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# EVALUATION OF THE PERFORMANCE OF GLOBAL CITIES IN TERMS OF GPCI INDEXES AND QUALITY OF LIFE WITH THE CRITIC SUPPORTED GRAY RELATIONAL ANALYSIS METHOD

*CRITIC Destekli Gri İlişkisel Analiz Yöntemi ile GPCI Endeksleri ve Yaşam Kalitesi Açısından Global Şehirlerin Performanslarının Değerlemesi*

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## ABSTRACT

Global cities are an indispensable platform for businesses around the world, with the ability to support and accommodate the economy by influencing the world economy, culture and politics. The purpose of this study is to evaluate and rank the performance of 46 global cities in the Global Power City Index for 2022 in terms of the GPCI functions of Economy, Research and Development, Cultural Interaction, Livability, Environment and Accessibility and Quality of Life using multi-criteria decision making (MCDM) method. In the study, the weights of the performance criteria are first determined with the CRITIC method and then the cities are ranked according to their performance by applying the Gray Relational Analysis (GRA) method. Empirical findings show that the most important criterion is CM (Climate index) and the least important criterion is PI (Purchasing power index). Furthermore, the findings of the GIA method indicate that in 2022, London ranks first, Frankfurt second and New York third, while Mumbai is the last ranked global city. These findings thus provide important recommendations for policymakers and investors.


**Keywords:** Global Cities, Performance of Global Cities, GPCI Index, Quality of Life.


## ÖZ

Küresel şehirler dünya ekonomisini, kültürünü ve siyasetini etkileyerek ekonomiyi destekleme ve barındırma yeteneği ile birlikte dünyadaki işletmeler için vazgeçilmez bir platformdur. Bu çalışmanın amacı da, çok kriterli karar verme (ÇKKV) yöntemi kullanarak 2022 yılı Global Power City Index'indeki 46 küresel şehrin performansını GPCI fonksiyonları olan Ekonomi, Araştırma ve Geliştirme, Kültürel Etkileşim, Yaşanabilirlik, Çevre ve Erişilebilirlik ve yaşam kalitesi unsurları açısından değerlendirmek ve sıralamaktır. Çalışmada öncelikle CRITIC yöntemi ile performans kriterlerinin ağırlıkları belirlenmekte ve sonrasında, Gri İlişkisel Analiz (GİA) yöntemi uygulanarak şehirler performanslarına göre sıralanmaktadır. Ampirik bulgular,

en önemli kriterin CM (İklim Endeksi), en önemsiz kriterin ise PI (Satınalma gücü Endeksi) olduğunu göstermektedir. Ayrıca, GİA yönteminin bulguları da, 2022 yılında birinci sırada London, ikinci sırada Frankfurt ve üçüncü sırada ise Newyork'un yer aldığını belirtirken en son sıradaki küresel şehrin ise Mumbai olduğunu belirtmektedir. Böylece elde edilen bu bulgular, politik yapıcılar ve yatırımcılar açısından önemli tavsiyeler sunmaktadır.

**Anahtar Kelimeler:** Küresel Şehirler, Küresel Şehirlerin Performansı, GPCI Endeksi, Yaşam Kalitesi

## INTRODUCTION

Cities play an increasing role in the transition of countries to sustainable growth (Lo-Iacono-Ferreira et al., 2022). Sassen (1992) refers to New York City, London and Tokyo, which are business and financial centers, as global cities. The trends and transformations that have taken place in these cities show that they are well positioned and outperform the economies of their nation-states.

Global cities, which can influence the world economy, culture and politics, are an indispensable platform for businesses around the world with the ability to support and host the economy. Economy cities on this platform, which have become the driving force for the development of the economy, are industrially leading cities that will accelerate urban development and transformation in the future (Aydın & Yıldız, 2021). Given the global competition among cities around the world, the Global Power City Index (GPCI) evaluates and ranks the world's major cities based on their comprehensive power to attract people, capital and businesses from around the world. This ranking is done by measuring factors such as Economy, Research and Development, Cultural Interaction, Livability, Environment and Accessibility (The Mori Memorial Foundation, 2022).

The performance ranking of cities is also made in terms of quality of life. The quality of life of a city is evaluated from a spatial and local social perspective, and the city's infrastructure services such as drinking water, sewerage, roads, parks, cultural, social and economic opportunities also constitute the quality of life. A city's quality of life is determined based on indicators such as economic development status, population, housing, labor force, health, security, environment, citizenship, political rights and social cohesion (Koçak, 2009).

In this context, global city rankings create significant value for countries and are increasingly attracting public attention. Many studies rank cities according to different economic, social and geographical characteristics and identify the best (and worst) cities in terms of quality of life and economic activity conditions. Comparing these cities not only supports investors in their choice of location, but also provides important findings for future city development. As a result of city rankings, policymakers who recognize their special assets benefit more from the results of these cities' identified strengths and weaknesses. Thus, city rankings and the identification of comparative advantages play an important role in defining goals and strategies for future development. At the same time, the positive results of city rankings provide guidance on a city's marketing strategy and help to improve a city's international image (Giffinger et al., 2010).

In light of the above assessments, the purpose of this study is to evaluate and rank the performance of 46 global cities in the Global Power City Index for 2022 in terms of the GPCI functions of Economy, Research and Development, Cultural Interaction, Livability, Environment and Accessibility and Quality of Life. In the study, multi-criteria decision making (MCDM) method is used since more than one criterion is used to determine the performance of the city. In addition, the performance criteria are determined by taking into account the studies of Kourtit et al. (2014) and Çınaroğlu (2021). GPCI index criteria are Economy, Research and Development, Cultural Interaction, Livability, Environment and Accessibility and quality of life criteria are Quality of Index, Purchasing Power Index, Safety Index, Health Care Index,

Cost of Living Index, Property Price to Income Ratio, Traffic Commucate Time Index, Pollution Index and Climate Index. In this context, the study first determines the weights of the performance criteria with the CRITIC (CRiteria Importance Through Intercriteria Correlation) method. Then, the cities are ranked according to their performance by applying the Gray Relational Analysis (GRA) method.

The findings of this study make important contributions to the literature. First of all, it provides a comparison between global city rankings and indicators and cities around the world, guiding policy makers and supporting the positioning of cities. In addition, the findings indicate that the city with the best performance among the cities is London, and the city with the last performing city is Mumbai. Finally, the most important performance criteria of cities are Climate Index, Cost of living index, Property price to income ratio, RD (R&D) and Safety Index, respectively, and it is predicted that the best cities with these criteria not only benefit their current residents, but also serve as a guide for talent and investment that attracts incoming business and people.

The rest of the study is designed as follows. The second section summarizes the literature review on the subject. The third section presents the methodology of the study, including data and methods. The fourth section reports the findings of the analysis. In the last section, the conclusion of the study is explained.

## LİTERATURE REVIEW

City rankings around the world are an important research topic of great interest to academic researchers, policy makers, administrators and the general public. These rankings can serve multiple purposes. Researchers' assessments of global cities help to analyze their status and functioning in the world economy and provide recommendations to policymakers regarding companies (Wang et al., 2020). There are many studies on ranking cities in the literature. For

example, Kourtit et al. (2014) aims to identify the strongest potential global city by using MAMCA and PROMETHEE techniques and focusing on 6 key criteria: economic, R&D, cultural interaction, livability, environmental and accessibility. According to the findings, the first city with the best performance is Paris and the second city is London. The worst performing city is Seoul. Ichikawa et al. (2017) develops the Global Power City Index to value and rank urban centers based on comprehensive attractive power combined with complex competition among major cities. The researchers found that London ranked first and New York, Paris, and Tokyo ranked second, third, and fourth in terms of six urban functions: economic, R&D, cultural interaction, livability, environment, and accessibility.

Similarly, Wang (2019) evaluates the performance of 40 major global cities over the period 2012-2018. Using the data envelopment analysis (DEA) method and Malmquist index analysis, the researcher finds that emerging cities such as Beijing, Cairo and Mumbai have excellent efficiency in converting resources into outputs, while Barcelona, Madrid and Milan have improved their performance but are at the worst level of efficiency in the period 2012-2018. Finally, it finds that 20% of cities maintained their performance between 2012 and 2018, 40% improved their performance, and 40% suffered efficiency losses.

Kourtit et al. (2020) use Data Envelopment Analysis (DEA) to examine which of the 40 cities in the Global Power City Index have high environmental performance results (i.e. super-efficient champions) and their efficiency ranking, wealth position and urban agglomeration. The empirical analysis shows that the 40 cities have different size classes and different wealth profiles. Similarly, using the DEA technique, Wang et al. (2020) aims to evaluate and rank global cities based on economic performance and climate change mitigation. Focusing on 39 global cities, nine cities with excellent efficiency are identified. In the super-efficiency models, three cities - Sydney, Tokyo, Vancouver - are always in the top five, while Buenos Aires and Cape Town are in the bottom five.

Çınaroğlu (2021) aims to analyze the quality of life of European Union member states in 2020 by using multi-criteria decision-making methods such as CRITIC, CODAS and ROV. As a result of determining the criteria weights based on purchasing power, climate, cost of living, safety, health care, real estate prices/income ratio, pollution and time spent in traffic indices, the cost of living index is the most important criterion. Moreover, at the minimum level of the cost of living index, Denmark is found to be the country with the highest quality of life. On the other hand, Seyhan and Seyhan (2021), who compared the quality of life of EU countries using ENTROPI, ARAS and TOPSIS methods, which are multi-criteria decision-making methods, found that Malta ranked first and Luxembourg ranked second according to ARAS and TOPSIS methods.

Lo-Iacono-Ferreira et al. (2022) aims to propose an integrated approach in establishing a composite range of indicators for achieving sustainable cities in Spain. It focuses on the 2019 report based on 100 Spanish cities with more than 80,000 inhabitants. According to the study, it has been applied to assess compliance with the 17 Sustainable Development Goals 16 in a total of 50 Spanish provincial capitals. The results obtained for the global range of composite indicators at the city scale show that the cities of Zaragoza, Oviedo and Córdoba occupy the top positions, but if we take into account a fully compensated aggregation rule, the top three cities are Vitoria-Gasteiz, Oviedo and Burgos.

Furthermore, Kutty et al. (2022) assess the long-term sustainability performance of Europe's top 35 smart cities in the period 2015-2020 and evaluate how these cities address smart sustainable cities. By applying the Double-Frontier Slack Based Measurement Data Envelopment Analysis (DFSBM-DEA) model and a modified Malmquist-DEA model, they address the dimensions of cities such as Energy and Environmental Resource, Governance and Institution, Economic dynamism, Social cohesion and solidarity, Climate Change, and Safety and Security. The results show that Dublin ranks first as the smartest and most sustainable

European city, while Oslo, Zurich and Amsterdam are cities with high sustainability performance. Aydın (2022) evaluates the Covid-19 performances of OECD countries using multi-criteria decision-making methods ENTROPI, ARAS and TOPSIS. The findings show that according to the ARAS method, the USA, the United Kingdom and Israel; according to the TOPSIS method, Israel, Norway and the United Kingdom have the highest Covid-19 performance.

Thus, the studies reviewed in the literature become an important source of motivation in determining the purpose of this study.

## METHODOLOGY

### Data

The study aims to determine the ranking of 46 global cities in the Global Power City Index in 2022 by evaluating their performance in terms of GPCI functions and quality of life elements. In the study, the data of 46 global cities in the GPCI index in 2022 are collected and the list of global cities is given in Table 1. At the same time, the criteria of Economy, Research and Development, Cultural Interaction, Livability, Environment and Accessibility are taken from Kourtit et al. (2014); quality of life indicators such as Quality of Index, Purchasing Power Index, Safety Index, Health Care Index, Cost of Living Index, Property Price to Income Ratio, Traffic Commucate Time Index, Pollution Index and Climate Index are based on Çınaroğlu (2021) study and the direction of the criteria is determined (Kourtit et al, 2014; Çınaroğlu, 2021; Quality of Life Index by City, 2022).

Quality of Index, Purchasing Power Index, Safety Index, Health Care Index, Cost of Living Index, Property Price to Income Ratio, Traffic Commucate Time Index, Pollution Index and Climate Index data are collected from the Quality of Life Index by City 2022 web online, while

Economy, Research and Development, Cultural Interaction, Livability, Environment and Accessibility are collected from The Mori Memorial Foundation (2023) web base.

**Table 1.** Global City List, Criteria, Criteria Direction and Codes

| Cities | | | Criteria | Direction of Criterion | Code |
|---|---|---|---|---|---|
| Newyork | Dubai | Bangkok | Economy | Maximum | EC |
| London | Geneva | Milan | R&D | Maximum | RD |
| Tokyo | Washington | Moscow | Cult-Inter | Maximum | CI |
| Beijing | Paris | Mexico City | Livability | Maximum | LI |
| HongKong | Frankfurt | Sao Paulo | Environmental | Maximum | EN |
| Zurich | Copanhagen | Buenos Aires | Accessibility | Maximum | AC |
| SanFrancisco | Boston | Dublin | Quality of Index | Maximum | QI |
| Sydney | Kuala Lumpur | Helsinki | Purchasing Power Index | Maximum | PI |
| Singapore | Chicago | Melbourne | Safety Index | Maximum | SI |
| Toronto | Berlin | Tel Aviv | Health Care Index | Maximum | HI |
| Stockholm | Taipei | Jakarta | Cost of Living Index | Minimum | CL |
| Los Angeles | Brussels | Johannesburg | Property Price to Income Ratio | Minimum | PR |
| Amsterdam | Vienna | Mumbai | Traffic Commucate Time Index | Minimum | TI |
| Vancouver | Madrid | Cairo | Pollution Index | Minimum | PO |
| Seoul | İstanbul | | Climate Index | Maximum | CM |
| Shanghai | Barcelona | | | | |

## Method

In this study, multi-criteria decision-making method is applied since multiple criteria are used to determine the performance of global cities (Kaya et al., 2011; Çınaroğlu, 2021; Seyhan & Seyhan, 2021; Aydın, 2022). The reason why we chose this method in our study is that in recent days, the multi-criteria decision-making method is seen as one of the best tools for solving complex problems, and by using these techniques, the ability to decide between different alternatives is developed according to the given qualities/criteria for the best possible choice (Sama et al., 2022).

In this context, firstly, the weights of the performance criteria of the cities are determined by CRITIC (Criteria Importance Through Intercriteria Correlation) method. Then, the Gray Relational Analysis (GRA) method is applied to rank global cities.

## 1. CRITIC Method

CRITIC (Criteria Importance Through Intercriteria Correlation) method was introduced to the literature by Diakoulaki et al. (1995) (Sümerli Sarıgül et al. 2023). It is a correlation-based technique that uses analytical tests to reveal essential information in decision criteria. It uses the contrast intensity and the conflicting nature of the criteria to determine the weights of the relevant criteria. The CRITIC method introduced the concept of conflict into multi-criteria decision-making methods (Zafar et al. 2021).

The steps of the CRITIC method are as follows (Yaşar and Çınaroğlu, 2022);

**First step**

The decision matrix consisting of "m" decision alternatives and "n" criteria is formed as in Formula (1).

$$X = [X_{ij}]_{m*n} = \begin{bmatrix} X_{11} & X_{12} & \cdots & X_{1n} \\ X_{21} & X_{22} & \cdots & X_{2n} \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ X_{m1} & X_{m2} & \cdots & X_{mn} \end{bmatrix} \quad (1)$$

**Second step**

The decision matrix is normalized to form a normalized decision matrix. This step is based on the direction of the criteria. Benefit-based criteria are normalized using Formula (2) and cost-based criteria are normalized using Formula (3).

$$r_{ij} = \frac{x_{ij} - x_j^{min}}{x_j^{max} - x_j^{min}} \quad (2)$$

$$r_{ij} = \frac{x_j^{max} - x_{ij}}{x_j^{max} - x_j^{min}} \quad (3)$$

**Third step**

The correlation levels between the criteria are calculated through Formula (4). The values obtained are used to determine the relationship dimension between the criteria.

$$P_{jk} = \frac{\sum_{i=1}^{m}(r_{ij}-\overline{r_j})(r_{ik}-\overline{r_k})}{\sqrt{\sum_{i=1}^{m}(r_{ij}-\overline{r_j})^2 \sum_{i=1}^{m}(r_{ik}-\overline{r_k})^2}} \quad (4)$$

**Fourth step**

The amount of information contained in the criteria is calculated by Formula (5). The term $\sigma_{ij}$ in Formula (5) refers to the standard deviation value of criterion $j$. The term $\sigma_{ij}$ is calculated as shown in Formula (6).

$$c_{ij} = \sigma_{ij} \sum_{k=1}^{n}(1 - p_{jk}) \quad (5)$$

$$\sigma_j = \frac{\sqrt{\sum_{i=1}^{m}(r_{ij}-\overline{r_j})^2}}{m} \quad (6)$$

**Fifth step**

In the last step, criterion weights are obtained. Formula (7) is used to determine the importance of the criteria.

$$w_j = \frac{c_j}{\sum_{k=1}^{2} c_k} \quad (7)$$

## 2. Gray Relational Analysis (GRA) Method

Gray Relational Analysis (GRA) Method is a method introduced to the literature by Deng (1982). The GRA Method is a method that allows choosing between alternatives in situations where there are many criteria. The term "gray" in the name of the method refers to incomplete or unknown information. Similarities or differences between two elements or two subsystems within a given system are called "gray relations" (Ecer & Günay, 2014).

The steps of the Gray Relational Analysis method are as follows (Elitaş et al., 2012):

**First step**

The decision matrix $(X_i)$ is created as shown in Formula (8)

$$X_i = \begin{bmatrix} X_1(1) & X_1(2) & \cdots & X_1(n) \\ X_2(1) & X_2(2) & \cdots & X_2(n) \\ . & . & . & . \\ . & . & . & . \\ . & . & . & . \\ X_n(1) & X_n(2) & \cdots & X_n(n) \end{bmatrix} \quad (8)$$

**Second step**

The reference series is created.

The reference series is expressed as $x_0 = (x_0(1), x_0(2), \dots, x_0(j), \dots, x_0(n))$. The $x_0(j)$, in the expression denotes the largest value among the normalized values of criterion *j*.

**Third step**

Normalization matrix is created. In this step, the data is normalized. In this step, 3 situations can be encountered. In Formula (9) the benefit is used, in Formula (10) the cost is used and in Formula (11) the average value is used if it is more appropriate.

$$x_i^*(j) = \frac{x_i(j) - \min_j x_i(j)}{\max_j x_i(j) - \min_j x_i(j)} \quad (9)$$

$$x_i^*(j) = \frac{\max_j x_i(j) - x_i(j)}{\max_j x_i(j) - \min_j x_i(j)} \quad (10)$$

$$x_i^* = \frac{|x_i(j) - x_{0b}(j)|}{\max_j x_i(j) - x_{0b}(j)} \quad (11)$$

$x_{0b}(j)$, in Formula (12) is the target value of criterion *j* and takes a value in the range shown in Formula (12).

$$\max_j x_i(j) \geq x_{0b}(j) \geq \min_j x_i(j) \quad (12)$$

**Fourth step**

Absolute value table is created.

The absolute value between $x_0^*$ and $x_i^*$, is $\Delta_{0i}^*(j)$ as shown in Formula (13).

$$\Delta_{0i}{}^{*}(j) = |x_0{}^{*}(j) - x_i{}^{*}(j)| \quad (13)$$

**Fifth step**

The construction of the gray relational coefficient matrix is given in Formula (14).

$$\gamma_{0i}(j) = \frac{\Delta \min + \zeta \Delta \max}{\Delta_{0i}(j) + \zeta} \quad (14)$$

"$\zeta$" in Formula (14) is the distinguish coefficient and takes values in the range [0,1]. However, it is recommended to take a value of 0.5 in transactions. In this study, the coefficient is taken as 0.5. The Δmax value in Formula (14) is calculated as shown in Formula (15) and the Δmin value is calculated as shown in Formula (16).

$$\Delta max = max_i max_j \Delta_{0i}(j) \quad (15)$$

$$\Delta min = min_i min_j \Delta_{0i}(j) \quad (16)$$

**Sixth step**

The degree of relationship is calculated as shown in Formula (17).

$$\Gamma_{0i} = \frac{1}{n} \sum_{j=1}^{n} \gamma_{0i}(j) \quad (17)$$

$\Gamma_{0i}$ in Formula (17) expresses the gray relationship degree of the *i* element and if the criteria have different weights, the calculation is made as stated in Formula (18).

$$\Gamma_{0i} = \sum_{j=1}^{n} [W_i(j) x \gamma_{0i}(j)] \quad (18)$$

**The Analyses of Data**

In order to evaluate the performance of global cities, the importance levels of 15 evaluation criteria were determined by CRITIC method. The findings obtained as a result of the CRITIC method were integrated into the Gray Relational Analysis method and the performance ranking of 46 global cities was obtained.

The decision matrix, which is the first stage of CRITIC and Gray Relational Analysis methods, is used in common in both methods. The common decision matrix of both methods is given in Table 2.

**Table 2.** Decision Matrix

| Cities | EC | RD | CI | LI | EN | AC | QI | PI | SI | HI | CL | PR | TI | PO | CM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Newyork | 362,50 | 207,40 | 254,30 | 304,00 | 157,10 | 220,60 | 136,50 | 100,00 | 50,90 | 62,30 | 100,00 | 10,20 | 43,60 | 57,60 | 79,70 |
| London | 324,50 | 181,30 | 338,90 | 358,30 | 192,90 | 196,80 | 131,50 | 88,10 | 46,20 | 70,20 | 74,20 | 16,00 | 44,40 | 58,10 | 88,30 |
| Tokyo | 292,00 | 145,40 | 210,60 | 353,10 | 181,00 | 185,10 | 164,70 | 90,00 | 75,40 | 79,90 | 73,70 | 12,60 | 41,60 | 43,00 | 85,30 |
| Beijing | 298,60 | 94,40 | 119,40 | 294,30 | 129,60 | 163,50 | 81,90 | 63,30 | 71,60 | 67,90 | 4,20 | 45,80 | 43,40 | 80,30 | 57,60 |
| HongKong | 221,30 | 100,40 | 111,50 | 320,10 | 161,90 | 153,00 | 101,90 | 67,70 | 78,50 | 65,80 | 75,80 | 44,90 | 42,70 | 67,20 | 83,60 |
| Zurich | 300,00 | 51,00 | 50,80 | 332,70 | 202,30 | 162,20 | 195,30 | 122,90 | 81,70 | 74,10 | 120,80 | 11,20 | 32,70 | 17,80 | 81,50 |
| SanFrancisco | 281,30 | 118,20 | 95,50 | 300,60 | 136,80 | 133,80 | 140,70 | 104,00 | 38,90 | 63,90 | 99,60 | 9,20 | 51,00 | 50,40 | 97,30 |
| Sydney | 245,10 | 85,00 | 104,70 | 341,10 | 206,90 | 132,30 | 179,60 | 110,60 | 66,10 | 77,00 | 81,50 | 12,20 | 43,60 | 28,10 | 97,10 |
| Singapore | 286,30 | 96,80 | 162,00 | 330,70 | 182,70 | 175,30 | 154,20 | 95,60 | 70,80 | 70,90 | 85,90 | 15,50 | 41,40 | 33,10 | 57,50 |
| Toronto | 245,90 | 61,00 | 94,70 | 352,90 | 173,00 | 145,50 | 149,70 | 91,00 | 57,80 | 75,60 | 73,00 | 12,90 | 44,80 | 37,50 | 65,30 |
| Stockholm | 242,90 | 46,90 | 84,30 | 349,70 | 238,20 | 133,20 | 163,40 | 94,60 | 53,90 | 66,60 | 70,80 | 14,30 | 35,20 | 18,50 | 69,70 |
| Los Angeles | 239,30 | 155,80 | 113,30 | 302,90 | 144,20 | 146,10 | 136,60 | 116,00 | 47,80 | 62,50 | 78,70 | 7,30 | 61,00 | 67,30 | 95,50 |
| Amsterdam | 259,80 | 66,10 | 144,80 | 360,00 | 168,60 | 229,30 | 183,00 | 101,70 | 68,00 | 72,30 | 71,40 | 10,30 | 26,60 | 28,50 | 87,50 |
| Vancouver | 236,70 | 45,80 | 59,40 | 322,80 | 198,70 | 113,20 | 172,40 | 94,00 | 60,40 | 73,90 | 71,70 | 12,90 | 36,60 | 25,40 | 91,20 |
| Seoul | 248,60 | 130,50 | 145,90 | 316,50 | 180,50 | 167,10 | 127,00 | 80,90 | 75,30 | 82,60 | 78,90 | 30,80 | 42,30 | 58,50 | 68,40 |
| Shanghai | 265,10 | 87,50 | 112,00 | 282,90 | 139,30 | 247,10 | 88,10 | 59,70 | 69,40 | 63,60 | 47,70 | 46,60 | 46,70 | 73,60 | 83,60 |
| Dubai | 221,70 | 25,20 | 226,80 | 338,80 | 129,40 | 185,80 | 175,60 | 129,10 | 83,60 | 68,10 | 65,30 | 3,60 | 37,30 | 49,60 | 50,30 |
| Geneva | 274,20 | 50,30 | 37,60 | 320,00 | 194,90 | 131,00 | 184,70 | 112,90 | 70,30 | 72,70 | 107,10 | 12,10 | 26,00 | 24,50 | 82,60 |
| Washington | 264,40 | 85,90 | 75,90 | 273,70 | 142,40 | 132,90 | 165,40 | 127,90 | 39,90 | 69,90 | 83,80 | 5,50 | 40,50 | 40,20 | 81,60 |
| Paris | 253,10 | 103,10 | 235,50 | 383,40 | 156,30 | 225,40 | 122,70 | 77,90 | 43,10 | 79,10 | 76,10 | 20,20 | 41,50 | 63,90 | 88,40 |
| Frankfurt | 220,90 | 30,60 | 78,10 | 346,80 | 179,40 | 217,80 | 171,90 | 708,00 | 55,30 | 75,20 | 70,10 | 13,20 | 25,70 | 36,30 | 84,70 |
| Copanhagen | 239,00 | 38,30 | 79,70 | 346,10 | 234,80 | 175,10 | 188,90 | 97,00 | 73,50 | 78,00 | 82,30 | 9,00 | 28,50 | 21,40 | 83,70 |
| Boston | 238,20 | 135,40 | 65,70 | 289,10 | 159,50 | 145,40 | 168,80 | 111,10 | 60,60 | 74,50 | 84,60 | 8,10 | 45,00 | 30,90 | 71,70 |
| Kuala Lumpur | 195,30 | 17,40 | 79,00 | 357,80 | 116,50 | 109,00 | 123,40 | 84,60 | 37,00 | 68,10 | 38,70 | 6,50 | 41,50 | 66,00 | 56,60 |
| Chicago | 228,30 | 109,50 | 106,90 | 287,20 | 133,70 | 192,80 | 148,50 | 121,30 | 33,90 | 64,80 | 79,00 | 3,40 | 41,60 | 49,20 | 66,10 |
| Berlin | 222,80 | 80,90 | 171,60 | 359,00 | 195,20 | 153,50 | 161,00 | 98,00 | 56,80 | 68,00 | 69,70 | 11,40 | 34,40 | 39,00 | 83,30 |
| Taipei | 224,20 | 51,70 | 57,30 | 327,80 | 166,20 | 136,00 | 150,90 | 78,20 | 84,90 | 86,40 | 57,60 | 29,50 | 34,70 | 49,50 | 84,40 |
| Brussels | 195,10 | 60,40 | 112,60 | 370,60 | 153,60 | 157,40 | 146,00 | 97,20 | 45,40 | 73,90 | 68,80 | 6,70 | 36,70 | 61,70 | 83,80 |
| Vienna | 196,80 | 36,90 | 121,40 | 351,20 | 204,70 | 191,90 | 199,60 | 112,90 | 73,10 | 79,20 | 61,80 | 11,50 | 24,50 | 16,70 | 81,80 |
| Madrid | 194,70 | 37,10 | 175,60 | 364,90 | 175,60 | 174,20 | 161,20 | 85,70 | 69,90 | 80,00 | 54,50 | 11,20 | 35,30 | 51,40 | 85,50 |
| İstanbul | 132,40 | 37,30 | 195,70 | 318,40 | 146,80 | 166,70 | 100,00 | 28,50 | 52,50 | 69,50 | 34,60 | 21,00 | 51,70 | 69,10 | 93,00 |
| Barcelona | 190,80 | 36,20 | 156,20 | 372,60 | 157,90 | 174,40 | 142,40 | 74,10 | 50,20 | 77,60 | 58,70 | 10,70 | 29,70 | 65,70 | 95,70 |
| Bangkok | 182,10 | 19,00 | 131,00 | 323,70 | 113,80 | 113,70 | 81,20 | 29,50 | 59,50 | 77,10 | 49,80 | 31,50 | 45,60 | 77,10 | 58,40 |
| Milan | 177,10 | 27,80 | 118,70 | 362,50 | 159,20 | 171,80 | 116,20 | 40,90 | 44,30 | 62,50 | 50,10 | 9,70 | 64,00 | 50,90 | 99,50 |
| Moscow | 142,90 | 55,50 | 171,50 | 327,40 | 127,80 | 166,80 | 111,00 | 58,80 | 63,20 | 65,50 | 46,20 | 21,60 | 50,50 | 56,20 | 55,80 |
| Mexico City | 102,50 | 16,60 | 157,70 | 289,00 | 126,40 | 124,90 | 87,20 | 38,10 | 31,50 | 65,40 | 40,80 | 16,00 | 52,10 | 81,80 | 92,40 |
| Sao Paulo | 124,70 | 23,70 | 149,90 | 331,70 | 164,70 | 109,60 | 76,10 | 26,10 | 29,50 | 58,70 | 41,20 | 23,40 | 50,10 | 79,60 | 99,00 |
| Buenos Aires | 100,80 | 9,50 | 162,10 | 348,40 | 145,70 | 98,00 | 101,70 | 33,40 | 36,70 | 69,00 | 31,60 | 27,70 | 49,20 | 52,30 | 98,30 |
| Dublin | 273,60 | 33,50 | 71,20 | 337,90 | 162,40 | 134,10 | 142,60 | 81,80 | 48,30 | 51,60 | 79,00 | 8,10 | 40,40 | 40,90 | 85,90 |
| Helsinki | 238,10 | 36,00 | 37,30 | 354,00 | 208,80 | 151,30 | 178,00 | 83,50 | 74,50 | 77,70 | 77,20 | 13,10 | 29,20 | 13,80 | 62,80 |
| Melbourne | 242,00 | 80,20 | 124,40 | 349,40 | 201,60 | 159,70 | 177,20 | 102,20 | 55,90 | 76,40 | 76,80 | 8,40 | 40,50 | 25,90 | 94,30 |
| Tel Aviv | 207,90 | 32,10 | 86,70 | 315,80 | 135,80 | 106,70 | 146,10 | 70,20 | 73,80 | 74,60 | 94,50 | 20,70 | 37,00 | 47,00 | 93,90 |
| Jakarta | 166,00 | 10,70 | 64,90 | 324,90 | 86,90 | 103,30 | 74,50 | 33,00 | 47,30 | 56,60 | 35,10 | 20,30 | 51,70 | 84,90 | 63,80 |
| Johannesburg | 107,90 | 4,50 | 79,50 | 223,20 | 131,70 | 92,90 | 134,50 | 94,50 | 19,30 | 60,60 | 40,50 | 2,40 | 40,70 | 61,30 | 91,40 |
| Mumbai | 111,40 | 6,60 | 65,40 | 275,00 | 80,30 | 89,00 | 73,60 | 46,60 | 55,00 | 65,20 | 25,70 | 36,60 | 54,90 | 83,70 | 71,50 |
| Cairo | 90,10 | 11,60 | 87,90 | 309,30 | 83,40 | 115,10 | 81,40 | 22,90 | 50,00 | 45,50 | 24,10 | 11,90 | 50,20 | 91,50 | 88,50 |

## CRITIC Method Findings

The decision matrix of the CRITIC method is shared in Table 2. The next stage, the normalized matrix, is shown in Table 3.

**Table 3.** Normalized Decision Matrix

| Cities | EC | RD | CI | LI | EN | AC | QI | PI | SI | HI | CL | PR | TI | PO | CM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Newyork | 1,000 | 1,000 | 0,719 | 0,504 | 0,486 | 0,832 | 0,499 | 0,113 | 0,482 | 0,411 | 0,178 | 0,824 | 0,516 | 0,436 | 0,598 |
| London | 0,860 | 0,871 | 1,000 | 0,843 | 0,713 | 0,682 | 0,460 | 0,095 | 0,410 | 0,604 | 0,400 | 0,692 | 0,496 | 0,430 | 0,772 |
| Tokyo | 0,741 | 0,694 | 0,575 | 0,811 | 0,638 | 0,608 | 0,723 | 0,098 | 0,855 | 0,841 | 0,404 | 0,769 | 0,567 | 0,624 | 0,711 |
| Beijing | 0,765 | 0,443 | 0,272 | 0,444 | 0,312 | 0,471 | 0,066 | 0,059 | 0,797 | 0,548 | 1,000 | 0,018 | 0,522 | 0,144 | 0,148 |
| HongKong | 0,482 | 0,473 | 0,246 | 0,605 | 0,517 | 0,405 | 0,225 | 0,065 | 0,902 | 0,496 | 0,386 | 0,038 | 0,539 | 0,313 | 0,677 |
| Zurich | 0,771 | 0,229 | 0,045 | 0,684 | 0,773 | 0,463 | 0,966 | 0,146 | 0,951 | 0,699 | 0,000 | 0,801 | 0,792 | 0,949 | 0,634 |
| SanFrancisco | 0,702 | 0,560 | 0,193 | 0,483 | 0,358 | 0,283 | 0,533 | 0,118 | 0,299 | 0,450 | 0,182 | 0,846 | 0,329 | 0,529 | 0,955 |
| Sydney | 0,569 | 0,397 | 0,223 | 0,736 | 0,802 | 0,274 | 0,841 | 0,128 | 0,713 | 0,770 | 0,337 | 0,778 | 0,516 | 0,816 | 0,951 |
| Singapore | 0,720 | 0,455 | 0,413 | 0,671 | 0,649 | 0,546 | 0,640 | 0,106 | 0,785 | 0,621 | 0,299 | 0,704 | 0,572 | 0,752 | 0,146 |
| Toronto | 0,572 | 0,278 | 0,190 | 0,810 | 0,587 | 0,357 | 0,604 | 0,099 | 0,587 | 0,736 | 0,410 | 0,762 | 0,486 | 0,695 | 0,305 |
| Stockholm | 0,561 | 0,209 | 0,156 | 0,790 | 1,000 | 0,280 | 0,713 | 0,105 | 0,527 | 0,516 | 0,429 | 0,731 | 0,729 | 0,940 | 0,394 |
| Los Angeles | 0,548 | 0,746 | 0,252 | 0,498 | 0,405 | 0,361 | 0,500 | 0,136 | 0,434 | 0,416 | 0,361 | 0,889 | 0,076 | 0,311 | 0,919 |
| Amsterdam | 0,623 | 0,304 | 0,356 | 0,854 | 0,559 | 0,887 | 0,868 | 0,115 | 0,742 | 0,655 | 0,424 | 0,821 | 0,947 | 0,811 | 0,756 |
| Vancouver | 0,538 | 0,204 | 0,073 | 0,622 | 0,750 | 0,153 | 0,784 | 0,104 | 0,627 | 0,694 | 0,421 | 0,762 | 0,694 | 0,851 | 0,831 |
| Seoul | 0,582 | 0,621 | 0,360 | 0,582 | 0,635 | 0,494 | 0,424 | 0,085 | 0,854 | 0,907 | 0,359 | 0,357 | 0,549 | 0,425 | 0,368 |
| Shanghai | 0,642 | 0,409 | 0,248 | 0,373 | 0,374 | 1,000 | 0,115 | 0,054 | 0,764 | 0,443 | 0,627 | 0,000 | 0,438 | 0,230 | 0,677 |
| Dubai | 0,483 | 0,102 | 0,628 | 0,722 | 0,311 | 0,612 | 0,810 | 0,155 | 0,980 | 0,553 | 0,476 | 0,973 | 0,676 | 0,539 | 0,000 |
| Geneva | 0,676 | 0,226 | 0,001 | 0,604 | 0,726 | 0,266 | 0,882 | 0,131 | 0,777 | 0,665 | 0,117 | 0,781 | 0,962 | 0,862 | 0,657 |
| Washington | 0,640 | 0,401 | 0,128 | 0,315 | 0,393 | 0,278 | 0,729 | 0,153 | 0,314 | 0,597 | 0,317 | 0,930 | 0,595 | 0,660 | 0,636 |
| Paris | 0,598 | 0,486 | 0,657 | 1,000 | 0,481 | 0,863 | 0,390 | 0,080 | 0,363 | 0,822 | 0,383 | 0,597 | 0,570 | 0,355 | 0,774 |
| Frankfurt | 0,480 | 0,129 | 0,135 | 0,772 | 0,628 | 0,815 | 0,780 | 1,000 | 0,549 | 0,726 | 0,435 | 0,756 | 0,970 | 0,710 | 0,699 |
| Copanhagen | 0,547 | 0,167 | 0,141 | 0,767 | 0,978 | 0,545 | 0,915 | 0,108 | 0,826 | 0,795 | 0,330 | 0,851 | 0,899 | 0,902 | 0,679 |
| Boston | 0,544 | 0,645 | 0,094 | 0,411 | 0,502 | 0,357 | 0,756 | 0,129 | 0,630 | 0,709 | 0,310 | 0,871 | 0,481 | 0,780 | 0,435 |
| Kuala Lumpur | 0,386 | 0,064 | 0,138 | 0,840 | 0,229 | 0,127 | 0,395 | 0,090 | 0,270 | 0,553 | 0,704 | 0,907 | 0,570 | 0,328 | 0,128 |
| Chicago | 0,507 | 0,517 | 0,231 | 0,400 | 0,338 | 0,657 | 0,594 | 0,144 | 0,223 | 0,472 | 0,358 | 0,977 | 0,567 | 0,544 | 0,321 |
| Berlin | 0,487 | 0,377 | 0,445 | 0,848 | 0,728 | 0,408 | 0,694 | 0,110 | 0,572 | 0,550 | 0,438 | 0,796 | 0,749 | 0,676 | 0,671 |
| Taipei | 0,492 | 0,233 | 0,066 | 0,653 | 0,544 | 0,297 | 0,613 | 0,081 | 1,000 | 1,000 | 0,542 | 0,387 | 0,742 | 0,541 | 0,693 |
| Brussels | 0,385 | 0,276 | 0,250 | 0,920 | 0,464 | 0,433 | 0,575 | 0,108 | 0,398 | 0,694 | 0,446 | 0,903 | 0,691 | 0,384 | 0,681 |
| Vienna | 0,392 | 0,160 | 0,279 | 0,799 | 0,788 | 0,651 | 1,000 | 0,131 | 0,820 | 0,824 | 0,506 | 0,794 | 1,000 | 0,963 | 0,640 |
| Madrid | 0,384 | 0,161 | 0,459 | 0,885 | 0,604 | 0,539 | 0,695 | 0,092 | 0,771 | 0,844 | 0,569 | 0,801 | 0,727 | 0,516 | 0,715 |
| İstanbul | 0,155 | 0,162 | 0,525 | 0,594 | 0,421 | 0,491 | 0,210 | 0,008 | 0,506 | 0,587 | 0,739 | 0,579 | 0,311 | 0,288 | 0,868 |
| Barcelona | 0,370 | 0,156 | 0,394 | 0,933 | 0,491 | 0,540 | 0,546 | 0,075 | 0,471 | 0,785 | 0,533 | 0,812 | 0,868 | 0,332 | 0,923 |
| Bangkok | 0,338 | 0,071 | 0,311 | 0,627 | 0,212 | 0,156 | 0,060 | 0,010 | 0,613 | 0,773 | 0,609 | 0,342 | 0,466 | 0,185 | 0,165 |
| Milan | 0,319 | 0,115 | 0,270 | 0,870 | 0,500 | 0,524 | 0,338 | 0,026 | 0,381 | 0,416 | 0,606 | 0,835 | 0,000 | 0,523 | 1,000 |
| Moscow | 0,194 | 0,251 | 0,445 | 0,650 | 0,301 | 0,492 | 0,297 | 0,052 | 0,669 | 0,489 | 0,640 | 0,566 | 0,342 | 0,454 | 0,112 |
| Mexico City | 0,046 | 0,060 | 0,399 | 0,411 | 0,292 | 0,227 | 0,108 | 0,022 | 0,186 | 0,487 | 0,686 | 0,692 | 0,301 | 0,125 | 0,856 |
| Sao Paulo | 0,127 | 0,095 | 0,373 | 0,677 | 0,535 | 0,130 | 0,020 | 0,005 | 0,155 | 0,323 | 0,683 | 0,525 | 0,352 | 0,153 | 0,990 |
| Buenos Aires | 0,039 | 0,025 | 0,414 | 0,782 | 0,414 | 0,057 | 0,223 | 0,015 | 0,265 | 0,575 | 0,765 | 0,428 | 0,375 | 0,505 | 0,976 |
| Dublin | 0,674 | 0,143 | 0,112 | 0,716 | 0,520 | 0,285 | 0,548 | 0,086 | 0,442 | 0,149 | 0,358 | 0,871 | 0,597 | 0,651 | 0,724 |
| Helsinki | 0,543 | 0,155 | 0,000 | 0,816 | 0,814 | 0,394 | 0,829 | 0,088 | 0,841 | 0,787 | 0,374 | 0,758 | 0,881 | 1,000 | 0,254 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Melbourne** | 0,558 | 0,373 | 0,289 | 0,788 | 0,768 | 0,447 | 0,822 | 0,116 | 0,558 | 0,756 | 0,377 | 0,864 | 0,595 | 0,844 | 0,894 |
| **Tel Aviv** | 0,432 | 0,136 | 0,164 | 0,578 | 0,351 | 0,112 | 0,575 | 0,069 | 0,831 | 0,711 | 0,226 | 0,586 | 0,684 | 0,573 | 0,886 |
| **Jakarta** | 0,279 | 0,031 | 0,092 | 0,635 | 0,042 | 0,090 | 0,007 | 0,015 | 0,427 | 0,271 | 0,735 | 0,595 | 0,311 | 0,085 | 0,274 |
| **Johannesburg** | 0,065 | 0,000 | 0,140 | 0,000 | 0,326 | 0,025 | 0,483 | 0,105 | 0,000 | 0,369 | 0,689 | 1,000 | 0,590 | 0,389 | 0,835 |
| **Mumbai** | 0,078 | 0,010 | 0,093 | 0,323 | 0,000 | 0,000 | 0,000 | 0,035 | 0,544 | 0,482 | 0,816 | 0,226 | 0,230 | 0,100 | 0,431 |
| **Cairo** | 0,000 | 0,035 | 0,168 | 0,537 | 0,020 | 0,165 | 0,062 | 0,000 | 0,468 | 0,000 | 0,829 | 0,785 | 0,349 | 0,000 | 0,776 |

In the next step, the levels of correlation between the criteria are calculated. The obtained values are given in Table 4.

**Table 4.** Correlation Levels Between Criteria

| Criteria | EC | RD | CI | LI | EN | AC | QI | PI | SI | HI | CL | PR | TI | PO | CM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EC** | 1,000 | 0,728 | 0,159 | 0,162 | 0,491 | 0,531 | 0,504 | 0,198 | 0,400 | 0,290 | -0,681 | 0,091 | 0,336 | 0,469 | -0,142 |
| **RD** | 0,750 | 1,000 | 0,457 | -0,054 | 0,229 | 0,495 | 0,168 | 0,033 | 0,105 | 0,132 | -0,479 | 0,011 | -0,108 | 0,093 | 0,021 |
| **CI** | 0,159 | 0,457 | 1,000 | 0,292 | 0,009 | 0,488 | -0,153 | -0,129 | -0,084 | 0,053 | 0,063 | -0,022 | -0,169 | -0,246 | 0,061 |
| **LI** | 0,162 | -0,054 | 0,292 | 1,000 | 0,463 | 0,314 | 0,314 | 0,091 | 0,238 | 0,399 | -0,147 | 0,173 | 0,337 | 0,318 | 0,055 |
| **EN** | 0,491 | 0,229 | 0,009 | 0,463 | 1,000 | 0,308 | 0,736 | 0,226 | 0,371 | 0,525 | -0,567 | 0,240 | 0,576 | 0,818 | 0,190 |
| **AC** | 0,531 | 0,495 | 0,488 | 0,314 | 0,308 | 1,000 | 0,291 | 0,329 | 0,304 | 0,260 | -0,268 | 0,011 | 0,291 | 0,199 | -0,039 |
| **QI** | 0,504 | 0,168 | -0,153 | 0,314 | 0,736 | 0,291 | 1,000 | 0,385 | 0,399 | 0,528 | -0,715 | 0,617 | 0,717 | 0,915 | 0,049 |
| **PI** | 0,198 | 0,033 | -0,129 | 0,091 | 0,226 | 0,329 | 0,385 | 1,000 | 0,057 | 0,195 | -0,247 | 0,210 | 0,406 | 0,306 | 0,008 |
| **SI** | 0,400 | 0,105 | -0,084 | 0,238 | 0,371 | 0,304 | 0,399 | 0,057 | 1,000 | 0,520 | -0,289 | -0,301 | 0,445 | 0,399 | -0,310 |
| **HI** | 0,290 | 0,132 | 0,053 | 0,399 | 0,525 | 0,260 | 0,528 | 0,195 | 0,520 | 1,000 | -0,326 | -0,034 | 0,532 | 0,479 | -0,054 |
| **CL** | -0,681 | -0,479 | 0,063 | -0,147 | -0,567 | -0,268 | -0,715 | -0,247 | -0,289 | -0,326 | 1,000 | -0,420 | -0,403 | -0,671 | -0,117 |
| **PR** | 0,091 | 0,011 | -0,022 | 0,173 | 0,240 | 0,011 | 0,617 | 0,210 | -0,301 | -0,034 | -0,420 | 1,000 | 0,232 | 0,459 | 0,138 |
| **TI** | 0,336 | -0,108 | -0,169 | 0,337 | 0,576 | 0,291 | 0,717 | 0,406 | 0,445 | 0,532 | -0,403 | 0,232 | 1,000 | 0,635 | -0,101 |
| **PO** | 0,469 | 0,093 | -0,246 | 0,318 | 0,818 | 0,199 | 0,915 | 0,306 | 0,399 | 0,479 | -0,671 | 0,459 | 0,635 | 1,000 | 0,008 |
| **CM** | -0,142 | 0,021 | 0,061 | 0,055 | 0,190 | -0,039 | 0,049 | 0,008 | -0,310 | -0,054 | -0,117 | 0,138 | -0,101 | 0,008 | 1,000 |

In the next stage, the $1 - p_{jk}$ matrix is created. The matrix is presented in Table 5.

**Table 5.** $1 - p_{jk}$ Matrix

| Criteria | EC | RD | CI | LI | EN | AC | QI | PI | SI | HI | CL | PR | TI | PO | CM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EC** | 0,000 | 0,272 | 0,841 | 0,838 | 0,509 | 0,469 | 0,496 | 0,802 | 0,600 | 0,710 | 1,681 | 0,909 | 0,664 | 0,531 | 1,142 |
| **RD** | 0,250 | 0,000 | 0,543 | 1,054 | 0,771 | 0,505 | 0,832 | 0,967 | 0,895 | 0,868 | 1,479 | 0,989 | 1,108 | 0,907 | 0,979 |
| **CI** | 0,841 | 0,543 | 0,000 | 0,708 | 0,991 | 0,512 | 1,153 | 1,129 | 1,084 | 0,947 | 0,937 | 1,022 | 1,169 | 1,246 | 0,939 |
| **LI** | 0,838 | 1,054 | 0,708 | 0,000 | 0,537 | 0,686 | 0,686 | 0,909 | 0,762 | 0,601 | 1,147 | 0,827 | 0,663 | 0,682 | 0,945 |
| **EN** | 0,509 | 0,771 | 0,991 | 0,537 | 0,000 | 0,692 | 0,264 | 0,774 | 0,629 | 0,475 | 1,567 | 0,760 | 0,424 | 0,182 | 0,810 |
| **AC** | 0,469 | 0,505 | 0,512 | 0,686 | 0,692 | 0,000 | 0,709 | 0,671 | 0,696 | 0,740 | 1,268 | 0,989 | 0,709 | 0,801 | 1,039 |
| **QI** | 0,496 | 0,832 | 1,153 | 0,686 | 0,264 | 0,709 | 0,000 | 0,615 | 0,601 | 0,472 | 1,715 | 0,383 | 0,283 | 0,085 | 0,951 |
| **PI** | 0,802 | 0,967 | 1,129 | 0,909 | 0,774 | 0,671 | 0,615 | 0,000 | 0,943 | 0,805 | 1,247 | 0,790 | 0,594 | 0,694 | 0,992 |
| **SI** | 0,600 | 0,895 | 1,084 | 0,762 | 0,629 | 0,696 | 0,601 | 0,943 | 0,000 | 0,480 | 1,289 | 1,301 | 0,555 | 0,601 | 1,310 |
| **HI** | 0,710 | 0,868 | 0,947 | 0,601 | 0,475 | 0,740 | 0,472 | 0,805 | 0,480 | 0,000 | 1,326 | 1,034 | 0,468 | 0,521 | 1,054 |
| **CL** | 1,681 | 1,479 | 0,937 | 1,147 | 1,567 | 1,268 | 1,715 | 1,247 | 1,289 | 1,326 | 0,000 | 1,420 | 1,403 | 1,671 | 1,117 |
| **PR** | 0,909 | 0,989 | 1,022 | 0,827 | 0,760 | 0,989 | 0,383 | 0,790 | 1,301 | 1,034 | 1,420 | 0,000 | 0,768 | 0,541 | 0,862 |
| **TI** | 0,664 | 1,108 | 1,169 | 0,663 | 0,424 | 0,709 | 0,283 | 0,594 | 0,555 | 0,468 | 1,403 | 0,768 | 0,000 | 0,365 | 1,101 |
| **PO** | 0,531 | 0,907 | 1,246 | 0,682 | 0,182 | 0,801 | 0,085 | 0,694 | 0,601 | 0,521 | 1,671 | 0,541 | 0,365 | 0,000 | 0,992 |
| **CM** | 1,142 | 0,979 | 0,939 | 0,945 | 0,810 | 1,039 | 0,951 | 0,992 | 1,310 | 1,054 | 1,117 | 0,862 | 1,101 | 0,992 | 0,000 |

In the last stage of the related method, criteria weights ($w_j$) are determined by calculating $\sigma_j$ and $c_j$ values. As a result of ranking the ($w_j$) values from largest to smallest, the importance levels of the criteria are determined. The relevant results are shown in Table 6.

**Table 6.** $\sigma_j$, $c_j$ and $w_j$ Values

| Sütun1 | EC | RD | CI | LI | EN | AC | QI | PI | SI | HI | CL | PR | TI | PO | CM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\sigma_j$ | 0,230 | 0,239 | 0,205 | 0,199 | 0,229 | 0,243 | 0,290 | 0,141 | 0,242 | 0,200 | 0,203 | 0,250 | 0,228 | 0,269 | 0,278 |
| $c_j$ | 2,398 | 2,907 | 2,713 | 2,195 | 2,149 | 2,544 | 2,678 | 1,688 | 2,844 | 2,095 | 3,913 | 3,146 | 2,345 | 2,646 | 3,957 |
| $w_j$ | **0,0596** | **0,0723** | **0,0675** | **0,0546** | **0,0534** | **0,0632** | **0,0666** | **0,0420** | **0,0707** | **0,0521** | **0,0973** | **0,0782** | **0,0583** | **0,0658** | **0,0984** |
| Rank | 10 | 4 | 6 | 12 | 13 | 9 | 7 | 15 | 5 | 14 | 2 | 3 | 11 | 8 | 1 |

When the relevant results are analyzed, it is determined that the most important criterion is CM (Climate index) and the least important criterion is PI (Purchasing power index) as a result of the CRITIC method. The ranking of the most important criteria continues as follows after CM; CL (Cost of living index), PR (Property price to income ratio), RD (R&D) and SI (Safety Index).

**Gray Relational Analysis Method Findings**

The decision matrix, which is the first step of the Gray Relational Analysis Method, is shared in Table 2. In the next step of the method, the reference series was created and the decision matrix was obtained. The results obtained are presented in Table 7.

**Table 7.** Reference Series Generated Decision Matrix

| Cities | EC | RD | CI | LI | EN | AC | QI | PI | SI | HI | CL | PR | TI | PO | CM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Reference** | 362,50 | 207,40 | 338,90 | 383,40 | 238,20 | 247,10 | 199,60 | 708,00 | 84,90 | 86,40 | 4,20 | 2,40 | 24,50 | 13,80 | 99,50 |
| **Newyork** | 362,50 | 207,40 | 254,30 | 304,00 | 157,10 | 220,60 | 136,50 | 100,00 | 50,90 | 62,30 | 100,00 | 10,20 | 43,60 | 57,60 | 79,70 |
| **London** | 324,50 | 181,30 | 338,90 | 358,30 | 192,90 | 196,80 | 131,50 | 88,10 | 46,20 | 70,20 | 74,20 | 16,00 | 44,40 | 58,10 | 88,30 |
| **Tokyo** | 292,00 | 145,40 | 210,60 | 353,10 | 181,00 | 185,10 | 164,70 | 90,00 | 75,40 | 79,90 | 73,70 | 12,60 | 41,60 | 43,00 | 85,30 |
| **Beijing** | 298,60 | 94,40 | 119,40 | 294,30 | 129,60 | 163,50 | 81,90 | 63,30 | 71,60 | 67,90 | 4,20 | 45,80 | 43,40 | 80,30 | 57,60 |
| **HongKong** | 221,30 | 100,40 | 111,50 | 320,10 | 161,90 | 153,00 | 101,90 | 67,70 | 78,50 | 65,80 | 75,80 | 44,90 | 42,70 | 67,20 | 83,60 |
| **Zurich** | 300,00 | 51,00 | 50,80 | 332,70 | 202,30 | 162,20 | 195,30 | 122,90 | 81,70 | 74,10 | 120,80 | 11,20 | 32,70 | 17,80 | 81,50 |
| **SanFrancisco** | 281,30 | 118,20 | 95,50 | 300,60 | 136,80 | 133,80 | 140,70 | 104,00 | 38,90 | 63,90 | 99,60 | 9,20 | 51,00 | 50,40 | 97,30 |
| **Sydney** | 245,10 | 85,00 | 104,70 | 341,10 | 206,90 | 132,30 | 179,60 | 110,60 | 66,10 | 77,00 | 81,50 | 12,20 | 43,60 | 28,10 | 97,10 |
| **Singapore** | 286,30 | 96,80 | 162,00 | 330,70 | 182,70 | 175,30 | 154,20 | 95,60 | 70,80 | 70,90 | 85,90 | 15,50 | 41,40 | 33,10 | 57,50 |
| **Toronto** | 245,90 | 61,00 | 94,70 | 352,90 | 173,00 | 145,50 | 149,70 | 91,00 | 57,80 | 75,60 | 73,00 | 12,90 | 44,80 | 37,50 | 65,30 |
| **Stockholm** | 242,90 | 46,90 | 84,30 | 349,70 | 238,20 | 133,20 | 163,40 | 94,60 | 53,90 | 66,60 | 70,80 | 14,30 | 35,20 | 18,50 | 69,70 |
| **Los Angeles** | 239,30 | 155,80 | 113,30 | 302,90 | 144,20 | 146,10 | 136,60 | 116,00 | 47,80 | 62,50 | 78,70 | 7,30 | 61,00 | 67,30 | 95,50 |
| **Amsterdam** | 259,80 | 66,10 | 144,80 | 360,00 | 168,60 | 229,30 | 183,00 | 101,70 | 68,00 | 72,30 | 71,40 | 10,30 | 26,60 | 28,50 | 87,50 |
| **Vancouver** | 236,70 | 45,80 | 59,40 | 322,80 | 198,70 | 113,20 | 172,40 | 94,00 | 60,40 | 73,90 | 71,70 | 12,90 | 36,60 | 25,40 | 91,20 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Seoul** | 248,60 | 130,50 | 145,90 | 316,50 | 180,50 | 167,10 | 127,00 | 80,90 | 75,30 | 82,60 | 78,90 | 30,80 | 42,30 | 58,50 | 68,40 |
| **Shanghai** | 265,10 | 87,50 | 112,00 | 282,90 | 139,30 | 247,10 | 88,10 | 59,70 | 69,40 | 63,60 | 47,70 | 46,60 | 46,70 | 73,60 | 83,60 |
| **Dubai** | 221,70 | 25,20 | 226,80 | 338,80 | 129,40 | 185,80 | 175,60 | 129,10 | 83,60 | 68,10 | 65,30 | 3,60 | 37,30 | 49,60 | 50,30 |
| **Geneva** | 274,20 | 50,30 | 37,60 | 320,00 | 194,90 | 131,00 | 184,70 | 112,90 | 70,30 | 72,70 | 107,10 | 12,10 | 26,00 | 24,50 | 82,60 |
| **Washington** | 264,40 | 85,90 | 75,90 | 273,70 | 142,40 | 132,90 | 165,40 | 127,90 | 39,90 | 69,90 | 83,80 | 5,50 | 40,50 | 40,20 | 81,60 |
| **Paris** | 253,10 | 103,10 | 235,50 | 383,40 | 156,30 | 225,40 | 122,70 | 77,90 | 43,10 | 79,10 | 76,10 | 20,20 | 41,50 | 63,90 | 88,40 |
| **Frankfurt** | 220,90 | 30,60 | 78,10 | 346,80 | 179,40 | 217,80 | 171,90 | 708,00 | 55,30 | 75,20 | 70,10 | 13,20 | 25,70 | 36,30 | 84,70 |
| **Copanhagen** | 239,00 | 38,30 | 79,70 | 346,10 | 234,80 | 175,10 | 188,90 | 97,00 | 73,50 | 78,00 | 82,30 | 9,00 | 28,50 | 21,40 | 83,70 |
| **Boston** | 238,20 | 135,40 | 65,70 | 289,10 | 159,50 | 145,40 | 168,80 | 111,10 | 60,60 | 74,50 | 84,60 | 8,10 | 45,00 | 30,90 | 71,70 |
| **Kuala Lumpur** | 195,30 | 17,40 | 79,00 | 357,80 | 116,50 | 109,00 | 123,40 | 84,60 | 37,00 | 68,10 | 38,70 | 6,50 | 41,50 | 66,00 | 56,60 |
| **Chicago** | 228,30 | 109,50 | 106,90 | 287,20 | 133,70 | 192,80 | 148,50 | 121,30 | 33,90 | 64,80 | 79,00 | 3,40 | 41,60 | 49,20 | 66,10 |
| **Berlin** | 222,80 | 80,90 | 171,60 | 359,00 | 195,20 | 153,50 | 161,00 | 98,00 | 56,80 | 68,00 | 69,70 | 11,40 | 34,40 | 39,00 | 83,30 |
| **Taipei** | 224,20 | 51,70 | 57,30 | 327,80 | 166,20 | 136,00 | 150,90 | 78,20 | 84,90 | 86,40 | 57,60 | 29,50 | 34,70 | 49,50 | 84,40 |
| **Brussels** | 195,10 | 60,40 | 112,60 | 370,60 | 153,60 | 157,40 | 146,00 | 97,20 | 45,40 | 73,90 | 68,80 | 6,70 | 36,70 | 61,70 | 83,80 |
| **Vienna** | 196,80 | 36,90 | 121,40 | 351,20 | 204,70 | 191,90 | 199,60 | 112,90 | 73,10 | 79,20 | 61,80 | 11,50 | 24,50 | 16,70 | 81,80 |
| **Madrid** | 194,70 | 37,10 | 175,60 | 364,90 | 175,60 | 174,20 | 161,20 | 85,70 | 69,90 | 80,00 | 54,50 | 11,20 | 35,30 | 51,40 | 85,50 |
| **İstanbul** | 132,40 | 37,30 | 195,70 | 318,40 | 146,80 | 166,70 | 100,00 | 28,50 | 52,50 | 69,50 | 34,60 | 21,00 | 51,70 | 69,10 | 93,00 |
| **Barcelona** | 190,80 | 36,20 | 156,20 | 372,60 | 157,90 | 174,40 | 142,40 | 74,10 | 50,20 | 77,60 | 58,70 | 10,70 | 29,70 | 65,70 | 95,70 |
| **Bangkok** | 182,10 | 19,00 | 131,00 | 323,70 | 113,80 | 113,70 | 81,20 | 29,50 | 59,50 | 77,10 | 49,80 | 31,50 | 45,60 | 77,10 | 58,40 |
| **Milan** | 177,10 | 27,80 | 118,70 | 362,50 | 159,20 | 171,80 | 116,20 | 40,90 | 44,30 | 62,50 | 50,10 | 9,70 | 64,00 | 50,90 | 99,50 |
| **Moscow** | 142,90 | 55,50 | 171,50 | 327,40 | 127,80 | 166,80 | 111,00 | 58,80 | 63,20 | 65,50 | 46,20 | 21,60 | 50,50 | 56,20 | 55,80 |
| **Mexico City** | 102,50 | 16,60 | 157,70 | 289,00 | 126,40 | 124,90 | 87,20 | 38,10 | 31,50 | 65,40 | 40,80 | 16,00 | 52,10 | 81,80 | 92,40 |
| **Sao Paulo** | 124,70 | 23,70 | 149,90 | 331,70 | 164,70 | 109,60 | 76,10 | 26,10 | 29,50 | 58,70 | 41,20 | 23,40 | 50,10 | 79,60 | 99,00 |
| **Buenos Aires** | 100,80 | 9,50 | 162,10 | 348,40 | 145,70 | 98,00 | 101,70 | 33,40 | 36,70 | 69,00 | 31,60 | 27,70 | 49,20 | 52,30 | 98,30 |
| **Dublin** | 273,60 | 33,50 | 71,20 | 337,90 | 162,40 | 134,10 | 142,60 | 81,80 | 48,30 | 51,60 | 79,00 | 8,10 | 40,40 | 40,90 | 85,90 |
| **Helsinki** | 238,10 | 36,00 | 37,30 | 354,00 | 208,80 | 151,30 | 178,00 | 83,50 | 74,50 | 77,70 | 77,20 | 13,10 | 29,20 | 13,80 | 62,80 |
| **Melbourne** | 242,00 | 80,20 | 124,40 | 349,40 | 201,60 | 159,70 | 177,20 | 102,20 | 55,90 | 76,40 | 76,80 | 8,40 | 40,50 | 25,90 | 94,30 |
| **Tel Aviv** | 207,90 | 32,10 | 86,70 | 315,80 | 135,80 | 106,70 | 146,10 | 70,20 | 73,80 | 74,60 | 94,50 | 20,70 | 37,00 | 47,00 | 93,90 |
| **Jakarta** | 166,00 | 10,70 | 64,90 | 324,90 | 86,90 | 103,30 | 74,50 | 33,00 | 47,30 | 56,60 | 35,10 | 20,30 | 51,70 | 84,90 | 63,80 |
| **Johannesburg** | 107,90 | 4,50 | 79,50 | 223,20 | 131,70 | 92,90 | 134,50 | 94,50 | 19,30 | 60,60 | 40,50 | 2,40 | 40,70 | 61,30 | 91,40 |
| **Mumbai** | 111,40 | 6,60 | 65,40 | 275,00 | 80,30 | 89,00 | 73,60 | 46,60 | 55,00 | 65,20 | 25,70 | 36,60 | 54,90 | 83,70 | 71,50 |
| **Cairo** | 90,10 | 11,60 | 87,90 | 309,30 | 83,40 | 115,10 | 81,40 | 22,90 | 50,00 | 45,50 | 24,10 | 11,90 | 50,20 | 91,50 | 88,50 |

Normalization process is performed with the matrix obtained. While performing the normalization process, the benefit and cost aspects of the criteria are taken into account. Calculations were made by taking into account the benefit/cost aspects of the criteria used in the study as given in Table 1. The normalized matrix is given in Table 8.

**Table 8.** Normalized Matrix

| Cities | EC | RD | CI | LI | EN | AC | QI | PI | SI | HI | CL | PR | TI | PO | CM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Reference** | 362,17 | 207,38 | 338,78 | 382,01 | 237,69 | 246,54 | 199,02 | 707,97 | 84,61 | 85,29 | 1,00 | 1,00 | 1,00 | 1,00 | 98,48 |
| **Newyork** | 362,17 | 207,38 | 254,18 | 302,61 | 156,59 | 220,04 | 135,92 | 99,97 | 50,61 | 61,19 | 0,18 | 0,82 | 0,52 | 0,44 | 78,68 |
| **London** | 324,17 | 181,28 | 338,78 | 356,91 | 192,39 | 196,24 | 130,92 | 88,07 | 45,91 | 69,09 | 0,40 | 0,69 | 0,50 | 0,43 | 87,28 |
| **Tokyo** | 291,67 | 145,38 | 210,48 | 351,71 | 180,49 | 184,54 | 164,12 | 89,97 | 75,11 | 78,79 | 0,40 | 0,77 | 0,57 | 0,62 | 84,28 |
| **Beijing** | 298,27 | 94,38 | 119,28 | 292,91 | 129,09 | 162,94 | 81,32 | 63,27 | 71,31 | 66,79 | 1,00 | 0,02 | 0,52 | 0,14 | 56,58 |
| **HongKong** | 220,97 | 100,38 | 111,38 | 318,71 | 161,39 | 152,44 | 101,32 | 67,67 | 78,21 | 64,69 | 0,39 | 0,04 | 0,54 | 0,31 | 82,58 |
| **Zurich** | 299,67 | 50,98 | 50,68 | 331,31 | 201,79 | 161,64 | 194,72 | 122,87 | 81,41 | 72,99 | 0,00 | 0,80 | 0,79 | 0,95 | 80,48 |
| **SanFrancisco** | 280,97 | 118,18 | 95,38 | 299,21 | 136,29 | 133,24 | 140,12 | 103,97 | 38,61 | 62,79 | 0,18 | 0,85 | 0,33 | 0,53 | 96,28 |
| **Sydney** | 244,77 | 84,98 | 104,58 | 339,71 | 206,39 | 131,74 | 179,02 | 110,57 | 65,81 | 75,89 | 0,34 | 0,78 | 0,52 | 0,82 | 96,08 |
| **Singapore** | 285,97 | 96,78 | 161,88 | 329,31 | 182,19 | 174,74 | 153,62 | 95,57 | 70,51 | 69,79 | 0,30 | 0,70 | 0,57 | 0,75 | 56,48 |
| **Toronto** | 245,57 | 60,98 | 94,58 | 351,51 | 172,49 | 144,94 | 149,12 | 90,97 | 57,51 | 74,49 | 0,41 | 0,76 | 0,49 | 0,69 | 64,28 |
| **Stockholm** | 242,57 | 46,88 | 84,18 | 348,31 | 237,69 | 132,64 | 162,82 | 94,57 | 53,61 | 65,49 | 0,43 | 0,73 | 0,73 | 0,94 | 68,68 |
| **Los Angeles** | 238,97 | 155,78 | 113,18 | 301,51 | 143,69 | 145,54 | 136,02 | 115,97 | 47,51 | 61,39 | 0,36 | 0,89 | 0,08 | 0,31 | 94,48 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Amsterdam** | 259,47 | 66,08 | 144,68 | 358,61 | 168,09 | 228,74 | 182,42 | 101,67 | 67,71 | 71,19 | 0,42 | 0,82 | 0,95 | 0,81 | 86,48 |
| **Vancouver** | 236,37 | 45,78 | 59,28 | 321,41 | 198,19 | 112,64 | 171,82 | 93,97 | 60,11 | 72,79 | 0,42 | 0,76 | 0,69 | 0,85 | 90,18 |
| **Seoul** | 248,27 | 130,48 | 145,78 | 315,11 | 179,99 | 166,54 | 126,42 | 80,87 | 75,01 | 81,49 | 0,36 | 0,36 | 0,55 | 0,42 | 67,38 |
| **Shanghai** | 264,77 | 87,48 | 111,88 | 281,51 | 138,79 | 246,54 | 87,52 | 59,67 | 69,11 | 62,49 | 0,63 | 0,00 | 0,44 | 0,23 | 82,58 |
| **Dubai** | 221,37 | 25,18 | 226,68 | 337,41 | 128,89 | 185,24 | 175,02 | 129,07 | 83,31 | 66,99 | 0,48 | 0,97 | 0,68 | 0,54 | 49,28 |
| **Geneva** | 273,87 | 50,28 | 37,48 | 318,61 | 194,39 | 130,44 | 184,12 | 112,87 | 70,01 | 71,59 | 0,12 | 0,78 | 0,96 | 0,86 | 81,58 |
| **Washington** | 264,07 | 85,88 | 75,78 | 272,31 | 141,89 | 132,34 | 164,82 | 127,87 | 39,61 | 68,79 | 0,32 | 0,93 | 0,59 | 0,66 | 80,58 |
| **Paris** | 252,77 | 103,08 | 235,38 | 382,01 | 155,79 | 224,84 | 122,12 | 77,87 | 42,81 | 77,99 | 0,38 | 0,60 | 0,57 | 0,36 | 87,38 |
| **Frankfurt** | 220,57 | 30,58 | 77,98 | 345,41 | 178,89 | 217,24 | 171,32 | 707,97 | 55,01 | 74,09 | 0,43 | 0,76 | 0,97 | 0,71 | 83,68 |
| **Copanhagen** | 238,67 | 38,28 | 79,58 | 344,71 | 234,29 | 174,54 | 188,32 | 96,97 | 73,21 | 76,89 | 0,33 | 0,85 | 0,90 | 0,90 | 82,68 |
| **Boston** | 237,87 | 135,38 | 65,58 | 287,71 | 158,99 | 144,84 | 168,22 | 111,07 | 60,31 | 73,39 | 0,31 | 0,87 | 0,48 | 0,78 | 70,68 |
| **Kuala Lumpur** | 194,97 | 17,38 | 78,88 | 356,41 | 115,99 | 108,44 | 122,82 | 84,57 | 36,71 | 66,99 | 0,70 | 0,91 | 0,57 | 0,33 | 55,58 |
| **Chicago** | 227,97 | 109,48 | 106,78 | 285,81 | 133,19 | 192,24 | 147,92 | 121,27 | 33,61 | 63,69 | 0,36 | 0,98 | 0,57 | 0,54 | 65,08 |
| **Berlin** | 222,47 | 80,88 | 171,48 | 357,61 | 194,69 | 152,94 | 160,42 | 97,97 | 56,51 | 66,89 | 0,44 | 0,80 | 0,75 | 0,68 | 82,28 |
| **Taipei** | 223,87 | 51,68 | 57,18 | 326,41 | 165,69 | 135,44 | 150,32 | 78,17 | 84,61 | 85,29 | 0,54 | 0,39 | 0,74 | 0,54 | 83,38 |
| **Brussels** | 194,77 | 60,38 | 112,48 | 369,21 | 153,09 | 156,84 | 145,42 | 97,17 | 45,11 | 72,79 | 0,45 | 0,90 | 0,69 | 0,38 | 82,78 |
| **Vienna** | 196,47 | 36,88 | 121,28 | 349,81 | 204,19 | 191,34 | 199,02 | 112,87 | 72,81 | 78,09 | 0,51 | 0,79 | 1,00 | 0,96 | 80,78 |
| **Madrid** | 194,37 | 37,08 | 175,48 | 363,51 | 175,09 | 173,64 | 160,62 | 85,67 | 69,61 | 78,89 | 0,57 | 0,80 | 0,73 | 0,52 | 84,48 |
| **İstanbul** | 132,07 | 37,28 | 195,58 | 317,01 | 146,29 | 166,14 | 99,42 | 28,47 | 52,21 | 68,39 | 0,74 | 0,58 | 0,31 | 0,29 | 91,98 |
| **Barcelona** | 190,47 | 36,18 | 156,08 | 371,21 | 157,39 | 173,84 | 141,82 | 74,07 | 49,91 | 76,49 | 0,53 | 0,81 | 0,87 | 0,33 | 94,68 |
| **Bangkok** | 181,77 | 18,98 | 130,88 | 322,31 | 113,29 | 113,14 | 80,62 | 29,47 | 59,21 | 75,99 | 0,61 | 0,34 | 0,47 | 0,19 | 57,38 |
| **Milan** | 176,77 | 27,78 | 118,58 | 361,11 | 158,69 | 171,24 | 115,62 | 40,87 | 44,01 | 61,39 | 0,61 | 0,83 | 0,00 | 0,52 | 98,48 |
| **Moscow** | 142,57 | 55,48 | 171,38 | 326,01 | 127,29 | 166,24 | 110,42 | 58,77 | 62,91 | 64,39 | 0,64 | 0,57 | 0,34 | 0,45 | 54,78 |
| **Mexico City** | 102,17 | 16,58 | 157,58 | 287,61 | 125,89 | 124,34 | 86,62 | 38,07 | 31,21 | 64,29 | 0,69 | 0,69 | 0,30 | 0,12 | 91,38 |
| **Sao Paulo** | 124,37 | 23,68 | 149,78 | 330,31 | 164,19 | 109,04 | 75,52 | 26,07 | 29,21 | 57,59 | 0,68 | 0,52 | 0,35 | 0,15 | 97,98 |
| **Buenos Aires** | 100,47 | 9,48 | 161,98 | 347,01 | 145,19 | 97,44 | 101,12 | 33,37 | 36,41 | 67,89 | 0,77 | 0,43 | 0,37 | 0,50 | 97,28 |
| **Dublin** | 273,27 | 33,48 | 71,08 | 336,51 | 161,89 | 133,54 | 142,02 | 81,77 | 48,01 | 50,49 | 0,36 | 0,87 | 0,60 | 0,65 | 84,88 |
| **Helsinki** | 237,77 | 35,98 | 37,18 | 352,61 | 208,29 | 150,74 | 177,42 | 83,47 | 74,21 | 76,59 | 0,37 | 0,76 | 0,88 | 1,00 | 61,78 |
| **Melbourne** | 241,67 | 80,18 | 124,28 | 348,01 | 201,09 | 159,14 | 176,62 | 102,17 | 55,61 | 75,29 | 0,38 | 0,86 | 0,59 | 0,84 | 93,28 |
| **Tel Aviv** | 207,57 | 32,08 | 86,58 | 314,41 | 135,29 | 106,14 | 145,52 | 70,17 | 73,51 | 73,49 | 0,23 | 0,59 | 0,68 | 0,57 | 92,88 |
| **Jakarta** | 165,67 | 10,68 | 64,78 | 323,51 | 86,39 | 102,74 | 73,92 | 32,97 | 47,01 | 55,49 | 0,73 | 0,60 | 0,31 | 0,08 | 62,78 |
| **Johannesburg** | 107,57 | 4,48 | 79,38 | 221,81 | 131,19 | 92,34 | 133,92 | 94,47 | 19,01 | 59,49 | 0,69 | 1,00 | 0,59 | 0,39 | 90,38 |
| **Mumbai** | 111,07 | 6,58 | 65,28 | 273,61 | 79,79 | 88,44 | 73,02 | 46,57 | 54,71 | 64,09 | 0,82 | 0,23 | 0,23 | 0,10 | 70,48 |
| **Cairo** | 89,77 | 11,58 | 87,78 | 307,91 | 82,89 | 114,54 | 80,82 | 22,87 | 49,71 | 44,39 | 0,83 | 0,79 | 0,35 | 0,00 | 87,48 |

In the next stage of the method, the absolute value table is created. The resulting absolute value table is shown in Table 9.

**Table 9.** Absolute Value Table

| Cities | EC | RD | CI | LI | EN | AC | QI | PI | SI | HI | CL | PR | TI | PO | CM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Newyork** | 0,00 | 0,00 | 84,60 | 79,40 | 81,10 | 26,50 | 63,10 | 608,00 | 34,00 | 24,10 | 0,82 | 0,18 | 0,48 | 0,56 | 19,80 |
| **London** | 38,00 | 26,10 | 0,00 | 25,10 | 45,30 | 50,30 | 68,10 | 619,90 | 38,70 | 16,20 | 0,60 | 0,31 | 0,50 | 0,57 | 11,20 |
| **Tokyo** | 70,50 | 62,00 | 128,30 | 30,30 | 57,20 | 62,00 | 34,90 | 618,00 | 9,50 | 6,50 | 0,60 | 0,23 | 0,43 | 0,38 | 14,20 |
| **Beijing** | 63,90 | 113,00 | 219,50 | 89,10 | 108,60 | 83,60 | 117,70 | 644,70 | 13,30 | 18,50 | 0,00 | 0,98 | 0,48 | 0,86 | 41,90 |
| **HongKong** | 141,20 | 107,00 | 227,40 | 63,30 | 76,30 | 94,10 | 97,70 | 640,30 | 6,40 | 20,60 | 0,61 | 0,96 | 0,46 | 0,69 | 15,90 |
| **Zurich** | 62,50 | 156,40 | 288,10 | 50,70 | 35,90 | 84,90 | 4,30 | 585,10 | 3,20 | 12,30 | 1,00 | 0,20 | 0,21 | 0,05 | 18,00 |
| **SanFrancisco** | 81,20 | 89,20 | 243,40 | 82,80 | 101,40 | 113,30 | 58,90 | 604,00 | 46,00 | 22,50 | 0,82 | 0,15 | 0,67 | 0,47 | 2,20 |
| **Sydney** | 117,40 | 122,40 | 234,20 | 42,30 | 31,30 | 114,80 | 20,00 | 597,40 | 18,80 | 9,40 | 0,66 | 0,22 | 0,48 | 0,18 | 2,40 |
| **Singapore** | 76,20 | 110,60 | 176,90 | 52,70 | 55,50 | 71,80 | 45,40 | 612,40 | 14,10 | 15,50 | 0,70 | 0,30 | 0,43 | 0,25 | 42,00 |
| **Toronto** | 116,60 | 146,40 | 244,20 | 30,50 | 65,20 | 101,60 | 49,90 | 617,00 | 27,10 | 10,80 | 0,59 | 0,24 | 0,51 | 0,31 | 34,20 |
| **Stockholm** | 119,60 | 160,50 | 254,60 | 33,70 | 0,00 | 113,90 | 36,20 | 613,40 | 31,00 | 19,80 | 0,57 | 0,27 | 0,27 | 0,06 | 29,80 |
| **Los Angeles** | 123,20 | 51,60 | 225,60 | 80,50 | 94,00 | 101,00 | 63,00 | 592,00 | 37,10 | 23,90 | 0,64 | 0,11 | 0,92 | 0,69 | 4,00 |
| **Amsterdam** | 102,70 | 141,30 | 194,10 | 23,40 | 69,60 | 17,80 | 16,60 | 606,30 | 16,90 | 14,10 | 0,58 | 0,18 | 0,05 | 0,19 | 12,00 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Vancouver** | 125,80 | 161,60 | 279,50 | 60,60 | 39,50 | 133,90 | 27,20 | 614,00 | 24,50 | 12,50 | 0,58 | 0,24 | 0,31 | 0,15 | 8,30 |
| **Seoul** | 113,90 | 76,90 | 193,00 | 66,90 | 57,70 | 80,00 | 72,60 | 627,10 | 9,60 | 3,80 | 0,64 | 0,64 | 0,45 | 0,58 | 31,10 |
| **Shanghai** | 97,40 | 119,90 | 226,90 | 100,50 | 98,90 | 0,00 | 111,50 | 648,30 | 15,50 | 22,80 | 0,37 | 1,00 | 0,56 | 0,77 | 15,90 |
| **Dubai** | 140,80 | 182,20 | 112,10 | 44,60 | 108,80 | 61,30 | 24,00 | 578,90 | 1,30 | 18,30 | 0,52 | 0,03 | 0,32 | 0,46 | 49,20 |
| **Geneva** | 88,30 | 157,10 | 301,30 | 63,40 | 43,30 | 116,10 | 14,90 | 595,10 | 14,60 | 13,70 | 0,88 | 0,22 | 0,04 | 0,14 | 16,90 |
| **Washington** | 98,10 | 121,50 | 263,00 | 109,70 | 95,80 | 114,20 | 34,20 | 580,10 | 45,00 | 16,50 | 0,68 | 0,07 | 0,41 | 0,34 | 17,90 |
| **Paris** | 109,40 | 104,30 | 103,40 | 0,00 | 81,90 | 21,70 | 76,90 | 630,10 | 41,80 | 7,30 | 0,62 | 0,40 | 0,43 | 0,64 | 11,10 |
| **Frankfurt** | 141,60 | 176,80 | 260,80 | 36,60 | 58,80 | 29,30 | 27,70 | 0,00 | 29,60 | 11,20 | 0,57 | 0,24 | 0,03 | 0,29 | 14,80 |
| **Copanhagen** | 123,50 | 169,10 | 259,20 | 37,30 | 3,40 | 72,00 | 10,70 | 611,00 | 11,40 | 8,40 | 0,67 | 0,15 | 0,10 | 0,10 | 15,80 |
| **Boston** | 124,30 | 72,00 | 273,20 | 94,30 | 78,70 | 101,70 | 30,80 | 596,90 | 24,30 | 11,90 | 0,69 | 0,13 | 0,52 | 0,22 | 27,80 |
| **Kuala Lumpur** | 167,20 | 190,00 | 259,90 | 25,60 | 121,70 | 138,10 | 76,20 | 623,40 | 47,90 | 18,30 | 0,30 | 0,09 | 0,43 | 0,67 | 42,90 |
| **Chicago** | 134,20 | 97,90 | 232,00 | 96,20 | 104,50 | 54,30 | 51,10 | 586,70 | 51,00 | 21,60 | 0,64 | 0,02 | 0,43 | 0,46 | 33,40 |
| **Berlin** | 139,70 | 126,50 | 167,30 | 24,40 | 43,00 | 93,60 | 38,60 | 610,00 | 28,10 | 18,40 | 0,56 | 0,20 | 0,25 | 0,32 | 16,20 |
| **Taipei** | 138,30 | 155,70 | 281,60 | 55,60 | 72,00 | 111,10 | 48,70 | 629,80 | 0,00 | 0,00 | 0,46 | 0,61 | 0,26 | 0,46 | 15,10 |
| **Brussels** | 167,40 | 147,00 | 226,30 | 12,80 | 84,60 | 89,70 | 53,60 | 610,80 | 39,50 | 12,50 | 0,55 | 0,10 | 0,31 | 0,62 | 15,70 |
| **Vienna** | 165,70 | 170,50 | 217,50 | 32,20 | 33,50 | 55,20 | 0,00 | 595,10 | 11,80 | 7,20 | 0,49 | 0,21 | 0,00 | 0,04 | 17,70 |
| **Madrid** | 167,80 | 170,30 | 163,30 | 18,50 | 62,60 | 72,90 | 38,40 | 622,30 | 15,00 | 6,40 | 0,43 | 0,20 | 0,27 | 0,48 | 14,00 |
| **İstanbul** | 230,10 | 170,10 | 143,20 | 65,00 | 91,40 | 80,40 | 99,60 | 679,50 | 32,40 | 16,90 | 0,26 | 0,42 | 0,69 | 0,71 | 6,50 |
| **Barcelona** | 171,70 | 171,20 | 182,70 | 10,80 | 80,30 | 72,70 | 57,20 | 633,90 | 34,70 | 8,80 | 0,47 | 0,19 | 0,13 | 0,67 | 3,80 |
| **Bangkok** | 180,40 | 188,40 | 207,90 | 59,70 | 124,40 | 133,40 | 118,40 | 678,50 | 25,40 | 9,30 | 0,39 | 0,66 | 0,53 | 0,81 | 41,10 |
| **Milan** | 185,40 | 179,60 | 220,20 | 20,90 | 79,00 | 75,30 | 83,40 | 667,10 | 40,60 | 23,90 | 0,39 | 0,17 | 1,00 | 0,48 | 0,00 |
| **Moscow** | 219,60 | 151,90 | 167,40 | 56,00 | 110,40 | 80,30 | 88,60 | 649,20 | 21,70 | 20,90 | 0,36 | 0,43 | 0,66 | 0,55 | 43,70 |
| **Mexico City** | 260,00 | 190,80 | 181,20 | 94,40 | 111,80 | 122,20 | 112,40 | 669,90 | 53,40 | 21,00 | 0,31 | 0,31 | 0,70 | 0,88 | 7,10 |
| **Sao Paulo** | 237,80 | 183,70 | 189,00 | 51,70 | 73,50 | 137,50 | 123,50 | 681,90 | 55,40 | 27,70 | 0,32 | 0,48 | 0,65 | 0,85 | 0,50 |
| **Buenos Aires** | 261,70 | 197,90 | 176,80 | 35,00 | 92,50 | 149,10 | 97,90 | 674,60 | 48,20 | 17,40 | 0,23 | 0,57 | 0,63 | 0,50 | 1,20 |
| **Dublin** | 88,90 | 173,90 | 267,70 | 45,50 | 75,80 | 113,00 | 57,00 | 626,20 | 36,60 | 34,80 | 0,64 | 0,13 | 0,40 | 0,35 | 13,60 |
| **Helsinki** | 124,40 | 171,40 | 301,60 | 29,40 | 29,40 | 95,80 | 21,60 | 624,50 | 10,40 | 8,70 | 0,63 | 0,24 | 0,12 | 0,00 | 36,70 |
| **Melbourne** | 120,50 | 127,20 | 214,50 | 34,00 | 36,60 | 87,40 | 22,40 | 605,80 | 29,00 | 10,00 | 0,62 | 0,14 | 0,41 | 0,16 | 5,20 |
| **Tel Aviv** | 154,60 | 175,30 | 252,20 | 67,60 | 102,40 | 140,40 | 53,50 | 637,80 | 11,10 | 11,80 | 0,77 | 0,41 | 0,32 | 0,43 | 5,60 |
| **Jakarta** | 196,50 | 196,70 | 274,00 | 58,50 | 151,30 | 143,80 | 125,10 | 675,00 | 37,60 | 29,80 | 0,27 | 0,40 | 0,69 | 0,92 | 35,70 |
| **Johannesburg** | 254,60 | 202,90 | 259,40 | 160,20 | 106,50 | 154,20 | 65,10 | 613,50 | 65,60 | 25,80 | 0,31 | 0,00 | 0,41 | 0,61 | 8,10 |
| **Mumbai** | 251,10 | 200,80 | 273,50 | 108,40 | 157,90 | 158,10 | 126,00 | 661,40 | 29,90 | 21,20 | 0,18 | 0,77 | 0,77 | 0,90 | 28,00 |
| **Cairo** | 272,40 | 195,80 | 251,00 | 74,10 | 154,80 | 132,00 | 118,20 | 685,10 | 34,90 | 40,90 | 0,17 | 0,21 | 0,65 | 1,00 | 11,00 |

In step 5 of the Gray Relational Analysis method, a gray relational coefficient matrix is created. The created matrix is shared in Table 10.

**Table 10.** Gray Relational Coefficient Matrix

| Cities | EC | RD | CI | LI | EN | AC | QI | PI | SI | HI | CL | PR | TI | PO | CM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Newyork** | 1,000 | 1,000 | 0,802 | 0,812 | 0,809 | 0,928 | 0,844 | 0,360 | 0,910 | 0,934 | 0,998 | 0,999 | 0,999 | 0,998 | 0,945 |
| **London** | 0,900 | 0,929 | 1,000 | 0,932 | 0,883 | 0,872 | 0,834 | 0,356 | 0,898 | 0,955 | 0,998 | 0,999 | 0,999 | 0,998 | 0,968 |
| **Tokyo** | 0,829 | 0,847 | 0,728 | 0,919 | 0,857 | 0,847 | 0,908 | 0,357 | 0,973 | 0,981 | 0,998 | 0,999 | 0,999 | 0,999 | 0,960 |
| **Beijing** | 0,843 | 0,752 | 0,609 | 0,794 | 0,759 | 0,804 | 0,744 | 0,347 | 0,963 | 0,949 | 1,000 | 0,997 | 0,999 | 0,998 | 0,891 |
| **HongKong** | 0,708 | 0,762 | 0,601 | 0,844 | 0,818 | 0,784 | 0,778 | 0,349 | 0,982 | 0,943 | 0,998 | 0,997 | 0,999 | 0,998 | 0,956 |
| **Zurich** | 0,846 | 0,687 | 0,543 | 0,871 | 0,905 | 0,801 | 0,988 | 0,369 | 0,991 | 0,965 | 0,997 | 0,999 | 0,999 | 1,000 | 0,950 |
| **SanFrancisco** | 0,808 | 0,793 | 0,585 | 0,805 | 0,772 | 0,751 | 0,853 | 0,362 | 0,882 | 0,938 | 0,998 | 1,000 | 0,998 | 0,999 | 0,994 |
| **Sydney** | 0,745 | 0,737 | 0,594 | 0,890 | 0,916 | 0,749 | 0,945 | 0,364 | 0,948 | 0,973 | 0,998 | 0,999 | 0,999 | 0,999 | 0,993 |
| **Singapore** | 0,818 | 0,756 | 0,659 | 0,867 | 0,861 | 0,827 | 0,883 | 0,359 | 0,960 | 0,957 | 0,998 | 0,999 | 0,999 | 0,999 | 0,891 |
| **Toronto** | 0,746 | 0,701 | 0,584 | 0,918 | 0,840 | 0,771 | 0,873 | 0,357 | 0,927 | 0,969 | 0,998 | 0,999 | 0,999 | 0,999 | 0,909 |
| **Stockholm** | 0,741 | 0,681 | 0,574 | 0,910 | 1,000 | 0,750 | 0,904 | 0,358 | 0,917 | 0,945 | 0,998 | 0,999 | 0,999 | 1,000 | 0,920 |
| **Los Angeles** | 0,735 | 0,869 | 0,603 | 0,810 | 0,785 | 0,772 | 0,845 | 0,367 | 0,902 | 0,935 | 0,998 | 1,000 | 0,997 | 0,998 | 0,988 |
| **Amsterdam** | 0,769 | 0,708 | 0,638 | 0,936 | 0,831 | 0,951 | 0,954 | 0,361 | 0,953 | 0,960 | 0,998 | 0,999 | 1,000 | 0,999 | 0,966 |
| **Vancouver** | 0,731 | 0,679 | 0,551 | 0,850 | 0,897 | 0,719 | 0,926 | 0,358 | 0,933 | 0,965 | 0,998 | 0,999 | 0,999 | 1,000 | 0,976 |
| **Seoul** | 0,750 | 0,817 | 0,640 | 0,837 | 0,856 | 0,811 | 0,825 | 0,353 | 0,973 | 0,989 | 0,998 | 0,998 | 0,999 | 0,998 | 0,917 |
| **Shanghai** | 0,779 | 0,741 | 0,602 | 0,773 | 0,776 | 1,000 | 0,754 | 0,346 | 0,957 | 0,938 | 0,999 | 0,997 | 0,998 | 0,998 | 0,956 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dubai** | 0,709 | 0,653 | 0,753 | 0,885 | 0,759 | 0,848 | 0,935 | 0,372 | 0,996 | 0,949 | 0,998 | 1,000 | 0,999 | 0,999 | 0,874 |
| **Geneva** | 0,795 | 0,686 | 0,532 | 0,844 | 0,888 | 0,747 | 0,958 | 0,365 | 0,959 | 0,962 | 0,997 | 0,999 | 1,000 | 1,000 | 0,953 |
| **Washington** | 0,777 | 0,738 | 0,566 | 0,757 | 0,781 | 0,750 | 0,909 | 0,371 | 0,884 | 0,954 | 0,998 | 1,000 | 0,999 | 0,999 | 0,950 |
| **Paris** | 0,758 | 0,767 | 0,768 | 1,000 | 0,807 | 0,940 | 0,817 | 0,352 | 0,891 | 0,979 | 0,998 | 0,999 | 0,999 | 0,998 | 0,969 |
| **Frankfurt** | 0,708 | 0,660 | 0,568 | 0,903 | 0,853 | 0,921 | 0,925 | 1,000 | 0,920 | 0,968 | 0,998 | 0,999 | 1,000 | 0,999 | 0,959 |
| **Copanhagen** | 0,735 | 0,670 | 0,569 | 0,902 | 0,990 | 0,826 | 0,970 | 0,359 | 0,968 | 0,976 | 0,998 | 1,000 | 1,000 | 1,000 | 0,956 |
| **Boston** | 0,734 | 0,826 | 0,556 | 0,784 | 0,813 | 0,771 | 0,918 | 0,365 | 0,934 | 0,966 | 0,998 | 1,000 | 0,998 | 0,999 | 0,925 |
| **Kuala Lumpur** | 0,672 | 0,643 | 0,569 | 0,930 | 0,738 | 0,713 | 0,818 | 0,355 | 0,877 | 0,949 | 0,999 | 1,000 | 0,999 | 0,998 | 0,889 |
| **Chicago** | 0,719 | 0,778 | 0,596 | 0,781 | 0,766 | 0,863 | 0,870 | 0,369 | 0,870 | 0,941 | 0,998 | 1,000 | 0,999 | 0,999 | 0,911 |
| **Berlin** | 0,710 | 0,730 | 0,672 | 0,934 | 0,888 | 0,785 | 0,899 | 0,360 | 0,924 | 0,949 | 0,998 | 0,999 | 0,999 | 0,999 | 0,955 |
| **Taipei** | 0,712 | 0,688 | 0,549 | 0,860 | 0,826 | 0,755 | 0,876 | 0,352 | 1,000 | 1,000 | 0,999 | 0,998 | 0,999 | 0,999 | 0,958 |
| **Brussels** | 0,672 | 0,700 | 0,602 | 0,964 | 0,802 | 0,792 | 0,865 | 0,359 | 0,897 | 0,965 | 0,998 | 1,000 | 0,999 | 0,998 | 0,956 |
| **Vienna** | 0,674 | 0,668 | 0,612 | 0,914 | 0,911 | 0,861 | 1,000 | 0,365 | 0,967 | 0,979 | 0,999 | 0,999 | 1,000 | 1,000 | 0,951 |
| **Madrid** | 0,671 | 0,668 | 0,677 | 0,949 | 0,845 | 0,825 | 0,899 | 0,355 | 0,958 | 0,982 | 0,999 | 0,999 | 0,999 | 0,999 | 0,961 |
| **İstanbul** | 0,598 | 0,668 | 0,705 | 0,841 | 0,789 | 0,810 | 0,775 | 0,335 | 0,914 | 0,953 | 0,999 | 0,999 | 0,998 | 0,998 | 0,981 |
| **Barcelona** | 0,666 | 0,667 | 0,652 | 0,969 | 0,810 | 0,825 | 0,857 | 0,351 | 0,908 | 0,975 | 0,999 | 0,999 | 1,000 | 0,998 | 0,989 |
| **Bangkok** | 0,655 | 0,645 | 0,622 | 0,852 | 0,734 | 0,720 | 0,743 | 0,335 | 0,931 | 0,974 | 0,999 | 0,998 | 0,998 | 0,998 | 0,893 |
| **Milan** | 0,649 | 0,656 | 0,609 | 0,942 | 0,813 | 0,820 | 0,804 | 0,339 | 0,894 | 0,935 | 0,999 | 1,000 | 0,997 | 0,999 | 1,000 |
| **Moscow** | 0,609 | 0,693 | 0,672 | 0,859 | 0,756 | 0,810 | 0,795 | 0,345 | 0,940 | 0,942 | 0,999 | 0,999 | 0,998 | 0,998 | 0,887 |
| **Mexico City** | 0,569 | 0,642 | 0,654 | 0,784 | 0,754 | 0,737 | 0,753 | 0,338 | 0,865 | 0,942 | 0,999 | 0,999 | 0,998 | 0,997 | 0,980 |
| **Sao Paulo** | 0,590 | 0,651 | 0,644 | 0,869 | 0,823 | 0,714 | 0,735 | 0,334 | 0,861 | 0,925 | 0,999 | 0,999 | 0,998 | 0,998 | 0,999 |
| **Buenos Aires** | 0,567 | 0,634 | 0,660 | 0,907 | 0,787 | 0,697 | 0,778 | 0,337 | 0,877 | 0,952 | 0,999 | 0,998 | 0,998 | 0,999 | 0,997 |
| **Dublin** | 0,794 | 0,663 | 0,561 | 0,883 | 0,819 | 0,752 | 0,857 | 0,354 | 0,903 | 0,908 | 0,998 | 1,000 | 0,999 | 0,999 | 0,962 |
| **Helsinki** | 0,734 | 0,667 | 0,532 | 0,921 | 0,921 | 0,781 | 0,941 | 0,354 | 0,971 | 0,975 | 0,998 | 0,999 | 1,000 | 1,000 | 0,903 |
| **Melbourne** | 0,740 | 0,729 | 0,615 | 0,910 | 0,903 | 0,797 | 0,939 | 0,361 | 0,922 | 0,972 | 0,998 | 1,000 | 0,999 | 1,000 | 0,985 |
| **Tel Aviv** | 0,689 | 0,661 | 0,576 | 0,835 | 0,770 | 0,709 | 0,865 | 0,349 | 0,969 | 0,967 | 0,998 | 0,999 | 0,999 | 0,999 | 0,984 |
| **Jakarta** | 0,635 | 0,635 | 0,556 | 0,854 | 0,694 | 0,704 | 0,732 | 0,337 | 0,901 | 0,920 | 0,999 | 0,999 | 0,998 | 0,997 | 0,906 |
| **Johannesburg** | 0,574 | 0,628 | 0,569 | 0,681 | 0,763 | 0,690 | 0,840 | 0,358 | 0,839 | 0,930 | 0,999 | 1,000 | 0,999 | 0,998 | 0,977 |
| **Mumbai** | 0,577 | 0,630 | 0,556 | 0,760 | 0,684 | 0,684 | 0,731 | 0,341 | 0,920 | 0,942 | 0,999 | 0,998 | 0,998 | 0,997 | 0,924 |
| **Cairo** | 0,557 | 0,636 | 0,577 | 0,822 | 0,689 | 0,722 | 0,743 | 0,333 | 0,908 | 0,893 | 1,000 | 0,999 | 0,998 | 0,997 | 0,969 |

There are two different situations when evaluating the Gray Relational coefficient matrix. The first of these situations is when the criteria have equal importance. In the study, the results of the situation where the criteria have equal importance are given in Table 11. The second situation is when the weights are different. The results obtained by integrating the criteria weights obtained as a result of the CRITIC method into the Gray Relational Analysis (GRA) method are given in Table 12.

**Table 11.** Results Obtained When Criteria Have Equal Importance

| Cities | EC | RD | CI | LI | EN | AC | QI | PI | SI | HI | CL | PR | TI | PO | CM | $\Gamma_{0i}$ | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Newyork** | 1,000 | 1,000 | 0,802 | 0,812 | 0,809 | 0,928 | 0,844 | 0,360 | 0,910 | 0,934 | 0,998 | 0,999 | 0,999 | 0,998 | 0,945 | 0,889 | 3 |
| **London** | 0,900 | 0,929 | 1,000 | 0,932 | 0,883 | 0,872 | 0,834 | 0,356 | 0,898 | 0,955 | 0,998 | 0,999 | 0,999 | 0,998 | 0,968 | 0,901 | 1 |
| **Tokyo** | 0,829 | 0,847 | 0,728 | 0,919 | 0,857 | 0,847 | 0,908 | 0,357 | 0,973 | 0,981 | 0,998 | 0,999 | 0,999 | 0,999 | 0,960 | 0,880 | 4 |
| **Beijing** | 0,843 | 0,752 | 0,609 | 0,794 | 0,759 | 0,804 | 0,744 | 0,347 | 0,963 | 0,949 | 1,000 | 0,997 | 0,999 | 0,998 | 0,891 | 0,830 | 33 |
| **HongKong** | 0,708 | 0,762 | 0,601 | 0,844 | 0,818 | 0,784 | 0,778 | 0,349 | 0,982 | 0,943 | 0,998 | 0,997 | 0,999 | 0,998 | 0,956 | 0,834 | 29 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Zurich** | 0,846 | 0,687 | 0,543 | 0,871 | 0,905 | 0,801 | 0,988 | 0,369 | 0,991 | 0,965 | 0,997 | 0,999 | 0,999 | 1,000 | 0,950 | 0,861 | 8 |
| **SanFrancisco** | 0,808 | 0,793 | 0,585 | 0,805 | 0,772 | 0,751 | 0,853 | 0,362 | 0,882 | 0,938 | 0,998 | 1,000 | 0,998 | 0,999 | 0,994 | 0,836 | 28 |
| **Sydney** | 0,745 | 0,737 | 0,594 | 0,890 | 0,916 | 0,749 | 0,945 | 0,364 | 0,948 | 0,973 | 0,998 | 0,999 | 0,999 | 0,999 | 0,993 | 0,857 | 11 |
| **Singapore** | 0,818 | 0,756 | 0,659 | 0,867 | 0,861 | 0,827 | 0,883 | 0,359 | 0,960 | 0,957 | 0,998 | 0,999 | 0,999 | 0,999 | 0,891 | 0,855 | 12 |
| **Toronto** | 0,746 | 0,701 | 0,584 | 0,918 | 0,840 | 0,771 | 0,873 | 0,357 | 0,927 | 0,969 | 0,998 | 0,999 | 0,999 | 0,999 | 0,909 | 0,839 | 23 |
| **Stockholm** | 0,741 | 0,681 | 0,574 | 0,910 | 1,000 | 0,750 | 0,904 | 0,358 | 0,917 | 0,945 | 0,998 | 0,999 | 0,999 | 1,000 | 0,920 | 0,847 | 17 |
| **Los Angeles** | 0,735 | 0,869 | 0,603 | 0,810 | 0,785 | 0,772 | 0,845 | 0,367 | 0,902 | 0,935 | 0,998 | 1,000 | 0,997 | 0,998 | 0,988 | 0,840 | 22 |
| **Amsterdam** | 0,769 | 0,708 | 0,638 | 0,936 | 0,831 | 0,951 | 0,954 | 0,361 | 0,953 | 0,960 | 0,998 | 0,999 | 1,000 | 0,999 | 0,966 | 0,868 | 6 |
| **Vancouver** | 0,731 | 0,679 | 0,551 | 0,850 | 0,897 | 0,719 | 0,926 | 0,358 | 0,933 | 0,965 | 0,998 | 0,999 | 0,999 | 1,000 | 0,976 | 0,839 | 25 |
| **Seoul** | 0,750 | 0,817 | 0,640 | 0,837 | 0,856 | 0,811 | 0,825 | 0,353 | 0,973 | 0,989 | 0,998 | 0,998 | 0,999 | 0,998 | 0,917 | 0,851 | 15 |
| **Shanghai** | 0,779 | 0,741 | 0,602 | 0,773 | 0,776 | 1,000 | 0,754 | 0,346 | 0,957 | 0,938 | 0,999 | 0,997 | 0,998 | 0,998 | 0,956 | 0,841 | 21 |
| **Dubai** | 0,709 | 0,653 | 0,753 | 0,885 | 0,759 | 0,848 | 0,935 | 0,372 | 0,996 | 0,949 | 0,998 | 1,000 | 0,999 | 0,999 | 0,874 | 0,849 | 16 |
| **Geneva** | 0,795 | 0,686 | 0,532 | 0,844 | 0,888 | 0,747 | 0,958 | 0,365 | 0,959 | 0,962 | 0,997 | 0,999 | 1,000 | 1,000 | 0,953 | 0,846 | 19 |
| **Washington** | 0,777 | 0,738 | 0,566 | 0,757 | 0,781 | 0,750 | 0,909 | 0,371 | 0,884 | 0,954 | 0,998 | 1,000 | 0,999 | 0,999 | 0,950 | 0,829 | 34 |
| **Paris** | 0,758 | 0,767 | 0,768 | 1,000 | 0,807 | 0,940 | 0,817 | 0,352 | 0,891 | 0,979 | 0,998 | 0,999 | 0,999 | 0,998 | 0,969 | 0,869 | 5 |
| **Frankfurt** | 0,708 | 0,660 | 0,568 | 0,903 | 0,853 | 0,921 | 0,925 | 1,000 | 0,920 | 0,968 | 0,998 | 0,999 | 1,000 | 0,999 | 0,959 | 0,892 | 2 |
| **Copanhagen** | 0,735 | 0,670 | 0,569 | 0,902 | 0,990 | 0,826 | 0,970 | 0,359 | 0,968 | 0,976 | 0,998 | 1,000 | 1,000 | 1,000 | 0,956 | 0,861 | 7 |
| **Boston** | 0,734 | 0,826 | 0,556 | 0,784 | 0,813 | 0,771 | 0,918 | 0,365 | 0,934 | 0,966 | 0,998 | 1,000 | 0,998 | 0,999 | 0,925 | 0,839 | 24 |
| **Kuala Lumpur** | 0,672 | 0,643 | 0,569 | 0,930 | 0,738 | 0,713 | 0,818 | 0,355 | 0,877 | 0,949 | 0,999 | 1,000 | 0,999 | 0,998 | 0,889 | 0,810 | 39 |
| **Chicago** | 0,719 | 0,778 | 0,596 | 0,781 | 0,766 | 0,863 | 0,870 | 0,369 | 0,870 | 0,941 | 0,998 | 1,000 | 0,999 | 0,999 | 0,911 | 0,831 | 30 |
| **Berlin** | 0,710 | 0,730 | 0,672 | 0,934 | 0,888 | 0,785 | 0,899 | 0,360 | 0,924 | 0,949 | 0,998 | 0,999 | 0,999 | 0,999 | 0,955 | 0,853 | 13 |
| **Taipei** | 0,712 | 0,688 | 0,549 | 0,860 | 0,826 | 0,755 | 0,876 | 0,352 | 1,000 | 1,000 | 0,999 | 0,998 | 0,999 | 0,999 | 0,958 | 0,838 | 26 |
| **Brussels** | 0,672 | 0,700 | 0,602 | 0,964 | 0,802 | 0,792 | 0,865 | 0,359 | 0,897 | 0,965 | 0,998 | 1,000 | 0,999 | 0,998 | 0,956 | 0,838 | 27 |
| **Vienna** | 0,674 | 0,668 | 0,612 | 0,914 | 0,911 | 0,861 | 1,000 | 0,365 | 0,967 | 0,979 | 0,999 | 0,999 | 1,000 | 1,000 | 0,951 | 0,860 | 9 |
| **Madrid** | 0,671 | 0,668 | 0,677 | 0,949 | 0,845 | 0,825 | 0,899 | 0,355 | 0,958 | 0,982 | 0,999 | 0,999 | 0,999 | 0,999 | 0,961 | 0,852 | 14 |
| **İstanbul** | 0,598 | 0,668 | 0,705 | 0,841 | 0,789 | 0,810 | 0,775 | 0,335 | 0,914 | 0,953 | 0,999 | 0,999 | 0,998 | 0,998 | 0,981 | 0,824 | 36 |
| **Barcelona** | 0,666 | 0,667 | 0,652 | 0,969 | 0,810 | 0,825 | 0,857 | 0,351 | 0,908 | 0,975 | 0,999 | 0,999 | 1,000 | 0,998 | 0,989 | 0,844 | 20 |
| **Bangkok** | 0,655 | 0,645 | 0,622 | 0,852 | 0,734 | 0,720 | 0,743 | 0,335 | 0,931 | 0,974 | 0,999 | 0,998 | 0,998 | 0,998 | 0,893 | 0,806 | 41 |
| **Milan** | 0,649 | 0,656 | 0,609 | 0,942 | 0,813 | 0,820 | 0,804 | 0,339 | 0,894 | 0,935 | 0,999 | 1,000 | 0,997 | 0,999 | 1,000 | 0,830 | 31 |
| **Moscow** | 0,609 | 0,693 | 0,672 | 0,859 | 0,756 | 0,810 | 0,795 | 0,345 | 0,940 | 0,942 | 0,999 | 0,999 | 0,998 | 0,998 | 0,887 | 0,820 | 37 |
| **Mexico City** | 0,569 | 0,642 | 0,654 | 0,784 | 0,754 | 0,737 | 0,753 | 0,338 | 0,865 | 0,942 | 0,999 | 0,999 | 0,998 | 0,997 | 0,980 | 0,801 | 42 |
| **Sao Paulo** | 0,590 | 0,651 | 0,644 | 0,869 | 0,823 | 0,714 | 0,735 | 0,334 | 0,861 | 0,925 | 0,999 | 0,999 | 0,998 | 0,998 | 0,999 | 0,809 | 40 |
| **Buenos Aires** | 0,567 | 0,634 | 0,660 | 0,907 | 0,787 | 0,697 | 0,778 | 0,337 | 0,877 | 0,952 | 0,999 | 0,998 | 0,998 | 0,999 | 0,997 | 0,812 | 38 |
| **Dublin** | 0,794 | 0,663 | 0,561 | 0,883 | 0,819 | 0,752 | 0,857 | 0,354 | 0,903 | 0,908 | 0,998 | 1,000 | 0,999 | 0,999 | 0,962 | 0,830 | 32 |
| **Helsinki** | 0,734 | 0,667 | 0,532 | 0,921 | 0,921 | 0,781 | 0,941 | 0,354 | 0,971 | 0,975 | 0,998 | 0,999 | 1,000 | 1,000 | 0,903 | 0,846 | 18 |
| **Melbourne** | 0,740 | 0,729 | 0,615 | 0,910 | 0,903 | 0,797 | 0,939 | 0,361 | 0,922 | 0,972 | 0,998 | 1,000 | 0,999 | 1,000 | 0,985 | 0,858 | 10 |
| **Tel Aviv** | 0,689 | 0,661 | 0,576 | 0,835 | 0,770 | 0,709 | 0,865 | 0,349 | 0,969 | 0,967 | 0,998 | 0,999 | 0,999 | 0,999 | 0,984 | 0,825 | 35 |
| **Jakarta** | 0,635 | 0,635 | 0,556 | 0,854 | 0,694 | 0,704 | 0,732 | 0,337 | 0,901 | 0,920 | 0,999 | 0,999 | 0,998 | 0,997 | 0,906 | 0,791 | 43 |
| **Johannesburg** | 0,574 | 0,628 | 0,569 | 0,681 | 0,763 | 0,690 | 0,840 | 0,358 | 0,839 | 0,930 | 0,999 | 1,000 | 0,999 | 0,998 | 0,977 | 0,790 | 44 |
| **Mumbai** | 0,577 | 0,630 | 0,556 | 0,760 | 0,684 | 0,684 | 0,731 | 0,341 | 0,920 | 0,942 | 0,999 | 0,998 | 0,998 | 0,997 | 0,924 | 0,783 | 46 |
| **Cairo** | 0,557 | 0,636 | 0,577 | 0,822 | 0,689 | 0,722 | 0,743 | 0,333 | 0,908 | 0,893 | 1,000 | 0,999 | 0,998 | 0,997 | 0,969 | 0,790 | 45 |

When the evaluation criteria are of equal importance, the global city with the highest performance is London. The following global cities are Frankfurt, New York, Tokyo and Paris, respectively. The global city with the lowest performance is Mumbai.

**Table 12.** Results Obtained by Integrating the Criterion Weights Obtained as a Result of the CRITIC Method

| Cities | EC | RD | CI | LI | EN | AC | QI | PI | SI | HI | CL | PR | TI | PO | CM | $\Gamma_{0i}$ | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Newyork | 1,000 | 1,000 | 0,802 | 0,812 | 0,809 | 0,928 | 0,844 | 0,360 | 0,910 | 0,934 | 0,998 | 0,999 | 0,999 | 0,998 | 0,945 | 0,908 | 2 |
| London | 0,900 | 0,929 | 1,000 | 0,932 | 0,883 | 0,872 | 0,834 | 0,356 | 0,898 | 0,955 | 0,998 | 0,999 | 0,999 | 0,998 | 0,968 | 0,919 | 1 |
| Tokyo | 0,829 | 0,847 | 0,728 | 0,919 | 0,857 | 0,847 | 0,908 | 0,357 | 0,973 | 0,981 | 0,998 | 0,999 | 0,999 | 0,999 | 0,960 | 0,898 | 3 |
| Beijing | 0,843 | 0,752 | 0,609 | 0,794 | 0,759 | 0,804 | 0,744 | 0,347 | 0,963 | 0,949 | 1,000 | 0,997 | 0,999 | 0,998 | 0,891 | 0,848 | 34 |
| HongKong | 0,708 | 0,762 | 0,601 | 0,844 | 0,818 | 0,784 | 0,778 | 0,349 | 0,982 | 0,943 | 0,998 | 0,997 | 0,999 | 0,998 | 0,956 | 0,855 | 29 |
| Zurich | 0,846 | 0,687 | 0,543 | 0,871 | 0,905 | 0,801 | 0,988 | 0,369 | 0,991 | 0,965 | 0,997 | 0,999 | 0,999 | 1,000 | 0,950 | 0,877 | 7 |
| SanFrancisco | 0,808 | 0,793 | 0,585 | 0,805 | 0,772 | 0,751 | 0,853 | 0,362 | 0,882 | 0,938 | 0,998 | 1,000 | 0,998 | 0,999 | 0,994 | 0,857 | 25 |
| Sydney | 0,745 | 0,737 | 0,594 | 0,890 | 0,916 | 0,749 | 0,945 | 0,364 | 0,948 | 0,973 | 0,998 | 0,999 | 0,999 | 0,999 | 0,993 | 0,875 | 11 |
| Singapore | 0,818 | 0,756 | 0,659 | 0,867 | 0,861 | 0,827 | 0,883 | 0,359 | 0,960 | 0,957 | 0,998 | 0,999 | 0,999 | 0,999 | 0,891 | 0,872 | 12 |
| Toronto | 0,746 | 0,701 | 0,584 | 0,918 | 0,840 | 0,771 | 0,873 | 0,357 | 0,927 | 0,969 | 0,998 | 0,999 | 0,999 | 0,999 | 0,909 | 0,856 | 28 |
| Stockholm | 0,741 | 0,681 | 0,574 | 0,910 | 1,000 | 0,750 | 0,904 | 0,358 | 0,917 | 0,945 | 0,998 | 0,999 | 0,999 | 1,000 | 0,920 | 0,861 | 20 |
| Los Angeles | 0,735 | 0,869 | 0,603 | 0,810 | 0,785 | 0,772 | 0,845 | 0,367 | 0,902 | 0,935 | 0,998 | 1,000 | 0,997 | 0,998 | 0,988 | 0,862 | 19 |
| Amsterdam | 0,769 | 0,708 | 0,638 | 0,936 | 0,831 | 0,951 | 0,954 | 0,361 | 0,953 | 0,960 | 0,998 | 0,999 | 1,000 | 0,999 | 0,966 | 0,886 | 6 |
| Vancouver | 0,731 | 0,679 | 0,551 | 0,850 | 0,897 | 0,719 | 0,926 | 0,358 | 0,933 | 0,965 | 0,998 | 0,999 | 0,999 | 1,000 | 0,976 | 0,858 | 24 |
| Seoul | 0,750 | 0,817 | 0,640 | 0,837 | 0,856 | 0,811 | 0,825 | 0,353 | 0,973 | 0,989 | 0,998 | 0,998 | 0,999 | 0,998 | 0,917 | 0,869 | 15 |
| Shanghai | 0,779 | 0,741 | 0,602 | 0,773 | 0,776 | 1,000 | 0,754 | 0,346 | 0,957 | 0,938 | 0,999 | 0,997 | 0,998 | 0,998 | 0,956 | 0,861 | 22 |
| Dubai | 0,709 | 0,653 | 0,753 | 0,885 | 0,759 | 0,848 | 0,935 | 0,372 | 0,996 | 0,949 | 0,998 | 1,000 | 0,999 | 0,999 | 0,874 | 0,865 | 16 |
| Geneva | 0,795 | 0,686 | 0,532 | 0,844 | 0,888 | 0,747 | 0,958 | 0,365 | 0,959 | 0,962 | 0,997 | 0,999 | 1,000 | 1,000 | 0,953 | 0,863 | 17 |
| Washington | 0,777 | 0,738 | 0,566 | 0,757 | 0,781 | 0,750 | 0,909 | 0,371 | 0,884 | 0,954 | 0,998 | 1,000 | 0,999 | 0,999 | 0,950 | 0,849 | 33 |
| Paris | 0,758 | 0,767 | 0,768 | 1,000 | 0,807 | 0,940 | 0,817 | 0,352 | 0,891 | 0,979 | 0,998 | 0,999 | 0,999 | 0,998 | 0,969 | 0,887 | 5 |
| Frankfurt | 0,708 | 0,660 | 0,568 | 0,903 | 0,853 | 0,921 | 0,925 | 1,000 | 0,920 | 0,968 | 0,998 | 0,999 | 1,000 | 0,999 | 0,959 | 0,894 | 4 |
| Copanhagen | 0,735 | 0,670 | 0,569 | 0,902 | 0,990 | 0,826 | 0,970 | 0,359 | 0,968 | 0,976 | 0,998 | 1,000 | 1,000 | 1,000 | 0,956 | 0,877 | 8 |
| Boston | 0,734 | 0,826 | 0,556 | 0,784 | 0,813 | 0,771 | 0,918 | 0,365 | 0,934 | 0,966 | 0,998 | 1,000 | 0,998 | 0,999 | 0,925 | 0,859 | 23 |
| Kuala Lumpur | 0,672 | 0,643 | 0,569 | 0,930 | 0,738 | 0,713 | 0,818 | 0,355 | 0,877 | 0,949 | 0,999 | 1,000 | 0,999 | 0,998 | 0,889 | 0,827 | 40 |
| Chicago | 0,719 | 0,778 | 0,596 | 0,781 | 0,766 | 0,863 | 0,870 | 0,369 | 0,870 | 0,941 | 0,998 | 1,000 | 0,999 | 0,999 | 0,911 | 0,850 | 31 |
| Berlin | 0,710 | 0,730 | 0,672 | 0,934 | 0,888 | 0,785 | 0,899 | 0,360 | 0,924 | 0,949 | 0,998 | 0,999 | 0,999 | 0,999 | 0,955 | 0,871 | 13 |
| Taipei | 0,712 | 0,688 | 0,549 | 0,860 | 0,826 | 0,755 | 0,876 | 0,352 | 1,000 | 1,000 | 0,999 | 0,998 | 0,999 | 0,999 | 0,958 | 0,857 | 26 |
| Brussels | 0,672 | 0,700 | 0,602 | 0,964 | 0,802 | 0,792 | 0,865 | 0,359 | 0,897 | 0,965 | 0,998 | 1,000 | 0,999 | 0,998 | 0,956 | 0,856 | 27 |
| Vienna | 0,674 | 0,668 | 0,612 | 0,914 | 0,911 | 0,861 | 1,000 | 0,365 | 0,967 | 0,979 | 0,999 | 0,999 | 1,000 | 1,000 | 0,951 | 0,877 | 9 |
| Madrid | 0,671 | 0,668 | 0,677 | 0,949 | 0,845 | 0,825 | 0,899 | 0,355 | 0,958 | 0,982 | 0,999 | 0,999 | 0,999 | 0,999 | 0,961 | 0,870 | 14 |
| İstanbul | 0,598 | 0,668 | 0,705 | 0,841 | 0,789 | 0,810 | 0,775 | 0,335 | 0,914 | 0,953 | 0,999 | 0,999 | 0,998 | 0,998 | 0,981 | 0,846 | 35 |
| Barcelona | 0,666 | 0,667 | 0,652 | 0,969 | 0,810 | 0,825 | 0,857 | 0,351 | 0,908 | 0,975 | 0,999 | 0,999 | 1,000 | 0,998 | 0,989 | 0,863 | 18 |
| Bangkok | 0,655 | 0,645 | 0,622 | 0,852 | 0,734 | 0,720 | 0,743 | 0,335 | 0,931 | 0,974 | 0,999 | 0,998 | 0,998 | 0,998 | 0,893 | 0,825 | 41 |
| Milan | 0,649 | 0,656 | 0,609 | 0,942 | 0,813 | 0,820 | 0,804 | 0,339 | 0,894 | 0,935 | 0,999 | 1,000 | 0,997 | 0,999 | 1,000 | 0,851 | 30 |
| Moscow | 0,609 | 0,693 | 0,672 | 0,859 | 0,756 | 0,810 | 0,795 | 0,345 | 0,940 | 0,942 | 0,999 | 0,999 | 0,998 | 0,998 | 0,887 | 0,839 | 37 |
| Mexico City | 0,569 | 0,642 | 0,654 | 0,784 | 0,754 | 0,737 | 0,753 | 0,338 | 0,865 | 0,942 | 0,999 | 0,999 | 0,998 | 0,997 | 0,980 | 0,824 | 42 |
| Sao Paulo | 0,590 | 0,651 | 0,644 | 0,869 | 0,823 | 0,714 | 0,735 | 0,334 | 0,861 | 0,925 | 0,999 | 0,999 | 0,998 | 0,998 | 0,999 | 0,831 | 39 |
| Buenos Aires | 0,567 | 0,634 | 0,660 | 0,907 | 0,787 | 0,697 | 0,778 | 0,337 | 0,877 | 0,952 | 0,999 | 0,998 | 0,998 | 0,999 | 0,997 | 0,834 | 38 |
| Dublin | 0,794 | 0,663 | 0,561 | 0,883 | 0,819 | 0,752 | 0,857 | 0,354 | 0,903 | 0,908 | 0,998 | 1,000 | 0,999 | 0,999 | 0,962 | 0,849 | 32 |
| Helsinki | 0,734 | 0,667 | 0,532 | 0,921 | 0,921 | 0,781 | 0,941 | 0,354 | 0,971 | 0,975 | 0,998 | 0,999 | 1,000 | 1,000 | 0,903 | 0,861 | 21 |
| Melbourne | 0,740 | 0,729 | 0,615 | 0,910 | 0,903 | 0,797 | 0,939 | 0,361 | 0,922 | 0,972 | 0,998 | 1,000 | 0,999 | 1,000 | 0,985 | 0,876 | 10 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tel Aviv | 0,689 | 0,661 | 0,576 | 0,835 | 0,770 | 0,709 | 0,865 | 0,349 | 0,969 | 0,967 | 0,998 | 0,999 | 0,999 | 0,999 | 0,984 | 0,846 | 36 |
| Jakarta | 0,635 | 0,635 | 0,556 | 0,854 | 0,694 | 0,704 | 0,732 | 0,337 | 0,901 | 0,920 | 0,999 | 0,999 | 0,998 | 0,997 | 0,906 | 0,812 | 45 |
| Johannesburg | 0,574 | 0,628 | 0,569 | 0,681 | 0,763 | 0,690 | 0,840 | 0,358 | 0,839 | 0,930 | 0,999 | 1,000 | 0,999 | 0,998 | 0,977 | 0,813 | 44 |
| Mumbai | 0,577 | 0,630 | 0,556 | 0,760 | 0,684 | 0,684 | 0,731 | 0,341 | 0,920 | 0,942 | 0,999 | 0,998 | 0,998 | 0,997 | 0,924 | 0,805 | 46 |
| Cairo | 0,557 | 0,636 | 0,577 | 0,822 | 0,689 | 0,722 | 0,743 | 0,333 | 0,908 | 0,893 | 1,000 | 0,999 | 0,998 | 0,997 | 0,969 | 0,814 | 43 |

When the results obtained by incorporating the criteria weights obtained from the CRITIC method into the Gray Relational Analysis Method are analyzed; it is determined that the global city with the highest performance is London. The other cities with the highest performance are New York, Tokyo, Frankfurt and Paris, respectively. The global city with the lowest ranking in terms of performance is Mumbai.

## SONUÇ ve ÖNERİLER

For the sustained growth of countries around the world, the role of cities is important and growing. Therefore, the purpose of this study is to rank the performance of global cities, which have become important for the growth of countries, in terms of GPCI criteria and quality of life indicators. The study is based on the GPCI criteria of Economy, Research and Development, Cultural Interaction, Livability, Environment and Accessibility and quality of life indicators such as Quality of Index, Purchasing Power Index, Safety Index, Health Care Index, Cost of Living Index, Property Price to Income Ratio, Traffic Commute Time Index, Pollution Index and Climate Index of 46 cities in the GPCI in 2022. The weights of these criteria are determined by the CRITIC method, which is a multi-criteria decision-making method, and the ranking among global cities is determined by the GRA method.

Considering the empirical findings of the study, according to the CRITIC method, the most important criterion is CM (Climate index) and the least important criterion is PI (Purchasing power index). According to the findings of the GRA method, London ranks first, Frankfurt second and New York third in 2022. According to the sample taken as basis in the study, the last ranked global city in 2022 is Mumbai.

Within the framework of these findings, Giffinger et al. (2010) offer some recommendations for investors and policymakers. For example, as a result of global city rankings, policymakers can identify the strengths and weaknesses of these cities and make strategic plans for the development and future goals of the city. Based on these findings, policymakers can make decisions to improve or further enhance the image of the city. At the same time, guided by the findings of the study, investors can determine the location of the establishment and create marketing strategies. Finally, an in-depth analysis of cities in terms of Economy, Research and Development, Cultural Interaction, Livability, Environment, Accessibility, Quality of Index, Purchasing Power Index, Safety Index, Health Care Index, Cost of Living Index, Property Price to Income Ratio, Traffic Commucate Time Index, Pollution Index and Climate Index criteria cannot sustain overall competitiveness and needs to be further developed by policy makers. As Ichikawa et al. (2017) stated in their study; The global economy is supported by urban centers that act globally around the world, and therefore competitiveness is recommended for policymakers to measure through economic indicators that attract investments and companies to large cities.

The study has some limitations. First, while this study is based only on data from 2022, the sample period can be increased in future studies. Second, while this study ranks the performance of global cities according to GPCI criteria and quality of life criteria, future studies can be based on different criteria. Finally, while the weights of the performance criteria are determined according to the CRITIC method and the ranking is determined according to the Gray Relational Analysis method in this study, different multi-criteria decision-making methods such as ENTROPI and TOPSIS can be applied in future studies.

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