SERIE
DE CONFERENCIAS

Check for updates

Categoría: STEM (Science, Technology, Engineering and Mathematics)

REVISIÓN

Multidimensional Framework for Territorial Attractiveness: Crafting Synthetic Indicators for Small Towns in Morocco

Marco multidimensional para el atractivo territorial: elaboración de indicadores sintéticos para ciudades pequeñas en Marruecos

Khaoula Rihab Khalid[1] , Abdeslam Boudhar[2], Sohaib Khalid[3] , Ahmed Elaissaoui[4], Abderrahman Yassine[5]

[1]Research Laboratory in Economics and Management of Organizations (LAREMO), National School of Commerce and Management, Sultan Moulay Slimane University. Béni-Mellal, Morocco.

[2]Research Laboratory in Economics and Management of Organizations (LAREMO), National School of Commerce and Management, Sultan Moulay Slimane University. Béni-Mellal, Morocco.

[3]MASAFEQ Laboratory, National Institute of Statistics and Applied Economics. Rabat, Morocco.

[4]Department of Geography, Dynamics of Spaces and Societies Laboratory (LADES), University Hassan 2 Casablanca (FLSH). Mohammedia, Morocco.

[5]GEAS3D Laboratory, National Institute of Statistics and Applied Economics. Rabat P.O. Box 6217, Morocco.

ABSTRACT

This paper presents a comprehensive, multidimensional approach to evaluating the territorial attractiveness of small Moroccan towns, focusing on four critical dimensions: socio-demographic, economic, spatial dynamics, and quality of life. By leveraging synthetic indicators, the study offers an in-depth analysis of the strengths and weaknesses across various regions, culminating in a ranking derived from a global synthetic index, calculated using the geometric mean of the four examined dimensions.

The findings uncover significant regional disparities, with Casablanca-Settat and Rabat-Salé-Kénitra emerging as the leading regions, underscoring their roles as key economic and administrative centers. In contrast, regions such as Béni Mellal-Khénifra and Drâa-Tafilalet demonstrate weaker performances, indicating the need for targeted interventions to enhance their overall attractiveness.

A key contribution of this work is the introduction, for the first time in Morocco, of a methodological reference framework for measuring the territorial attractiveness of small towns. This innovative approach allows for a nuanced, multidimensional evaluation, offering policymakers a robust foundation to inform and refine their development strategies.

Furthermore, the article underscores the importance of adopting tailored territorial development strategies that address local characteristics, aiming to reduce intra-regional disparities and unlock the potential of smaller towns. In conclusion, this study provides a crucial decision-making tool, offering insights that can guide territorial planning and foster balanced, sustainable development across Morocco's small towns.

Keywords: Territorial Attractiveness; Small Towns; Principal Component Analysis; Morocco.

RESUMEN

Este artículo presenta un enfoque integral y multidimensional para evaluar el atractivo territorial de las pequeñas ciudades marroquíes, centrándose en cuatro dimensiones críticas: sociodemográfica, económica,

inámica espacial y calidad de vida. Al aprovechar indicadores sintéticos, el estudio ofrece un análisis en profundidad de las fortalezas y debilidades de varias regiones, que culmina en una clasificación derivada de un índice sintético global, calculado utilizando la media geométrica de las cuatro dimensiones examinadas. Los hallazgos revelan importantes disparidades regionales, con Casablanca-Settat y Rabat-Salé-Kénitra emergiendo como las regiones líderes, lo que subraya su papel como centros económicos y administrativos clave. En cambio, regiones como Béni Mellal-Khénifra y Drâa-Tafilalet muestran desempeños más débiles, lo que indica la necesidad de intervenciones específicas para mejorar su atractivo general.

Una contribución clave de este trabajo es la introducción, por primera vez en Marruecos, de un marco de referencia metodológico para medir el atractivo territorial de las ciudades pequeñas. Este enfoque innovador permite una evaluación multidimensional y matizada, ofreciendo a los responsables de políticas una base sólida para informar y perfeccionar sus estrategias de desarrollo.

Además, el artículo subraya la importancia de adoptar estrategias de desarrollo territorial adaptadas que aborden las características locales, con el objetivo de reducir las disparidades intrarregionales y liberar el potencial de las ciudades más pequeñas. En conclusión, este estudio proporciona una herramienta crucial para la toma de decisiones, ofreciendo ideas que pueden guiar la planificación territorial y fomentar un desarrollo equilibrado y sostenible en las pequeñas ciudades de Marruecos.

Palabras clave: Atractivo Territorial; Ciudades Pequeñas; Análisis de Componentes Principales; Marruecos.

INTRODUCCIÓN

In the current era of globalization and heightened territorial competition, a region's ability to attract and retain individuals, businesses, and investment; collectively known as territorial attractiveness; has emerged as a key concern for policymakers and economic stakeholders (Deisting and Paumard, 2012).

Recognizing the inherent complexity of territorial attractiveness, which transcends economic factors to encompass elements such as the residential dimension, quality of life, and population well-being, it becomes imperative to adopt a holistic methodology that captures the multifaceted nature of this concept (Sohaib et al., 2022). The growing interdependence between economic dynamics and a region's social and environmental qualities has rendered traditional approaches insufficient for fully grasping the essence of a region's allure (Khalid et al., 2024; Sohaib et al., 2023).

In this context, our contribution introduces an innovative methodological framework for assessing territorial attractiveness through a multidimensional approach. This approach integrates economic, social, spatial, and well-being indicators in a balanced manner, providing a comprehensive and nuanced evaluation of attractiveness. By positioning these various dimensions at the heart of the analysis, we can develop synthetic indicators that more accurately reflect the reasons a location is chosen as a place to live, work, or invest (Farhaoui,2023) (Khouibiri, 2024).

Indeed, synthetic indicators of territorial attractiveness play a crucial role in assessing and monitoring regional dynamics, offering measurable insights into the strengths and areas for improvement unique to each region. These indicators transform complex data into accessible metrics, essential for strategic decision-making. They are particularly valuable for guiding public policy and supporting economic development initiatives (Khalid and Effina, 2023).

This article focuses on designing an econometric approach aimed at developing and constructing synthetic indicators to better understand the territorial attractiveness of small Moroccan towns, addressing the current absence of such a framework at the national level. Drawing on international best practices, this initiative paves the way for a multidimensional evaluation of attractiveness, crucial for effectively guiding development policies (Farhaoui,2024).

At the core of our approach is the principle of adaptation, which seeks not only to draw from international practices but also to tailor them to the specific realities of small Moroccan towns. This adaptation is more than a mere transposition; it entails a deep reflection on the most relevant indicators to capture the essence of attractiveness in Morocco's small towns. For example, the socio-demographic dimension, with a focus on migration dynamics, must consider the unique migration patterns of these towns. Similarly, the analysis of spatial dynamics should account for the influence of physical and digital connectivity, proximity to growth centers, and geographic factors on accessibility and the integration of small towns into national economic networks (Khalid et al., 2023).

The originality of our approach also lies in its exploration of quality of life and its impact on territorial attractiveness. In a country where territorial disparities in quality of life are pronounced, understanding how basic services, education, healthcare, and housing conditions interact to shape a region's appeal is crucial (Faye, 2017). This requires going beyond conventional analyses to incorporate more holistic perspectives, factoring in the expectations and needs of both current and potential residents.

By developing indicators specifically tailored to the Moroccan context, our work aims to equip decision-makers with a robust analytical tool. The dual objective is to identify the key levers for enhancing the attractiveness of small towns and to establish intervention priorities that account for the unique characteristics of each region. This approach will facilitate a more strategic allocation of resources, focusing on areas with the greatest potential to significantly improve territorial attractiveness.

Ultimately, the ambition of this conceptual and measurement framework is to meaningfully contribute to the discourse and practice of territorial planning in Morocco, laying the foundation for an adapted and pioneering methodology. Through this approach, we hope not only to inform current policies but also to inspire new directions for territorial planning and economic development, placing attractiveness at the forefront of growth strategies.

Econometric Approach and Variables

Target Population: small Moroccan towns play a crucial role in territorial development, serving as bridges between rural and urban areas (Blais, 2007; Deisting and Paumard, 2012). They contribute to the redistribution of economic opportunities and the strengthening of social and cultural ties across the country (Demazière, 2017; Dubuc, 2004; Edouard, 2019a). Despite their importance within the national urban fabric, these towns are often overlooked in development policies and face specific challenges, such as limited access to infrastructure and public services (Khalid et al., 2024). These small towns, which represent the target population of our study, require particular attention to fully unlock their development potential (Farhaoui,2018) (Sossi Alaoui, 2024).

It is important to note that the definition of small towns varies according to context. For this study, we adopt the definition provided by the Department of Territorial Planning, which classifies any city with a population between 1,000 and 5,000 inhabitants as a small city (MATNUHPV, 2017). According to the 2014 census, Morocco has **292** small towns meeting these criteria, accounting for 83% of the national total (MATNUHPV, 2020).

The distribution of small towns across the regions of Morocco reflects significant regional disparities. The region of Fès-Meknès stands out with the highest number of small towns, totaling 51, followed by Oriental with 37 and Marrakech-Safi with 36 towns. Casablanca-Settat and Rabat-Salé-Kénitra also host a considerable number of small towns, with 31 and 27, respectively. On the lower end of the spectrum, Laayoune-Sakia El Hamra has only 3 small towns, and Guelmim-Oued Noun has 8. Other regions such as Béni Mellal-Khénifra and Souss-Massa hold 32 and 19 small towns, respectively.

Given the unique challenges faced by these small urban entities, it is crucial to devise strategies specifically tailored to address their distinct realities (Edouard, 2019b). This study aims to establish a reference framework for evaluating their territorial attractiveness by identifying the key drivers that can unlock their development potential. By focusing on these towns, the study seeks to promote a more equitable territorial development, thereby enhancing the quality of life and reducing regional disparities (Farhaoui,2022) (Shamim,2024).

Methodological Steps: to model the attractiveness of small Moroccan towns, we undertook a rigorous econometric approach, starting with the identification of the most suitable indicators to represent attractiveness in all its dimensions, while considering data availability. This task involved a preliminary subdivision of attractiveness into four essential dimensions: socio-demographic, economic, spatial dynamics, and quality of life. Each of these dimensions reflects a specific and crucial aspect of attractiveness, allowing for a comprehensive and differentiated analysis. For each of these dimensions, a meticulous selection of indicators was carried out to ensure that they are representative of the variabilities and specificities of attractiveness at the local scale of small towns.

The next step in our process was to standardize the indicators to neutralize scale effects and enable fair comparisons between them. This standardization is crucial to homogenize measurement units and balance the influence of each variable in the subsequent analysis. In addition to standardization, it is essential to harmonize the orientation of the variables so that they consistently reflect attractiveness. In other words, each variable must be adjusted such that an increase in its value corresponds to an increase in attractiveness. Variables that are naturally negatively correlated with attractiveness need to be transformed using appropriate utility functions. The variable table, including these utility functions, serves as our reference for making these transformations, ensuring that all measures contribute in the same direction to our overall attractiveness model.

Principal Component Analysis (PCA) was employed to synthesize these standardized indicators. For our study, we chose to retain the principal axes for each synthetic indicator that cumulatively explain at least 70% of the total variance, ensuring that we preserve most of the relevant information while simplifying the data structure.

Finally, based on the selected factorial axes, we constructed synthetic indicators for each dimension of attractiveness. These indicators are calculated by aggregating the factorial scores according to their contribution to the variance, thus providing a concise yet comprehensive measure of each dimension of attractiveness. They materialize into unique scores for each town, capturing the magnitude and quality of their territorial attractiveness within a robust and transparent methodological framework (Farhaoui,2017)(Triantafyllou,2024).

The final phase of our econometric analysis involved aggregating the synthetic indicators specific to each dimension to form a global composite index of territorial attractiveness. To achieve this, we opted for the geometric mean, chosen for its property of mitigating the compensatory effects that the arithmetic mean can introduce. The geometric mean is particularly appropriate when dealing with variables that vary across different ranges or when it is necessary to preserve the relative nature of variations in one indicator compared to others. It allows for the balanced weighting of each indicator's influence, preventing any extreme-value indicator from unduly dominating the result. This global index thus reflects attractiveness in a way that respects the proportional contribution of each dimension, providing a more accurate and nuanced view of the territorial attractiveness of small towns in Morocco.
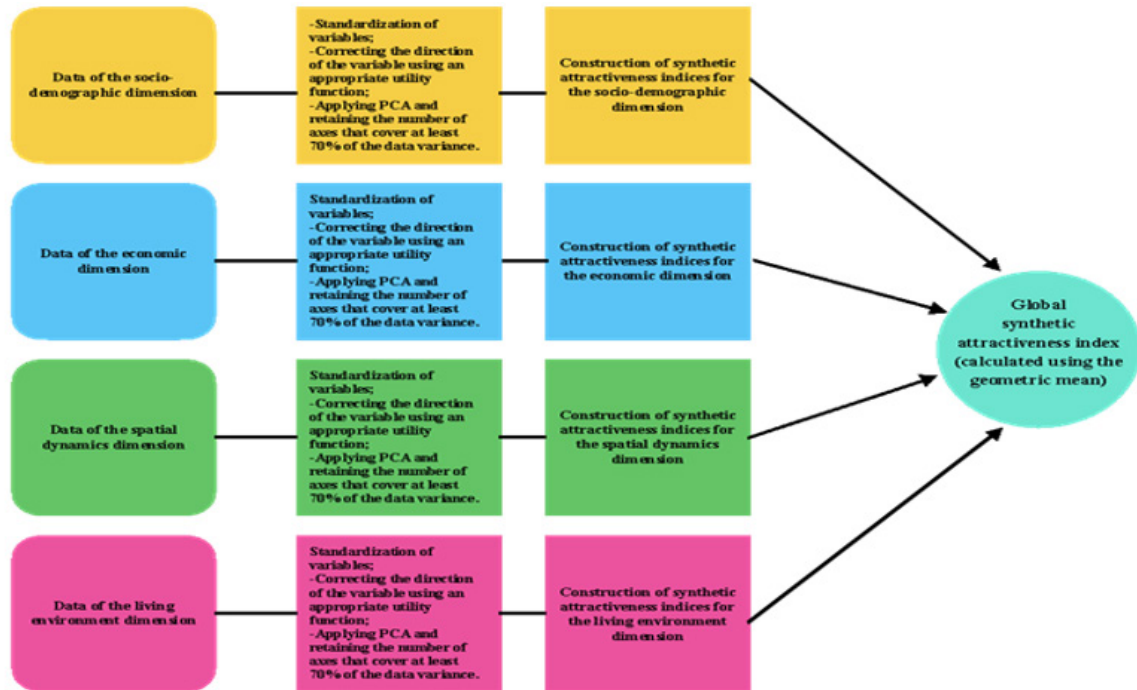

Figure 1. Econometric Approach

Note: the entire econometric approach, including the standardization of indicators, Principal Component Analysis (PCA), and the calculation of the geometric mean to establish the global attractiveness index, was meticulously programmed in R.

Liste des variables: in the context of our study, special attention has been paid to the selection of variables that form the basis of our synthetic indicators. This selection is crucial as it must reflect the specificities and challenges unique to small towns, which often differ from large metropolitan areas in terms of economic, demographic, spatial dynamics, and quality of life.

In this study, we worked with a wide range of variables across multiple dimensions, making it impractical to present each one individually in a detailed table. Instead, we offer a summarized description of these variables, categorized into key dimensions such as socio-demographics, economics, spatial dynamics, and quality of life. This aggregated approach facilitates a clearer understanding of the methodological framework while preserving the complexity of the indicators used to assess territorial attractiveness. The selected variables are relevant to capturing critical aspects of regional development, and where necessary, utility functions have been applied to ensure consistency in their interpretation.

The socio-demographic dimension encompasses variables such as the net migration rate, the foreign population, the population aging index, the evolution of population aging between 2004 and 2014, and the demographic dependency ratio. These indicators offer insights into population dynamics, age structure, and dependency burdens. While variables like net migration and the foreign population naturally align with increased territorial attractiveness, others, such as aging and dependency ratios, present challenges, as higher values typically indicate regions with less economic dynamism. To mitigate this discrepancy, utility functions have been employed to reverse the interpretation of these variables, ensuring that higher values represent decreased attractiveness.

In the economic dimension, core variables include the employment rate, the percentage of salaried workers in the private sector, the employer rate, the rates of industrial and tertiary specialization, and the area of land dedicated to economic activities. These indicators are directly tied to the economic vitality and competitiveness of a region. Typically, higher employment rates and greater specialization positively contribute

to territorial attractiveness. Since these variables inherently promote development, no utility transformations were required, as they naturally align with the enhancement of regional attractiveness.

The spatial dynamics dimension assesses geographical positioning and connectivity through indicators such as proximity to agglomerations, the coast, highways, and fiber optic nodes. In general, greater distances from these critical infrastructure points correspond to reduced attractiveness. Consequently, these variables exhibit an inverse relationship with attractiveness. To standardize this relationship across the model, utility functions were applied, ensuring that increased distances reflect a decline in attractiveness, facilitating consistent regional comparisons.

Finally, the quality-of-life dimension incorporates indicators such as the local development index, access to running water and electricity, education, and healthcare infrastructure, including the number of doctors and care units. Most of these variables naturally correspond to increased attractiveness, better public services, infrastructure, and access to essential needs enhance a region's appeal. However, variables such as rural and inadequate housing, which detract from attractiveness, were transformed using utility functions to ensure that higher values for such variables reflect reduced attractiveness. These transformations maintain the coherence and consistency of the overall attractiveness assessment framework.

RESULTS

Synthetic Attractiveness Indicator: socio-demographic Dimension. This section discusses the results of the socio-demographic synthetic indicator, which is critical for understanding the attractiveness of small towns. The socio-demographic dimension reflects population dynamics and structure, including factors like population growth due to migration and dependency rates. These elements are key indicators of socioeconomic changes and influence a town's overall attractiveness.

The ranking of regions based on the average of the standardized socio-demographic synthetic index highlights significant variations in the socio-demographic appeal of different Moroccan regions.

Table 1. Ranking of Regions Based on the Synthetic Socio-Demographic Index (SSDI)	
Region	**Mean SSDI**
Laayoune-Sakia El Hamra	0,647561889
Casablanca-Settat	0,480307498
Rabat-Salé-Kénitra	0,46667582
Tanger-Tetouan-Al Hoceima	0,442243754
Souss-Massa	0,437688879
Guelmim-Oued Noun	0,420373039
Fès-Meknès	0,417662186
National Average	0,4161584
Marrakech-Safi	0,413235547
Drâa-Tafilalet	0,389425717
Oriental	0,352925341
Béni Mellal-Khénifra	0,348698142

At the top of the ranking, the Laayoune-Sakia El Hamra region displays an average score of 0,647, indicating exceptionally high attractiveness. However, it is crucial to note that this score is based on only three towns. This small number of small towns may exaggerate the region's perceived attractiveness and may not accurately reflect broader trends or be directly comparable to regions with a larger number of towns.

Following this leader are Casablanca-Settat with a score of 0,480, Rabat-Salé-Kénitra with 0,466, and Tanger-Tetouan-Al Hoceima with 0,442, reflecting their strong socio-demographic potential, likely due to their economic dynamism and well-established infrastructures. Souss-Massa, with a score of 0,438, and Guelmim-Oued Noun, with 0,420, follow, indicating notable socio-demographic attractiveness.

Regions such as Fès-Meknès, Marrakech-Safi, and Drâa-Tafilalet, with average scores ranging from 0,389 to 0,418, show moderate attractiveness, suggesting the presence of challenges but also growth potential.

At the other end of the spectrum, the Oriental and Béni Mellal-Khénifra regions display the lowest scores, with 0,353 and 0,349 respectively, highlighting the need for strengthened policies to improve socio-demographic attractiveness.

This ranking, while highlighting regional disparities in terms of socio-demographic attractiveness, should be interpreted with caution, considering the size of the regional samples, particularly for cases such as the Laayoune-Sakia El Hamra region, where high scores based on a small number of towns may potentially provide a misleading image.

It should be noted that while regional-level analysis provides general insights into territorial attractiveness, it does not fully reflect the subtle variations present at the provincial and distinct small-city levels. Each of these entities, rich in its own characteristics, contributes to the diversity and dynamism of Morocco and deserves tailored attention. Recognizing the diversity and richness represented by the country's 292 small towns, our study does not claim to detail each individual situation but rather to provide an overall overview. Nevertheless, this analysis offers valuable data for policymakers, who can draw on these guidelines to develop tailored strategies and promote balanced development across Moroccan territory.
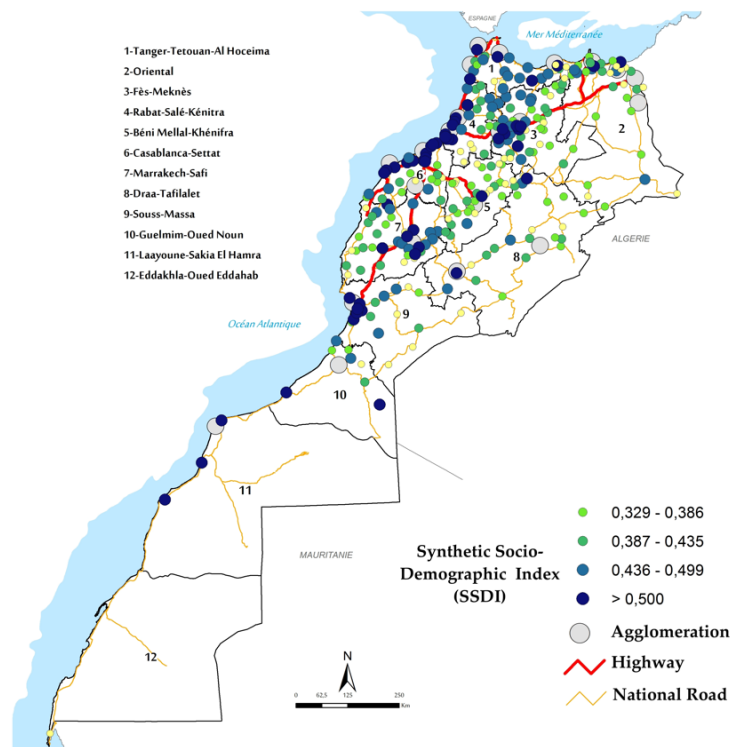

Figure 2. Socio-Demographic Synthetic Index (SDSI)

Synthetic Attractiveness Indicator: Economic Dimension:

After analyzing the socio-demographic dimension of territorial attractiveness, the focus now shifts to the economic aspect. This dimension includes crucial factors such as employment, private sector activity, and the development of industrial and tertiary sectors, which together define the economic vitality of small towns. Employment serves as a key attractor of skilled labor, while the development of the industrial and tertiary sectors indicates innovation, diversity, and service quality.

The results of the synthetic indicator for economic attractiveness are presented to identify trends and growth potential. This ranking of regions, based on the economic synthetic index, highlights which regions demonstrate the highest economic dynamism and which may need more targeted strategies to enhance their economic appeal.

Table 2. Ranking of Regions Based on the Synthetic Economic Index (SEI)	
Region	**Mean SEI**
Laayoune-Sakia El Hamra	0,430345599
Casablanca-Settat	0,325960259
Rabat-Salé-Kénitra	0,277197073
Tanger-Tetouan-Al Hoceima	0,250844873
Marrakech-Safi	0,245478578
National Average	0,2391074
Souss-Massa	0,238371194
Fès-Meknès	0,223067342
Béni Mellal-Khénifra	0,219890554
Oriental	0,197835292
Drâa-Tafilalet	0,189790883
Guelmim-Oued Noun	0,150475238

Laayoune-Sakia El Hamra presents the highest score with an average of 0,430, but this ranking must once again be interpreted with caution, as it is based on only three small towns, which could result in a disproportionate representation of the region's economic attractiveness.

Next, Casablanca-Settat shows a score of 0,326, Rabat-Salé-Kénitra stands at 0,277, and Tanger-Tetouan-Al Hoceima at 0,251, all reflecting significant levels of economic attractiveness, suggesting a dynamic and diverse economic environment.

Marrakech-Safi and Souss-Massa have similar scores, with 0,245 and 0,238, respectively, indicating good economic attractiveness, potentially supported by tourism and the service sector.

Fès-Meknès, with a score of 0,223, Béni Mellal-Khénifra at 0,220, and the Oriental at 0,198 fall within a moderate range, signaling more nuanced economic attractiveness that could mask disparities within the regions themselves.

Finally, Drâa-Tafilalet, with a score of 0,190, and Guelmim-Oued Noun, with 0,150, are at the bottom of the ranking, reflecting regions that may require increased attention to boost the economies of their small towns.
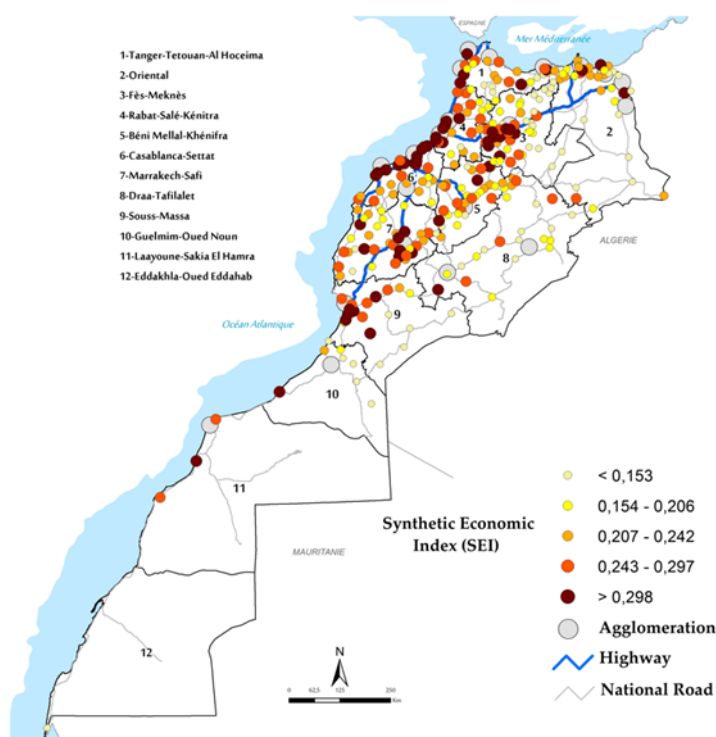

Figure 3. Synthetic Economic Index (SEI)

Synthetic Attractiveness Indicator: Spatial Dynamics Dimension:

This section introduces the synthetic spatial dynamics index, which evaluates the influence of geographical features and infrastructure on the development potential of small Moroccan towns. Key factors include proximity to urban areas, coastlines, highways, and fiber-optic nodes, all of which play significant roles in connectivity, economic opportunities, and competitiveness. The spatial dimension is critical for understanding the attractiveness of towns, shaping their economic development, employment, and quality of life.

The ranking of regions based on the spatial dynamics index highlights how access to strategic infrastructure and geographical positioning impacts a city's attractiveness. Regions with better connectivity and infrastructure stand out, while others can enhance their competitive advantage through targeted interventions. The analysis provides a detailed overview of how spatial factors contribute to the attractiveness of small towns across regions.

Table 3. Ranking of Regions Based on the Synthetic Spatial Dynamics Index (SSDI)	
Region	**Mean (SSDI)**
Casablanca-Settat	0,936884027
Tanger-Tetouan-Al Hoceima	0,929687331
Rabat-Salé-Kénitra	0,925793788

Marrakech-Safi	0,891620882
Fès-Meknès	0,87670343
Souss-Massa	0,867788622
National Average	0,8655494
Béni Mellal-Khénifra	0,861445153
Oriental	0,857307419
Guelmim-Oued Noun	0,799483868
Drâa-Tafilalet	0,686505575
Laayoune-Sakia El Hamra	0,229354863

At the top of this ranking, the Casablanca-Settat region stands out with a remarkable score of 0,937, reflecting its status as a vibrant and well-connected economic hub. Tanger-Tétouan-Al Hoceima, with an almost equivalent score of 0,930, and Rabat-Salé-Kénitra, with 0,926, also confirm their place as key regions benefiting from excellent infrastructure and privileged access to major transportation networks.

Marrakech-Safi and Fès-Meknès follow with significant scores of 0,892 and 0,877, indicating their attractiveness as important urban centers, with good access to services and infrastructure.

The regions of Souss-Massa, Béni Mellal-Khénifra, and the Oriental, though slightly behind with scores of 0,868, 0,861, and 0,857, respectively, maintain competitive levels of attractiveness, demonstrating solid infrastructure and effective integration within the national ecosystem.

Guelmim-Oued Noun and Drâa-Tafilalet, with scores of 0,799 and 0,687, highlight regions with connectivity potential that can be optimized to stimulate their spatial and economic development.

Finally, the Laayoune-Sakia El Hamra region, displaying the lowest score of 0,229, highlights a particular case that may be due to a limited sample of towns and a geographic situation that places these towns far from major economic centers, impacting their overall spatial attractiveness score.

This assessment provides crucial insights for strategic planning and resource allocation, emphasizing the need to adapt development strategies to the specific characteristics of each region to improve their integration and strengthen Morocco's overall spatial attractiveness.
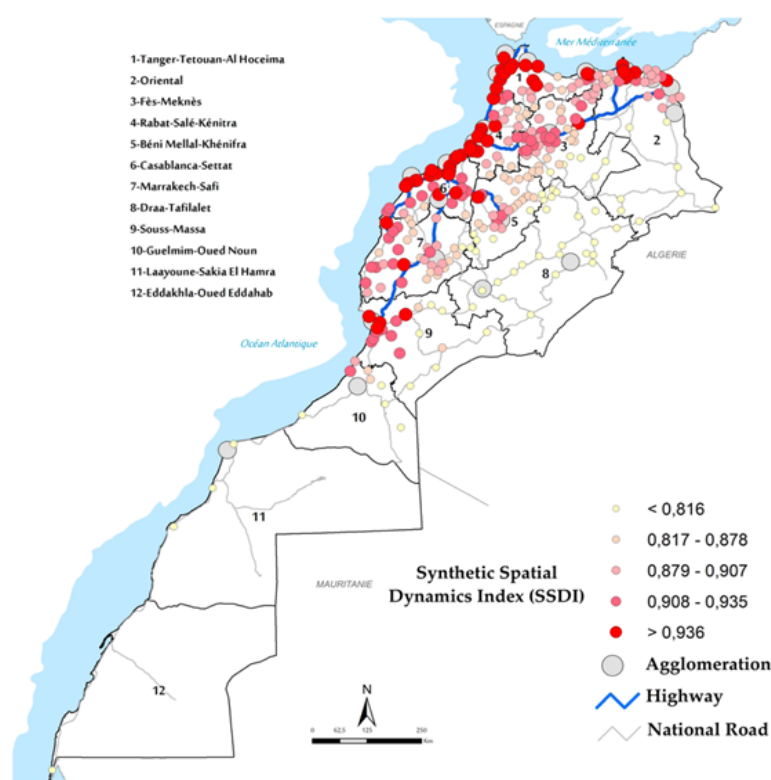

Figure 4. The Synthetic Spatial Dynamics Index (SSDI)

Synthetic Attractiveness Indicator: Quality of Life Dimension:

Following the analysis of the synthetic spatial dynamic's indicator, the focus shifts to the quality of life in small Moroccan towns. This indicator includes critical factors such as local development, housing conditions, education and healthcare services, banking access, and administrative support. These aspects significantly affect residents' well-being and the city's ability to attract new inhabitants and investments.

The quality-of-life component reflects a city's commitment to creating a favorable environment for its communities. By analyzing this indicator, the aim is to highlight the strengths and opportunities of each city, while identifying areas needing improvement for balanced and sustainable development.

Table 4. Ranking of Regions Based on the Synthetic Quality of Life Index (SQLI)	
Region	**Mean SQLI**
Laayoune-Sakia El Hamra	0,69002107
Guelmim-Oued Noun	0,652200392
Souss-Massa	0,59839719
Drâa-Tafilalet	0,591685978
Oriental	0,585979255
National Average	0,5502347
Béni Mellal-Khénifra	0,547676175
Fès-Meknès	0,537675778
Casablanca-Settat	0,532958683
Tanger-Tetouan-Al Hoceima	0,528001342
Marrakech-Safi	0,52056198
Rabat-Salé-Kénitra	0,493045702

At the top of the ranking, Laayoune-Sakia El Hamra stands out with a score of 0,690, signaling a quality of life that surpasses the national average of 0,550. This high score could reflect a combination of positive factors, such as successful investments in infrastructure and effective management of local resources. Once again, it should be noted that this region contains only three small towns, which may skew this average.

Guelmim-Oued Noun, with an index of 0,652, also ranks well above the national average. The quality of life in this region may be the result of targeted efforts to strengthen healthcare, education, and other essential components of resident well-being.

Souss-Massa shows a score of 0,598, followed closely by Drâa-Tafilalet with 0,591, both above the national average. These scores suggest that these regions offer an advantageous living environment, possibly due to relatively good access to basic services and particular attention to housing and infrastructure development.

The Oriental, with a score of 0,585, also shows a favorable quality of life, although there is potential for this region to improve certain conditions to achieve even higher living standards.

Just below the national average, Béni Mellal-Khénifra and Fès-Meknès, with scores of 0,547 and 0,537 respectively, seem to be at a crossroads where strategic improvements in quality of life could propel these regions above the national average.

Casablanca-Settat records a score of 0,532, which can be interpreted as an indication of the need for targeted investments to address urban challenges and improve quality of life, despite its economic dynamism.

Tanger-Tetouan-Al Hoceima and Marrakech-Safi have scores of 0,528 and 0,520, respectively, indicating areas where quality of life could be improved, particularly in terms of access to essential services and housing improvements.

Finally, Rabat-Salé-Kénitra shows the greatest need for improvement, with the lowest score of 0,493. This region could benefit from intensified measures across all aspects of quality of life, from housing quality to educational and healthcare services.

This analysis highlights the importance of a differentiated focus on the needs of each region. By using these analyses, policymakers can prioritize investments and policies not only to uplift small towns in lagging regions but also to maintain and strengthen the quality of life where performance is already high.
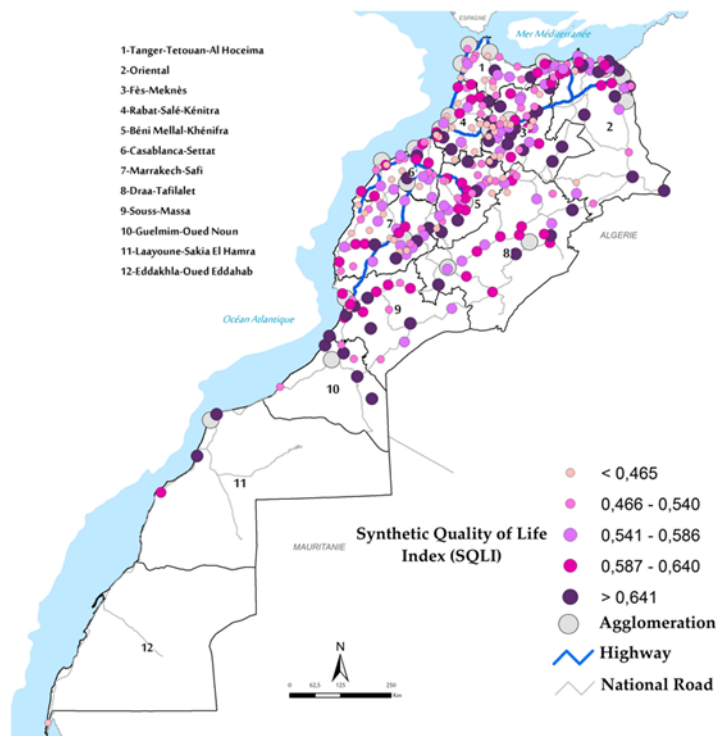
Figure 5. The Synthetic Spatial Dynamics Index (SSDI)

Cross-analysis of the attractiveness of small towns:

After evaluating the attractiveness of small Moroccan towns according to four essential dimensions, we proceed to an analytical synthesis by ranking the regions based on the average performance of their small towns for each of these indices.

The following map provides a consolidated overview of this ranking, summarizing the relative position of the regions based on the aggregated averages of their small towns across the various indices developed.
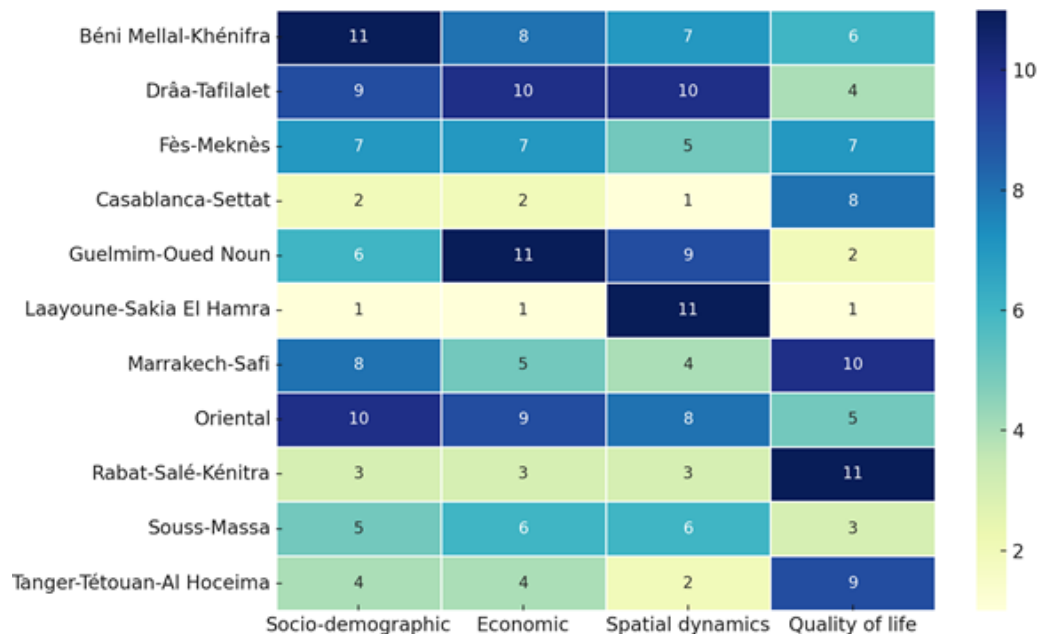

Figure 6. Analysis of the regional rank

The analysis of the regional ranking table based on the various synthetic attractiveness indicators shows that the Casablanca-Settat region stands out with excellent performance in spatial dynamics (1st) and good scores in socio-demographics (2nd) and economics (2nd), indicating a prosperous and well-connected region. However, the quality of life (8th) could benefit from improvement measures to match its economic status.

Rabat-Salé-Kénitra, with its high rankings in socio-demographics (3rd), economics (3rd), and spatial dynamics (3rd), reflects its centrality and economic diversity. The major challenge lies in its quality of life (11th), requiring investments in social services to improve the living standards of the population in the region's small towns.

Tanger-Tetouan-Al Hoceima benefits from its strategic location with excellent scores in spatial dynamics (2nd) and good economic performance (4th). However, the quality of life (9th) could be improved to maximize its potential for attraction.

The Souss-Massa region shows balanced attractiveness with respectable performances in quality of life (3rd) and spatial dynamics (6th), indicating a region with a high quality of life and reasonable accessibility. Its economy (6th) and demography (5th) offer solid foundations for future development.

Marrakech-Safi enjoys an advantageous position in spatial dynamics (4th) and economics (5th) but faces challenges in terms of quality of life (10th) and socio-demographics (8th). Special attention to social services and urban planning could enhance its attractiveness.

Fès-Meknès offers balanced performance with notable potential in spatial dynamics (5th). However, its rankings in socio-demographics (7th), economics (7th), and quality of life (7th) highlight the importance of targeted investments to stimulate growth, job creation, and improved living conditions.

Laayoune-Sakia El Hamra presents a unique profile with excellent scores in economics (1st) and an attractive quality of life (1st) but faces challenges in spatial dynamics (11th). Efforts to improve connectivity could enhance its regional integration.

Guelmim-Oued Noun reveals an interesting position in quality of life (2nd), but its performance is less convincing in economics (11th) and spatial dynamics (9th). Initiatives to stimulate economic activity and improve accessibility are essential.

The Oriental region faces challenges across all indices, particularly in economics (9th) and spatial dynamics (8th), indicating the need for an integrated development strategy that addresses both the economy and connectivity.

Drâa-Tafilalet shows the greatest need for intervention, with low rankings in almost all indices, especially in economics (10th) and spatial dynamics (10th). Focused efforts on economic development, demography, and infrastructure improvement are crucial.

Béni Mellal-Khénifra must address its weaknesses in socio-demographics (11th) and economics (8th), although its scores in spatial dynamics (7th) and quality of life (6th) show positive aspects to build on for the development of its urban fabric.

This analysis reveals the diversity of challenges and opportunities across Morocco, underscoring the importance of differentiated regional approaches to improving territorial attractiveness in a holistic and balanced manner.

While the presented analysis provides valuable insights into regional attractiveness trends, it is crucial to emphasize that each small city within these regions has its own unique characteristics, as well as its own strengths and challenges. This internal diversity within each region suggests that uniform approaches to improving territorial attractiveness may not be optimal without a fine-grained understanding and consideration of local specifitowns.

Therefore, it is essential to adopt a planning and development approach that recognizes and values the heterogeneity of small towns. This involves implementing tailored strategies, developed based on detailed analyses of local conditions, to effectively address the specific needs of each city. This nuanced and localized approach will not only maximize the unique potential of each city but also contribute to balanced and sustainable territorial development across the country.

In summary, this remark aims to highlight the importance of going beyond regional generalizations to focus on the dynamics specific to each small city, engaging in targeted and adapted actions that consider the complexity and richness of Morocco's urban fabric.

Global Synthetic Index of Territorial Attractiveness
Following the analysis of various synthetic indicators across the socio-demographic, economic, spatial dynamics, and quality of life dimensions, attention is now directed toward the evaluation of the global synthetic index of territorial attractiveness for small towns in Morocco. This composite index, derived from the geometric mean of the previously mentioned indicators, offers a holistic measure of territorial attractiveness, encapsulating the multidimensional capacity of Moroccan regions to attract and retain both inhabitants and economic activities.

The choice of the geometric mean for constructing this index proves particularly advantageous, as it mitigates the distorting effects of outlier values. By ensuring that no single area of weakness disproportionately affects the overall score, this method emphasizes the importance of balanced development. Thus, a high-ranking city must demonstrate competence across all dimensions, reinforcing the need for a comprehensive approach to

urban and regional planning.

The relevance of this global synthetic index extends beyond theoretical analysis; it holds significant practical value for policymakers and urban planners. The index facilitates the precise identification of areas requiring targeted interventions while providing an objective comparative framework to monitor progress. It is not merely an analytical tool but an operational instrument essential for the strategic allocation of resources, guiding small towns toward inclusive and sustainable prosperity.

Moreover, the section presents a ranking of regions based on their average global synthetic attractiveness index, offering a comparative overview of regional performance. This ranking elucidates the disparities in territorial attractiveness, enabling a better understanding of which regions lead in development and which require more focused attention. It also highlights regions with latent potential, presenting significant opportunities for future growth and development.

Table 5. Ranking of Regions Based on the Global Synthetic Attractiveness Index (GSAI)	
Region	**Mean (GSAI)**
Casablanca-Settat	0,531298787
Rabat-Salé-Kénitra	0,470297423
Souss-Massa	0,464793698
Tanger-Tétouan-Al Hoceima	0,460474541
Marrakech-Safi	0,428039915
National Average	0,4271939
Fès-Meknès	0,417483616
Laayoune-Sakia El Hamra	0,399235857
Guelmim-Oued Noun	0,39299576
Oriental	0,385518482
Béni Mellal-Khénifra	0,381821364
Drâa-Tafilalet	0,334963217

At the top of the ranking, Casablanca-Settat boasts the highest score, which is unsurprising given its role as the economic and financial nerve center of Morocco. Its strategic position, combined with a dense urban fabric and top-tier infrastructure, gives its small towns unparalleled territorial attractiveness. However, as shown in the results of the synthetic quality of life index, this may mask internal disparities, particularly in terms of wealth distribution and quality of life in most of the region's small towns.

Just behind, Rabat-Salé-Kénitra presents an attractive profile, likely bolstered by its function as the administrative and political capital, hosting numerous national and international institutions as well as high-quality educational infrastructure. This region could capitalize on these assets to further develop the tourism and cultural potential of its entire urban fabric, specifically that of its small towns.

Souss-Massa and Tanger-Tétouan-Al Hoceima, two regions with respectable scores, rank third and fourth, respectively, highlighting the success of strategies focused on industry, tourism, and commerce. Souss-Massa benefits from its favorable climate and natural resources, while Tanger-Tétouan-Al Hoceima takes advantage of its advantageous geographic location and investments in the industrial, port, and logistics sectors.

Marrakech-Safi, ranked fifth in terms of territorial attractiveness, also stands out for its cultural appeal and its booming tourism industry. However, further efforts may be necessary to strengthen economic development beyond tourism and ensure that prosperity is equitably shared.

Fès-Meknès, ranked sixth, shows considerable potential, anchored in a rich historical heritage and an active agricultural sector. The region could capitalize on its cultural wealth to attract more visitors and promote agritourism.

The situation is more mixed for Laayoune-Sakia El Hamra, Guelmim-Oued Noun, and the Oriental region, whose more moderate indices reflect challenges. Laayoune-Sakia El Hamra could develop its infrastructure to better integrate recent investments into a more coherent urban development model. Guelmim-Oued Noun and the Oriental region, while benefiting from relatively good living conditions and satisfactory connectivity, need to explore ways to stimulate their economies through diversification and innovation.

Béni Mellal-Khénifra and Drâa-Tafilalet close the ranking, with indices calling for targeted actions to improve their economies and their integration into the national urban fabric. These regions may require significant investments in infrastructure and services to improve the attractiveness of their small towns and meet the needs of their populations.

In sum, the attractiveness of each Moroccan region is defined by a set of distinct characteristics and unique

challenges. To enhance the attractiveness of the less-performing regions, it is essential to adopt integrated strategies that leverage existing strengths while addressing economic and social weaknesses. These efforts are vital for fostering harmonious territorial development.

However, it is important to note that regional summaries, while useful, may overlook significant disparities between provinces and between different small towns. Each city, with its characteristics, contributes to the diversity of its territory and deserves individual attention. Nevertheless, due to the complexity and vast scope of small towns in Morocco, our study does not undertake a detailed analysis by city or province.
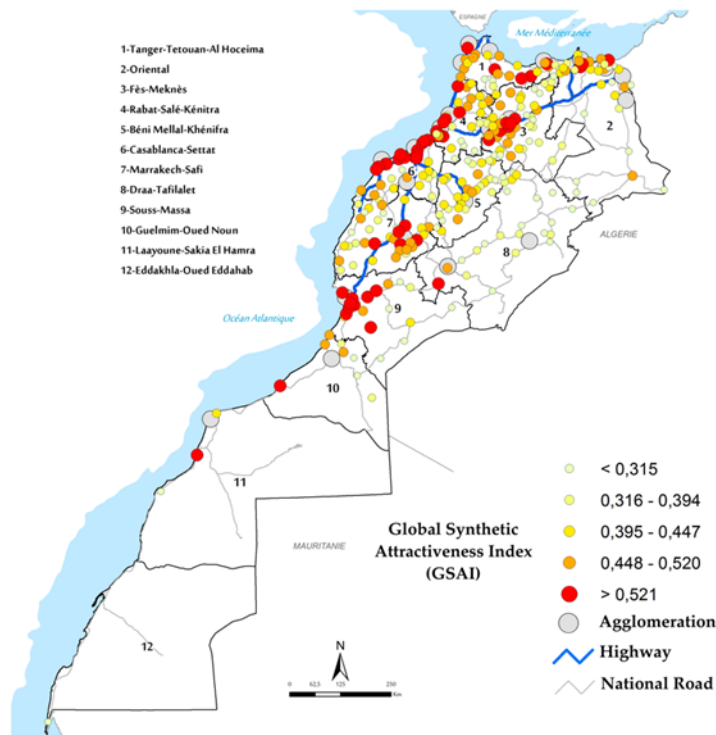

Figure 7. The Global Synthetic Attractiveness Index (GSAI)

CONCLUSIONS

The evaluation of the territorial attractiveness of small Moroccan towns through the socio-demographic, economic, spatial, and quality of life dimensions has provided an overview of the strengths and weaknesses of the various regions. Thanks to the global synthetic index, territorial disparities are highlighted, with regions such as Casablanca-Settat and Rabat-Salé-Kénitra emerging as leaders in overall attractiveness, while others, such as Béni Mellal-Khénifra and Drâa-Tafilalet, exhibit significant deficits requiring targeted interventions.

This work first and foremost offers an unprecedented reference framework for measuring territorial attractiveness in Morocco, filling a methodological gap the country has faced until now. In the absence of an official framework for measuring attractiveness, this approach enables a rigorous evaluation and comparison of regional performance, paving the way for more data-driven territorial planning.

The analysis demonstrates that balanced territorial attractiveness relies on the ability of regions to excel in multiple dimensions simultaneously. The results also show that development strategies must be tailored to local realities, considering the characteristics of each small city. Targeted efforts are essential to address intra-regional disparities and maximize the potential of underperforming towns.

In conclusion, this article not only provides a detailed analysis of the current situation but also offers pathways for more effective territorial planning, contributing to the harmonious and sustainable development of small Moroccan towns. It is crucial that policymakers consider these results to guide their policies, ensuring better integration of towns into the national urban fabric and promoting inclusive development across all Moroccan territories.

REFERENCES

1. Blais, J.-P., 2007. L'attractivité des territoires : regards croisés.

2. Deisting, F., Paumard, P., 2012. Développement durable et attractivité des territoires : Marché Organ. N° 16, 53–75. https://doi.org/10.3917/maorg.016.0053

3. Demazière, C., 2017. Le traitement des petites et moyennes villes par les études urbaines. Espac. Sociétés 168–169, 17-32. https://doi.org/10.3917/esp.168.0017

4. Dubuc, S., 2004. Dynamisme rural : l'effet des petites villes. L'Espace Géographique 33, 69-85. https://doi.org/10.3917/eg.033.0069

5. Edouard, J.-C., 2019a. L'attrait des petites villes, une chance pour redynamiser leur centralité ? Réflexions à partir du cas des petites villes auvergnates. Belgeo. https://doi.org/10.4000/belgeo.34295

6. Edouard, J.-C., 2019b. L'attrait des petites villes, une chance pour redynamiser leur centralité ?: Réflexions à partir du cas des petites villes auvergnates. Belgeo. https://doi.org/10.4000/belgeo.34295

7. Faye, B., 2017. Revisiter l'attractivité résidentielle des moyennes et grandes villes françaises entre fondamentaux et nouvelles politiques d'attractivité.

8. Khalid, S., Effina, D., 2023. Quantifying Urban Dynamics: An Investigation of Employment Mobility, Spatial Proximity, and Residential Attractiveness in Moroccan Small Cities Applying Data Science Methods. Data Metadata 2, 167. https://doi.org/10.56294/dm2023167

9. Khalid, S., Effina, D., Khalid, K.R., 2024. The Effect of Employment Mobility and Spatial Proximity on the Residential Attractiveness of Moroccan Small's Cities: Evidence from Quantile Regression Analysis, in: Farhaoui, Y., Hussain, A., Saba, T., Taherdoost, H., Verma, A. (Eds.), Artificial Intelligence, Data Science and Applications, Lecture Notes in Networks and Systems. Springer Nature Switzerland, Cham, pp. 459–465. https://doi.org/10.1007/978-3-031-48465-0_61

10. Khalid, S., Effina, D., Khalid, khaoula rihab, Chaabane, M.S., 2023. The Artificial Intelligence as a decision-making instrument for Modeling and Predicting Small Cities' Attractiveness: Evidence from Morocco. Appl. Math. Inf. Sci.

11. MATNUHPV, 2020. Étude d'élaboration de la stratégie nationale de promotion de la compétitivité des petites villes.

12. MATNUHPV, 2017. Schéma national d'armature urbaine.

13. Sohaib, K., Driss, E., Chaabane, M.S., 2023. The Artificial Intelligence for Modeling and Predicting SMALL's Cities Attractiveness, in: Farhaoui, Y., Rocha, A., Brahmia, Z., Bhushab, B. (Eds.), Artificial Intelligence and Smart Environment, Lecture Notes in Networks and Systems. Springer International Publishing, Cham, pp. 763–769. https://doi.org/10.1007/978-3-031-26254-8_110

14. Sohaib, K., Driss, E., Youness, J., 2022. An Econometric Analysis of the Determinants of Small's Cities' Attractiveness: Evidence from Moroccan Case, in: 2022 8th International Conference on Optimization and Applications (ICOA). Presented at the 2022 8th International Conference on Optimization and Applications (ICOA), IEEE, Genoa, Italy, pp. 1-6. https://doi.org/10.1109/ICOA55659.2022.9934146

15. Farhaoui, Y.and All, Big Data Mining and Analytics, 2023, 6(3), pp. I–II, DOI: 10.26599/BDMA.2022.9020045

16. Farhaoui, Y. "Big data analytics applied for control systems" Lecture Notes in Networks and Systems, 2018, 25, pp. 408–415. https://doi.org/10.1007/978-3-319-69137-4_36

17. Farhaoui, Y. and All, Big Data Mining and Analytics, 2022, 5(4), pp. I IIDOI: 10.26599/BDMA.2022.9020004

18. Farhaoui, Y."Teaching Computer Sciences in Morocco: An Overview", IT Professional, 2017, 19(4), pp. 12–15, 8012307. DOI: 10.1109/MITP.2017.3051325

19. Triantafyllou, Serafeim A.,and All, "Gamification and Computational Thinking in Education: A systematic literature review", Salud, Ciencia y Tecnologia - Serie de Conferencias, Volume 3, Article number 659, 2024 , DOI:10.56294/sctconf2024659

20. Farhaoui, Y, Lecture Notes in Networks and Systems Volume 838 LNNS, Pages v – vi 2024 5th International

Conference on Artificial Intelligence and Smart Environment, ICAISE 2023Errachidia 23 November 2023 through 25 November 2023, Code 307209, ISSN 23673370, ISBN 978-303148572-5

21. Shamim, Rejuwana, and All, "Enhancing Cloud-Based Machine Learning Models with Federated Learning Techniques", Lecture Notes in Networks and SystemsVolume 838 LNNS, Pages 594 – 606, 2024, DOI: 10.1007/978-3-031-48573-2_85

22. Sossi Alaoui, Safae and All, "Machine Learning for Early Fire Detection in the Oasis Environment" Lecture Notes in Networks and SystemsVolume 838 LNNS, Pages 138 – 1432024, DOI: 10.1007/978-3-031-48573-2_20

23. Khouibiri.N and All, "Design and Analysis of a Recommendation System Based on Collaborative Filtering Techniques for Big Data", Intelligent and Converged Networks, Volume 4, Issue 4, Pages 296 – 304, DOI: 10.23919/ICN.2023.0024

24. Farhaoui, Y, Lecture Notes in Networks and Systems Volume 837 LNNS, Pages v – vi ,2024 5th International Conference on Artificial Intelligence and Smart Environment, ICAISE 2023, Errachidia23 November 2023through 25 November 2023, Code 309309, ISSN 23673370, ISBN 978-303148464-3

FINANCING

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

Conceptualization: Khaoula Rihab Khalid, Abdeslam Boudhar, Sohaib Khalid, Ahmed Elaissaoui, Abderrahman Yassine.

Data curation: Khaoula Rihab Khalid, Abdeslam Boudhar, Sohaib Khalid, Ahmed Elaissaoui, Abderrahman Yassine.

Formal analysis: Khaoula Rihab Khalid, Abdeslam Boudhar, Sohaib Khalid, Ahmed Elaissaoui, Abderrahman Yassine.

Research: Khaoula Rihab Khalid, Abdeslam Boudhar, Sohaib Khalid, Ahmed Elaissaoui, Abderrahman Yassine.

Methodology: Khaoula Rihab Khalid, Abdeslam Boudhar, Sohaib Khalid, Ahmed Elaissaoui, Abderrahman Yassine.

Project management: Khaoula Rihab Khalid, Abdeslam Boudhar, Sohaib Khalid, Ahmed Elaissaoui, Abderrahman Yassine.

Resources: Khaoula Rihab Khalid, Abdeslam Boudhar, Sohaib Khalid, Ahmed Elaissaoui, Abderrahman Yassine.

Software: Khaoula Rihab Khalid, Abdeslam Boudhar, Sohaib Khalid, Ahmed Elaissaoui, Abderrahman Yassine.

Supervision: Khaoula Rihab Khalid, Abdeslam Boudhar, Sohaib Khalid, Ahmed Elaissaoui, Abderrahman Yassine.

Validation: Khaoula Rihab Khalid, Abdeslam Boudhar, Sohaib Khalid, Ahmed Elaissaoui, Abderrahman Yassine.

Display: Khaoula Rihab Khalid, Abdeslam Boudhar, Sohaib Khalid, Ahmed Elaissaoui, Abderrahman Yassine.

Drafting - original draft: Khaoula Rihab Khalid, Abdeslam Boudhar, Sohaib Khalid, Ahmed Elaissaoui, Abderrahman Yassine.