Bell Syst. Tech. J. 1948, 27, 379–423.

Sgambati, S., & Gargiulo, C. (2022). The evolution of urban competitiveness studies over the past 30 years. A bibliometric analysis. Cities, 128, 103811.

Sharifzadegan, M. H., & Nedae Tousi, S. (2015). Iran's Regional Competitiveness Spatial Development Framework Case Study: 30 Provinces of Iran. Honar-Ha-Ye-Ziba: Memary Va Shahrsazi, 20(3), 5-20.

Song, M., & Xie, Q. (2021). Evaluation of urban competitiveness of the Huaihe River eco-economic belt based on dynamic factor analysis. Computational Economics, 58(3), 615-639.

Tafuro, A., De Matteis, F., Preite, D., Costa, A., Mariella, L., & Treviso, G. (2019). Social sustainability and local authorities: What is the relationship between spending commitments and social issues?. Socio-Economic Planning Sciences, 67(C), 120-132.

Taghvaee, V. M., Nodehi, M., Saber, R. M., & Mohebi, M. (2022). Sustainable development goals and transportation modes: Analyzing sustainability pillars of environment, health, and economy. World Development Sustainability, 1, 100018.

Tang, Y., Xia, N., Varga, L., Tan, Y., Hua, X., & Li, Q. (2022). Sustainable international competitiveness of regional construction industry: Spatiotemporal evolution and influential factor analysis in China. Journal of Cleaner Production, 337, 130592.

The World Bank. (2020). https://www.worldbank.org/.

Wang, L., & Shen, J. (2017). Comparative analysis of urban competitiveness in the Yangtze River Delta and Pearl River Delta regions of China, 2000–2010. Applied Spatial Analysis and Policy, 10(3), 401-419.

Wang, Y., Hu, H., Dai, W., & Burns, K. (2021). Evaluation of industrial green development and industrial green competitiveness: Evidence from Chinese urban agglomerations. Ecological Indicators, 124, 107371.

Yadav, A., & Prakash, A. (2022). Factors influencing sustainable development integration in management education: An Empirical Assessment of management education institutions in India. The International Journal of Management Education, 20(1), 100604.

Yalcintas, H (Agan). (2008). Evaluation the impact of urban competitive advantages on economic revitalization of deprived inner cities through a case study held in Istanbul. A Thesis Submitted to the Graduate School of Engineering and Sciences of Izmir Institute of Technology in Partial Fulfilment of the Requirements for the Degree of Doctor of philosophy in City and Regional Planning.

Zaidi, S. A. H., Shahbaz, M., Hou, F., & Abbas, Q. (2021). Sustainability challenges in public health sector procurement: an application of interpretative structural modelling. Socio-Economic Planning Sciences, 77, 101028.

Zhang, L., Zhang, Y., Li, H. X., & Lei, Z. (2021). Estimating long-term impacts of tunnel infrastructure development on urban sustainability using granular computing. Applied Soft Computing, 113, 107932.