European Cities in Global Clusters: A 2-Sided View of Environmental and Economic Differences

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ABSTRACT

In contemporary times, the economy and sustainability are deeply linked, serving as the foundational pillars that support the development and prosperity of settlements around the world. This paper explores their interdependence by investigating the formation and differentiation of global city clusters based on the Global Power City Index (GPCI) 2024 as a key analytical framework due to its multidimensional nature. Using Two-Steps cluster analysis and the Mann-Whitney U test, the study examines two perspectives, one centred on economic factors and the second focused on environmental factors. The results highlight the essential function of various GPCI pillars in defining urban groups, revealing the role of economic strength as a decisive differentiator for environmentally-defined clusters, while accessibility played the role of differentiator considering the economic perspective. The analysis continues by profiling the European cities landscape, with each city possessing unique features and with no single universal leader emerging. The findings provide valuable insights for city governments, enabling them to understand their position worldwide and consolidate their urban development strategies. Furthermore, it aids in developing public policies to increase investor appeal and assists tourism organisations in designing personalised campaigns.

KEYWORDS: *economic factors, environmental factors, European cities profile, global city clusters, GPCI index.*

JEL CLASSIFICATION: *R11, Q56, A13.*

1. INTRODUCTION

Sustainability is a major concern for organisations, government institutions, investors, and overall the entire society, representing the harmonisation of economic progress, social inclusion, and environmental protection (Pieroni et al., 2019). In these circumstances, economic growth designates a contemporary central objective of states as a result of the ability to attract resources for poverty reduction and survival in the face of demographic constraints (Walker et al., 2021). The interest in studying European cities is on the rise as they are increasingly recognised as centres of urbanism, with an impact on the economic and environmental directions of the continent and at a global level. The academic literature contains a multitude of papers that address the clustering of these European cities in the landscape of sustainable development and green policies (Akande et al., 2019; Cantuarias-Villessuzanne et al., 2021; Zinchenko et al., 2025), or integrate them into specific discussions within continental and global economic frameworks (Dijkstra et al., 2012; Ketels & Protsiv 2020). At the same time, Romania actively participates in the study of European cities behaviour in digital (Popa et al., 2025), sustainable (Serbanica & Constantin, 2017) and urban (Bănică & Muntele, 2017) contexts.

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In the global landscape, there are several organisations and research centres that develop various indexes to determine the economic and sustainable position of the most powerful cities, such as the Global Power City Index (GPCI) developed by The Mori Memorial Foundation's Institute for Urban Strategies in Japan (2024), The Arcadis Sustainable Cities Index (Arcadis, 2024), or World's Best Cities (Resonance Consultancy, 2024), all of which offering valuable perspectives. To ensure a comprehensive analysis of the economic and environmental context of major European cities such as London, Dublin, Berlin, Paris, Madrid, and others, the present study will be based on the inclusion of the GPCI index (Mori Memorial Foundation, 2024), due to its multidimensional perspective based on six pillars, namely economy, research and development, environment, livability, accessibility, and cultural interaction, which supports a nuanced understanding of the sources of power of major cities.

While many papers have addressed the topic of global and European cities clustering in the context of sustainable development and economic structure, it is noted the absence of an integrated analysis of all the specific factors of the GPCI index in a two-dimensional analysis, with an emphasis on the interaction of economic and environmental elements, which would lead to the characterisation of the positions of the most powerful European cities in the world picture. Therefore, the present paper seeks to discover how the specific factors of the GPCI index contribute to the formation and differentiation of clusters of world-renowned cities included in the study. At the same time, it aims to identify the key attributes that differentiate this mode of urban grouping, as well as to characterise the profiles of the European cities that are part of the analysis process through the specific GPCI economic and environmental factors. Hence, it is intended to answer the following research questions:

RQ1. How do the GPCI factors shape the formation and differentiation of global city clusters?
RQ2. What are the primary differentiating factors of the city clusters?
RQ3. How can the profiles of European cities be characterised through the lens of their economic and environmental factors?

Given the specificity of the GPCI index, to analyse how urban centres are positioned on a global scale, the factors within the indicator were grouped into two representative categories, namely: (1) economic factors - economy and research and development, and (2) environmental factors - environment, livability, accessibility, and cultural interaction. Likewise, the novelty of this paper stems from its distinct methodological approach, which covers the gap in academic literature regarding the integrated analysis of all GPCI pillars, focusing on how the interaction between economic and sustainable factors relates to the formation of clusters of major cities in European territory.

2. CONCEPTUAL BACKGROUND

In the early 2000s, Taylor (2001) conceived a paper that serves as the theoretical and methodological basis for the Globalisation and World Cities (GaWC) initiative (2025a). The group, which he founded, periodically publishes classifications of cities worldwide and investigates the critical intersection of their networks. According to the author (Taylor, 2001), the most important cities in the world form an entire network that extends across three layers: (1) cities that function as nodes; (2) the global economy, which is the supranodal layer; and (3) leading companies in the production sector that function at a subnodal level.

The latest classification published by the GaWC group (2024) is associated with the previous year and evaluates cities based on their importance as nodes in a global network, with data coming from 175 firms that provide advanced producer services. Thus, *The World According to GaWC* ranking reveals several categories of cities, such as (GaWC, 2025b): (1) Alpha++ cities, with London and New York maintaining their position in this category throughout all analyses due to the intensity of their level of integration; (2) Alpha+ cities, which are characterised by strong global connectivity, responding to the needs for top-tier services in the Asia-Pacific area; (3) Alpha and Alpha- cities, whose importance is given by the connection they ensure between major economic regions; (4) Beta cities, which serve to connect their state to the world economy; (5) Gamma cities, which link smaller states to the global economy or which do not provide top-tier production services, and (6) cities that have sufficient services not to be dependent on the powerful ones, but not being the most relevant in the world.

At the same time, the modern perspective on global cities that complements the previous one was introduced by Saskia Sassen (2005), who developed a series of seven defining hypotheses associated with the concept, respectively:

1. The trend of globalisation determines the increasing importance of company headquarters, as their expansion is accompanied by the need for stronger management and more efficient coordination of organisational operations which are becoming more complex.
2. As the complexity of operations intensifies, companies prefer to outsource them to specialised organisations rather than producing them in-house.
3. Specialised service firms tend to group in certain cities, which become true knowledge hubs as a result of agglomeration economies, due to the level of complexity and uncertainty of the markets in which they operate. Thus, organisational presence in such urban frameworks supports the competitiveness and efficiency of responses to customer needs.
4. An effect of outsourcing is that company headquarters gain more freedom in choosing their location, not being constrained to be located in a crowded city for the purpose of having access to the specialised services they need. Therefore, a global city does not reflect its importance in the headquarters it hosts, but in the quality and concentration of the specialised service sector, and in developed countries, companies can easily opt to settle outside major business hubs, having access to the necessary services.
5. Specialised firms had to no longer operate only locally, but to develop a global network with various partners to meet the needs of global companies. In this manner, transnational urban networks were born, with cities gaining the role of nodes within them that link the majority of economic transactions.
6. The global cities that have emerged, which benefit from specialised service firms and top professionals who, being very valuable, are rewarded with considerable incomes, lead to an intensification of inequality since personnel from other sectors do not receive the same advantages. This results in increased social and economic polarisation in these cities.
7. The paradox of global cities arises, which on one hand supports powerful corporations with high levels of profit, and on the other hand an informal economy characterised by high living costs and economic pressures as a result of social inequality in which people try to survive.

The study conducted by Turok and Mykhnenko (2007) traces the trajectory of European cities over time, revealing a shift from the old perspective that viewed them as places facing economic and social problems or as remnants of an industrial era to a new perspective that

embodies them as dynamic settlements, engines of prosperity, places where innovation is born and productivity reaches superior levels, and where social infrastructure and professional opportunities constitute fundamental elements for urban competitiveness. Equally, starting with the '90s, The governments of the states in the European sphere chose to concentrate their resources represented by financial investments and political support in the cities considered the most competitive and integrated in the global space, resulting in both consequences such as deepening inequality from a social and spatial perspective, as well as benefits such as the revitalisation of many cities in the European area (Cucca & Ranci, 2022).

Over time, the concept that is so often discussed today, namely *smart cities*, gradually emerged, a subject intensified with the investments made by the European Commission in support projects for them (Correia et al., 2022). Numerous authors tried to define this concept through representative dimensions. According to Nam and Pardo (2011), smart cities represent the circumstantial interactions that occur between managerial, technological, political, and organisational innovation. Other authors like Giffinger et al. (2007) consider that such a city is defined by economy, people, government, mobility, environment, and smart living, or, according to Barrionuevo et al. (2012) by the economic power given by GDP, cross-border transactions and foreign investments, human capabilities such as talent, creativity, education level, the social part with traditions, customs, ethnic and religious elements, the environmental area regarding policies in the energy, water and waste spheres, and institutional practices, especially civic engagement, governance, elections. We also can observe the importance of European urban centres in the global landscape, especially since cities like London, Paris, Milan, Frankfurt, Madrid, and Amsterdam are classified in the Alpha categories, according to the GaWC report (2024).

Taking into consideration all these mentioned dimensions, an extremely relevant approach in the study of contemporary urban dynamics at a global level is the GPCI index (Mori Memorial Foundation, 2024), which offers a broad vision, measuring the magnetism of the world's cities through their power to attract people, capital, and businesses. It is based on six main categories that are subsequently divided into a series of subcategories, after which these subcategories include other elements. Given the scope of the index, the present paper will focus on the main categories and subcategories. Hence, the GPCI index covers (Mori Memorial Foundation, 2024): (1) economy including market size and attractiveness, economic vitality, human capital, business environment, and ease of doing business; (2) research and development based on academic resources, research, and innovation environment; (3) cultural interaction including trend-setting potential, tourism resources, cultural and visitor facilities, and international interaction; (4) livability including the working environment, cost of living, safety and security, well-being, and ease of living; (5) environment with sustainability, comfort, and quality of atmospheric air and urban environment and (6) accessibility given by the international network, air transport capacity, intra-city transport, and transport costs.

3. ANALYSIS PATTERN

The purpose of this paper is to explore the manner in which the factors that make up the GPCI lead to the formation and differentiation of clusters of cities worldwide, while identifying the key attributes that differentiate this mode of urban grouping. The global cities included in the analysis are the 48 mentioned in the GPCI 2024 report (Mori Memorial Foundation, 2024), specifically: Cairo, Johannesburg (Africa), Bangkok, Beijing, Dubai, Fukuoka, Hong Kong, Jakarta, Kuala Lumpur, Mumbai, Osaka, Seoul, Shanghai, Singapore, Taipei, Tel Aviv, Tokyo (Asia), Melbourne, Sydney (Australia and Oceania), Amsterdam, Barcelona, Berlin, Brussels,

Copenhagen, Dublin, Frankfurt, Geneva, Helsinki, Istanbul, London, Madrid, Milan, Moscow, Paris, Stockholm, Vienna, Zurich (Europe), Boston, Chicago, Los Angeles, Mexico City, New York, San Francisco, Toronto, Vancouver, Washington DC (North America), Buenos Aires, São Paulo (South America). Simultaneously, it is intended to characterise the profiles of the European cities that take part in the analysis process through economic and environmental factors. The data used in the analysis process comes from the Global Power City Index report for the year 2024 (Mori Memorial Foundation, 2024).

The analysis pattern proposed (Figure 1) was carried out in three sequentially approached stages: (1) cluster analysis, according to the Two-Steps algorithm; (2) the Mann-Whitney U test; and (3) profiling European cities through the lens of economic and environmental characteristics. A cluster analysis represents a statistical type of analysis that facilitates the identification of homogeneous groups called clusters (Popa et al., 2025; Tkaczynski, 2017), in our case the groups being formed by cities. This includes, as the algorithm is named, two steps, specifically (Tkaczynski, 2017): (1) *preclustering* – which deals with reducing the size of the matrix that includes the distances found in the potential pairs of cases and (2) *clustering* – the hierarchical grouping of the clusters, which contributes to finding the range of solutions that will materialise in the optimal number of clusters associated with the data set. Subsequently, the Mann-Whitney U test, a non-parametric test (chosen given the size of the groups studied), was used, to compares two independent groups aiming to highlight the significant differences between them (MacFarland & Yates, 2016). The IBM SPSS Statistics software, version 26.0 (2019), was used for performing statistical tests.

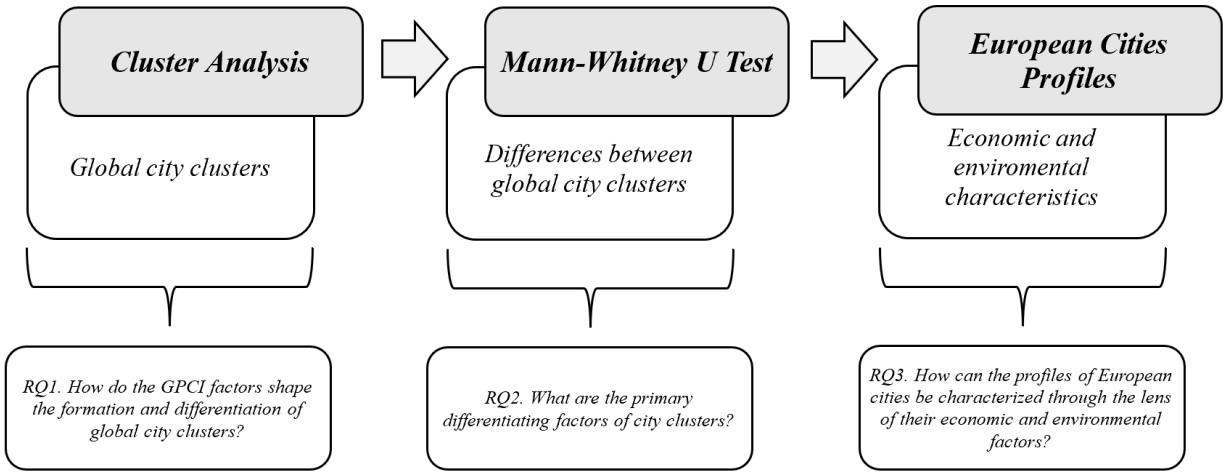

Figure 1. Research process steps
Source: author's conception

A dual implementation of the Two-Steps cluster analysis and the Mann-Whitney U test was conducted to ensure a view from two perspectives, initially based on economic factors and, subsequently, based on environmental factors. Table 1 presents the cluster analysis framework from both perspectives.

Table 1. Cluster analysis framework indicators

Indicators		Economic factors perspective	Environmental factors perspective
Algorithm		*Two-Steps*	
Inputs		2	4
Clusters		2	2
Cluster quality (Average silhouette)		0.60	0.50
Size of smallest cluster		22 (45.8%)	18 (37.5%)
Size of largest cluster		26 (54.2%)	30 (62.5%)
Ratio of sizes		1.18	1.67
Predictor importance	Economy	1.00	-
	Research and Development	0.63	-
	Environment	-	1.00
	Livability	-	0.79
	Accessibility	-	0.72
	Cultural Interaction	-	0.11

Source: author using IBM SPSS Statistics (2019)

In the first perspective, based on economic factors, two inputs were used: economy (which participated in the formation of the groups in the maximum proportion) and research and development (which participated in the formation of the groups in the proportion of 63%), resulting two approximately equal clusters (ratio of sizes = 1.18), the small one including 22 cities (45.8%), and the large one, 26 cities (54.2%). Regarding the clusters quality, it is evaluated using an average silhouette score, which, in the present case, reaches a value of 0.60 on a scale from -1 to +1. According to the authors Shahapure and Nicholas (2020), a silhouette score that tends towards the value +1 indicates that each data point is found in the correct cluster and a proper separation of the clusters was achieved.

From the second perspective, the one associated with environmental factors, there were four input factors, respectively environment which contributed to the solution in the maximum percentage, livability which had a contribution of 79%, approximately that of accessibility (72%). Cultural interaction participated in the composition of the city groups to the smallest extent, 11%. The solution, which is distinguished by an average silhouette score of 0.50 – indicating the quality of the resulting clusters – consists of two groups of different sizes (ratio of sizes = 1.67), one with 18 cities (37.5%) and the second one with 30 cities (62.5%).

4. RESULTS ANALYSIS

4.1 Economic factors perspective

Depending on the economic factors, Table 2 presents the grouping of the cities participating in the analysis into the two resulting clusters, organised according to the continents they belong to. It is notable that cluster 1 (26 cities) includes the majority of the large cities on the North American continent such as New York, San Francisco, Washington DC, Toronto, Boston, Los Angeles, and Chicago, as well as European cities like London, Dublin, Zurich, Geneva, Copenhagen, Amsterdam, Paris, Stockholm and Berlin. Asia makes its presence felt in the first cluster through its world-renowned cities Singapore, Beijing, Tokyo, Shanghai, Seoul, Taipei and Hong Kong. Likewise, Dubai is the only urban settlement in the Middle East that participates in the formation of this cluster. At the same time, Australian cities, such as Sydney and Melbourne, complete the metropolitan landscape in this case.

Table 2. Grouping clusters according to continents

Continent	Cluster 1	Cluster 2
North America	New York, San Francisco, Washington DC, Toronto, Boston, Los Angeles, Chicago	Vancouver, Mexico City
Europe	London, Dublin, Zurich, Geneva, Copenhagen, Amsterdam, Paris, Stockholm, Berlin	Helsinki, Frankfurt, Vienna, Madrid, Brussels, Barcelona, Milan, Moscow, Istanbul
Asia	Singapore, Beijing, Tokyo, Shanghai, Seoul, Taipei, Hong Kong	Tel Aviv, Kuala Lumpur, Bangkok, Osaka, Jakarta, Fukuoka
Middle East	Dubai	Mumbai
Oceania	Sydney (Australia), Melbourne (Australia)	-
South America	-	Sao Paulo, Buenos Aires
Africa	-	Johannesburg, Cairo

Source: author using IBM SPSS Statistics (2019)

The second cluster (22 cities) includes a smaller number of cities from North America (Vancouver and Mexico City), but a significant number of cities from the Europe area (Helsinki, Frankfurt, Vienna, Madrid, Brussels, Barcelona, Milan, Moscow and Istanbul). At the same time, Mumbai from the Eastern sphere, Paulo and Buenos Aires from South America, and Johannesburg and Cairo from Africa contribute to the formation of the cluster. Overall, a geographical distribution with variations of cities between the two clusters is observed, with a preponderance of North American cities in the first group and an exclusive presence of African and South American areas in the second group.

Given that economic factors participated in the construction of the clusters, the differences between groups were tested according to environmental factors, to observe the manner in which they contribute to the distinction between the clusters of cities formed. Thus, Table 3 presents the results of the Mann-Whitney U test.

Table 3. Differences between clusters

Variables	Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	Asymptotic
Cultural Interaction	Cluster 1	26	25.50	663.00	260.000	-0.538	0.591
	Cluster 2	22	23.32	513.00			
Livability	Cluster 1	26	24.56	638.50	284.500	-0.031	0.975
	Cluster 2	22	24.43	537.50			
Environment	Cluster 1	26	27.87	724.50	198.500	-1.811	0.070
	Cluster 2	22	20.52	451.50			
Accessibility	Cluster 1	26	28.27	735.00	188.000	-2.028	0.043
	Cluster 2	22	20.05	441.00			

Source: author using IBM SPSS Statistics (2019)

With regard to cultural interaction ($U = 260.000$; $Z = -0.538$; $p > 0.05$) and livability ($U = 284.500$; $Z = -0.031$; $p > 0.05$), no significant difference is observed between the two groups participating. Compared to these, environment ($U = 198.500$; $Z = 1.811$; $p > 0.05$) is in a much more favourable situation which, although it does not confirm its statistical significance, has a tendency to differentiate the two clusters, the first of these ($M_{RE1} = 27.87$) excelling to a greater extent in this factor unlike the second ($M_{RE2} = 20.52$). The only statistically confirmed clear difference is that related to accessibility ($U = 188.000$; $Z = -$

2.028; $p < 0.05$) which separates the first cluster ($M_{RA1} = 28.27$) from the second ($M_{RA2} = 20.05$) through a significantly better accessibility score.

4.2 Environmental factors perspective

The second approach, corresponding to environmental factors, reveals a grouping of the studied cities with certain differences compared to the previous one. This time, cluster 1 (30 cities) no longer highlights such a strong presence of North American cities (including only New York, Toronto and Vancouver), but it strongly enhances the contribution of most European cities through London, Dublin, Zurich, Geneva, Copenhagen, Amsterdam, Paris, Stockholm, Helsinki, Frankfurt, Berlin, Vienna, Madrid, Brussels, Barcelona, Milan and Istanbul. Asia continues its participation with urban spaces such as Singapore, Tokyo, Shanghai, Seoul, Taipei, Hong Kong, and Fukuoka. At the same time, Dubai remains in the first cluster alongside Sydney and Melbourne, as in the previous case.

Table 4. Grouping clusters according to continents (2)

Continent	Cluster 1	Cluster 2
North America	New York, Toronto, Vancouver	San Francisco, Washington DC, Boston, Los Angeles, Chicago, Mexico City
Europe	London, Dublin, Zurich, Geneva, Copenhagen, Amsterdam, Paris, Stockholm, Helsinki, Frankfurt, Berlin, Vienna, Madrid, Brussels, Barcelona, Milan, Istanbul	Moscow
Asia	Singapore, Tokyo, Shanghai, Seoul, Taipei, Hong Kong, Fukuoka	Beijing, Tel Aviv, Kuala Lumpur, Bangkok, Osaka, Jakarta
Middle East	Dubai	Mumbai
Oceania	Sydney (Australia), Melbourne (Australia)	-
South America	-	Sao Paulo, Buenos Aires
Africa	-	Johannesburg, Cairo

Source: author using IBM SPSS Statistics (2019)

On the other hand, the composition of environmental cluster 2 (18 cities) includes the large cities of North America (San Francisco, Washington DC, Boston, Los Angeles, Chicago, and Mexico City), Moscow as the only city on the European continent, Beijing, Tel Aviv, Kuala Lumpur, Bangkok, Osaka, and Jakarta from the Asian side, and Mumbai from the Eastern sphere. Sao Paulo, Buenos Aires (South America), and Johannesburg and Cairo (Africa) maintain their position as participants of the first cluster. In general, a geographical polarisation of the cities is observed according to the environmental factors, with a concentration on the European area in the first cluster and on the American one in the second. Table 5 illustrates the results obtained by performing the Mann-Whitney U test from the perspective of economic factors.

Table 5. Differences between clusters

Variables	Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	Asymptotic
Economy	Cluster 1	30	29.02	870.50	134.500	-2.886	0.004
	Cluster 2	18	16.97	305.50			
Research and Development	Cluster 1	30	27.23	817.00	188.000	-1.746	0.081
	Cluster 2	18	19.94	359.00			

Source: author using IBM SPSS Statistics (2019)

Economy proves to be an impactful GPCI factor in the process of differentiating city groups ($U = 134{,}500$; $Z = -2.886$; $p < 0.01$), with the first cluster ($M_{RE1} = 29.02$) having a significantly higher average rank and demonstrating a considerably stronger economic performance compared to the second-ranked cluster ($M_{RE2} = 29.02$). With reference to research and development, despite the fact that no significant distinction is determined ($U = 188{,}000$; $Z = -1.746$; $p < 0.05$), there is a tendency to highlight a superior performance of cluster 1 ($M_{RRD1} = 27.23$) regarding this factor compared to the second resulting group ($M_{RRD2} = 19.94$).

4.3 European cities profiles

This section focuses on the third research question, which concerns the profile of European cities. Table 6 presents the scores of the 18 European cities that take part in the annual calculation of the GPCI index, offering an insight on their performance in relation to the six categories of factors, namely economy, research and development, environment, livability, accessibility and cultural interaction. As the background of the cells darkens, a higher score for the factors under analysis is recorded by the cities participating in the study.

Table 6. GPCI factors scores associated with European cities

City	Economy	Research and Development	Environment	Livability	Accessibility	Cultural Interaction
Amsterdam	243.7	58.7	178.9	362.4	196.7	144.9
Barcelona	175.7	35.3	156.0	382.4	174.4	168.2
Berlin	196.7	78.6	190.3	378.9	151.9	175.2
Brussels	185.0	63.0	156.1	364.4	148.4	121.8
Copenhagen	264.9	49.3	223.6	362.4	150.2	77.9
Dublin	299.1	36.2	175.6	342.9	130.5	79.7
Frankfurt	203.0	30.4	186.8	364.1	203.2	71.6
Geneva	268.9	55.4	202.3	342.6	105.9	41.8
Helsinki	222.8	35.2	206.7	367.6	133.1	45.5
Istanbul	133.4	44.8	142.7	310.5	183.4	190.8
London	306.4	187.1	186.3	370.9	249.4	355.3
Madrid	185.3	36.3	184.9	387.8	172.1	186.9
Milan	173.8	34.1	158.5	369.4	153.3	119.7
Moscow	146.5	65.8	140.4	335.5	124.9	188.4
Paris	243.5	115.1	151.4	404.8	210.9	297.3
Stockholm	239.8	54.1	221.0	363.0	144.0	89.5
Vienna	189.3	43.6	210.7	362.1	167.6	137.9
Zurich	290.3	55.9	205.6	360.3	124.9	46.4

Source: Mori Memorial Foundation (2024)

It is noteworthy that there is a fairly heterogeneous state of city performance, with multiple variations and no single city standing out as a clear leader. Therefore, each city highlights its strengths, made possible by the priorities it has established and the actions it has taken in this regard. Regarding the economy factor, London holds the leading position with a score of 306.4, followed by Dublin (299.1) and Zurich (290.3), while at the opposite pole are Istanbul (133.4) and Moscow (146.5). Concerning the research and development factor, the dominant positions are held by London (187.1), Paris (115.1), and Berlin (78.6), with notable differences between them. Cities such as Helsinki (35.2) and Barcelona (35.3) recorded the lowest values.

Moving to the environmental aspect, the environment factor brings Copenhagen (223.6) and Stockholm (221) to the top of the ranking, while Moscow (140.4) and Istanbul (142.7) at the bottom. For livability, Paris records the highest score (404.8), followed by Madrid (387.8), Berlin (378.9) and London (370.9). The Istanbul city stands out with the most diminished score here (310.5). Accessibility brings London (249.4), Paris (210.9) and Frankfurt (203.2) to the top positions, while cities like Geneva (105.9) and Zurich (124.9) are at the bottom. The last environmental category, cultural interaction, confirms the strongly consolidated positions of London (355.3) and Paris (297.3), which are followed by Istanbul (190.8) and Moscow (188.4). Geneva (41.8) and Helsinki (45.5) stand out with the lowest values of this factor.

Furthermore, given that the economic perspective led to the most balanced solution of the two that were generated, it was decided that the results of this solution should be taken into account in the process of defining the profiles of the European cities participating in the study. Table 7 presents the average scores of the European cities according to the GPCI factors in a comparative manner.

Table 7. Average scores of European cities according to GPCI factors

GPCI Factors	Cluster 1	Cluster 2
Economy	261.48	179.42
Research and Development	76.71	43.17
Environment	192.78	171.42
Livability	365.36	360.42
Accessibility	162.71	162.27
Cultural Interaction	145.33	136.76

Source: author's calculation based on GPCI index (Mori Memorial Foundation, 2024)

There is a clear performance difference between the two groups of European cities, with cluster 1 recording higher average scores for each factor analysed. Economy shows the biggest discrepancy, as cluster 1 (261.48) includes the economic pillars of Europe, while cluster 2 (179.42) comprises solid economies, but with a moderate growth rate. The research and development factor achieves the lowest scores on the overall picture, although cluster 1's urban centres (76.71) denote a considerable involvement in research and innovation compared to cluster 2 (43.17). Moving to the environmental perspective, it is observed that the city groups record relatively close scores. The environment factor differentiates the solid sustainable base of cluster 1 (192.78) from the slight need for environmental improvement of cluster 2 (171.42).

We note that, regardless of the cities economic background, the liveability factor reaches the highest levels in both cases, suggesting a high quality of life for both cluster 1 (365.36) and cluster 2 (360.42). Regarding accessibility, cluster 1 has an associated score of 162.71 and cluster 2 is found with an insignificant difference, with 162.27. Last but not least, cultural interaction marks a difference also reduced between the first cluster (145.33) with remarkable cultural hubs and the second one (136.76), which is distinguished by rich and diverse cultural experiences.

5. DISCUSSIONS

Over time, metropolitan regions have resorted to strategic planning to keep up with the changes specific to the transition from an industry-based to a service-based economy, and despite the fact that the objectives associated with sustainable development and environmental protection have gained ground in recent times, economic interests prevail. Therefore, the major challenge

derives from balancing these forces by integrating natural elements in the context of the economic development of cities (Hersperger et al., 2020) and, concurrently, to ensure an effective governance of urban centres to facilitate a more ecological future (Cicea & Marinescu, 2024). The GPCI index (Mori Memorial Foundation, 2024) represents a mark of performance in this regard, managing to address both perspectives in an integrated manner with the help of six fundamental pillars.

This study results bring to the centre of the discussion the importance of the global cities behaviour assessed through the GPCI index. In response to RQ1, the considerable, but not equivalent, contribution of GPCI factors in the formation of global city clusters is noticed. Within the analysis from an economic perspective, both economy and research and development have a major role in shaping city groups, which highlights the importance of the economic infrastructure of urban centres (Hope et al., 2025). At the same time, London, which ranks first in terms of both factors, does nothing more than validate the GaWC model (2024), developed based on data from organisations in the productive sphere, where it is classified in the Alpha++ category.

The analysis based on environmental factors presents more heterogeneous results, with the environment, livability and accessibility factors having major contributions in the formation of city clusters, while cultural interaction participates to a lesser extent, not representing a decisive factor in their definition. Despite this, the study by Clincu and Bănică (2023) presents the role of culture as a catalyst of social interaction in society, a stimulator of economic growth, and a support for environmental protection actions, being decisive for the community and even for governance processes.

Regarding RQ2, the Mann-Whitney U test identified the accessibility factor as the one that differentiates the groups of cities separated according to the economic perspective, highlighting that a strong economic background is closely related to a superior level of accessibility, an aspect confirmed by Taylor (2001) who treats world cities as nodes of a network. As for the groups formed from an environmental standpoint, the economy factor is the one that statistically significantly differentiates them. Considering that cluster 1 has a greater economic power than cluster 2 as a result of the scores obtained, the confirmed link with the environmental elements proves the correlation between urban centres with advanced green practices and more robust economies, which are capable of supporting investments in the field of sustainability (Chen et al., 2025).

RQ3 brought to light the high level of diversity among European cities, no single city being superior to all in the rankings according to the factors considered, but each one representing an authentic combination. We find the category of top economic models such as London, Dublin, and Zurich, which confirms their position as major business centres (Wall, 2009). At the same time, Copenhagen and Stockholm stand out as leaders in the environment category (Czupich et al., 2022), which can also be said of Paris and Madrid regarding livability, that showing the primacy of resource allocation in the sphere of sustainability and social infrastructure for the success of urban development strategies (Jordán & Infante, 2012). There is also the situation of cities with moderate economic levels, like Barcelona and Milan, which excel in area of life quality. This picture is completed by the comparative perspective of the averages of the two European clusters, the first of which mainly includes true economic engines that respond excellently to the criteria of all GPCI factors, validating the idea that economic prosperity and sustainable development are mutually supportive (Giddings et al., 2002).

6. CONCLUSIONS

The present study aims to provide a holistic analysis of all pillars of the GPCI index (Mori Memorial Foundation, 2024), focusing on the dynamics of global cities in the context of the interaction between economic and environmental factors. The analysis enabled the characterisation of how world city clusters are composed, highlighting the manner in which GPCI criteria contribute to their formation, and also outlining the profile of Europe's most powerful cities based on their key attributes.

Theoretical implications. The main theoretical contribution of the paper is the integrated manner in which it treated the analysis of global cities, using the GPCI index. The study recalls the traditional perspectives, which it transposes into a new, contemporary approach, defining the global city of our time through an analytical model that focuses both on the environmental and economic spheres. Simultaneously, the results of the analysis confirm the importance of the GPCI index (Mori Memorial Foundation, 2024) viewed as a multidimensional tool for evaluating the magnetism and competitiveness of urban centres through the comprehensive categories that represent it.

Methodological implications. The methodological approach stands out as a hybrid one, starting with a cluster analysis with the Two-Steps algorithm that identifies global city groups based on economic and environmental GPCI factors. To complete this, the Mann-Whitney U test is used to show the differences between the formed clusters. At the same time, the analysis is notable for its high degree of objectivity, unfolding over two phases, one associated with economic factors and one associated with social factors, this bidimensionality supporting the shaping of a comprehensive and nuanced vision of the behaviour of urban settlements.

Practical implications. The study helps city governments understand their global position and strengthen their urban development strategies. It also supports the creation of public policies that increase attractiveness in the eyes of investors. Additionally, the results are useful for organisations in the tourism sector, which can design personalised campaigns that align GPCI factors with tourists' needs.

Research limitations. The exclusive focus on a single index, namely GPCI, and the consideration of only cities in the European area for economic and social profiling may limit the generalisability of the study's conclusions.

Future research. As future research directions, one could consider analysing the correlation between tourists' needs and the specific GPCI factors of cities in order to build detailed profiles of different visitor categories. Another area of interest deriving from the previous one is the analysis of the emotional profile of European and global cities, based on both economic and environmental factors, as well as on the behaviours of their visitors. Moreover, outlining complex profiles of global cities based on the correlation between several such indices would offer a holistic and nuanced perspective on their competitiveness and relevance within the networks they are part of.

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