

Indicators for measuring tourism intensification in urban areas through their associative network: Case studies from the Spanish Mediterranean coast

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Abstract

Clustering of tourism-related activities leads to tourism gentrification because of urban tourism. This study proposes a methodology for identifying pattern of tourism intensification in cities. The main objectives were to conduct an in-depth measurement of tourism intensification and to consider the conflict of interest between stakeholders involved. The proposed indicator system is based on several variables measured by neighbourhoods as territorial units: citizen initiatives, population and tourist accommodations and facilities. All indicators were tested in two Spanish port cities: Malaga and Valencia. Geographic Information System mapping showed common patterns in both cities, such as tertiary use concentrated in the old town, new tourist offers around it, and emerging clusters far away. Statistical analysis showed a high spatial correlation between neighbourhoods with several citizen initiatives and a wide range of Airbnb listings or cultural facilities. The spatial analysis and correlations between tourism intensification indicators may serve as a basis for local administrations to propose an urban policy that deals with overtourism in the short and medium terms. This work serves as a basis for new research on urban tourism: redefinition and addition of variables, as well as further development of comparative case studies or field studies that check the datasets.

Keywords: Tourism Intensification, Touristification, Gentrification, Urban Tourism, Overtourism, Indicator System

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1. Introduction

The concept of touristification refers to the use of public spaces by tourists and how their consumption habits transform the commercial and residential structure of a specific urban area (Vollmer, 2019). Touristification processes are associated with “urban colonialism” (Atkinson & Bridge, 2005) or displacement of residents, which expands beyond the urban centres. Not only do tourists want to visit the places with the highest attractions in a city, but they also want to take part in authentic urban experiences in those neighbourhoods that have a deep local identity. In this context, touristification reinforces the expulsion of residents, which is known as “tourism gentrification” (Gotham, 2005). Thus, the revaluation of a specific area in the city causes a change in the resident population due to new property and economic and political interests (Bernt & Holm, 2009). When this expulsion happens because of tourist demands, residential use is on the decrease due to emerging businesses (Barata-Salgueiro *et al.*, 2017). Long-term rentals and local trade are replaced by peer-to-peer (P2P) accommodations and franchises, respectively.

This displacement is reinforced by the lack of public regulation of the housing market and the growth of tourist attractions through urban regeneration plans (Calle Vaquero, 2019). Both facilitate the prevalence of tourist/tertiary use over residential use particularly in the city centres. Thus, urban tourism has been commodified because of short-term rental platforms that have grown substantially (Brossat, 2019). The Airbnb platform stands out from the rest, with an offer of 5.6 million listings over more than 100,000 cities in September 2020 (Airbnb, 2020). A huge number of current studies analyse the Airbnb phenomenon at different scales all over the world (see Table 1) and results have shown that P2P accommodations have seen a rapid rise in the last decade. Previous studies have shown (1) how this kind of sharing economy boom has promoted tertiary use in mature and emerging tourist destinations, (2) which are the urban transformations on account of increasing tourist charge, and (3) whether there is an unfair competition against hotel supply.

Few research studies are based on variables that measure the degree of touristification of urban environments (see Table 1). These works consider static or quantitative indicators that correlate the sociodemographic and socioeconomic variables. Even though this topic has been widely researched, a qualitative point of view has not been thoroughly considered because of the difficulty in collecting informal data. The models presented in recent surveys show a complex vision of urban areas under tourist pressure, considering static variables from official statistics sources but with a lesser focus on informal ones from collaborative platforms or social networks, such as tourist attractions, reviews, or selfie points. Although Garcia-Ayllon (2018) defines a mixed model putting together quantitative and qualitative indicators, it is necessary to redefine the variables and include new ones from unofficial sources to have a holistic approach to the phenomenon. This is the research gap that serves as a basis for the present work.

The current work presents a methodology that can be used to identify neighbourhoods under tourism intensification processes in tourist destinations facing the tourism gentrification phenomenon. The main goal is the definition of an indicator system based on quantitative and qualitative variables: citizen initiatives, population, short-term rentals, regulated tourist accommodations, catering facilities, and cultural equipment. This would help identify neighbourhoods with a high level of tourism intensification as well as those with conflict of interest between residents, tourists, and other stakeholders involved. The identification of these issues will enable the application of urban policies by local governments to tackle overtourism in those neighbourhoods that are under tourist pressure and touristification.

The relevant information was collected from the representation of urban tourism issues in the most-read local newspapers. Thus, content analysis on news items has been developed to identify the associative network concerned about touristification, gentrification, and P2P accommodations. All this was done to determine if tourism intensification facilitates the emergence of citizen initiatives. This spatial analysis may serve as a basis for new strategies and purposes to tackle touristification and gentrification processes in the short and medium term.

2. Literature review

Recent studies on urban tourism are based on the Airbnb boom and its spatial distribution in tourist destinations all around the world (see Table 1). To gain comprehensive knowledge about this phenomenon spatially, Geographic Information System (GIS) tools have been applied in current research projects to gather several variables that measure the Airbnb offer. The variables include types of listings (i.e., entire properties and shared/private rooms), availability, beds, and professionalisation (i.e., multihouseholds), etc. The most-used variables taken into account include inhabitants, followed by residential use, hotel supply and beds, as well as incomes (see Table 1). These models depend on sociodemographic and socioeconomic variables mainly derived from official statistics sources. However, previous indicator systems are less dependent on variables that are qualitative in nature—for example, the stakeholders, facilities, local commerce, or catering trade—due to the difficulty in collecting, quantifying, monitoring, and obtaining real-time information about them. From a qualitative point of view and to a lesser extent, there are studies that also include dynamic and social variables, such as sightseeing points, feedback to hosts, geolocated photographs from the Panoramio platform, level of vulnerability to the displacement of residents, and local trade and other nonresidential properties (see Table 1).

Table 1. *Urban tourism variables related to Airbnb offer from a spatial point of view*

| Variable | Location(s) Continent Country State/Region (Country) City (Country) Neighbourhood/Street (City, Country) | Study |
|---|--|--------------------------------|
| 1. Residents | New Zealand | Campbell <i>et al.</i> (2019) |
| | Oregon (US) | DiNatale <i>et al.</i> (2018) |
| | Barcelona (Spain) | Gutiérrez <i>et al.</i> (2017) |
| | Porto (Portugal) | Chamusca <i>et al.</i> (2019) |
| | Seville (Spain) | Jover and Díaz-Parra (2020) |
| | Toronto (Canada) | Gridale (2019) |
| | Venice (Italy) | Bertocchi and Visentin (2019) |
| 2. Housing | Lombok (Utrecht, Netherlands) | Ioannides <i>et al.</i> (2019) |
| | Spain | Adamiak <i>et al.</i> (2019) |
| | Oregon (US) | DiNatale <i>et al.</i> (2018) |
| | Barcelona (Spain) | Gutiérrez <i>et al.</i> (2017) |
| | Berlin (Germany) | Schäfer and Braun (2016) |
| | Bologna-Florence-Napoles-Palermo-Rome-Venice (Italy) | Celata and Romano (2020) |
| | Seville (Spain) | Jover and Díaz-Parra (2020) |
| Rua dos Remedios (Alfama, Lisbon, Portugal) | Cocola-Gant and Gago (2019) | |
| 3. Hotel bed-places | Europe | Adamiak (2018) |
| | Spain | Adamiak <i>et al.</i> (2019) |
| | Balearic Islands (Spain) | Valdivielso and Moranta (2019) |
| | Barcelona (Spain) | Gutiérrez <i>et al.</i> (2017) |
| | Venice (Italy) | Bertocchi and Visentin (2019) |
| | Barceloneta (Barcelona, Spain) | Nofre <i>et al.</i> (2018) |

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| Variable | Location(s) Continent Country State/Region (Country) City (Country) Neighbourhood/Street (City, Country) | Study |
|-----------------------------|---|---|
| 4. Hotels | Spain | Adamiak <i>et al.</i> (2019) |
| | Andalusia (Spain) | Rodríguez-Pérez de Arenaza <i>et al.</i> (2019) |
| | Barcelona (Spain) HK(China)-LDN(UK)-NYC(US)-PAR(France)-SYD(Australia) Seville (Spain) | Gutiérrez <i>et al.</i> (2017) Crommelin <i>et al.</i> (2018) Jover and Díaz-Parra (2020) |
| | Barceloneta (Barcelona, Spain) | Nofre <i>et al.</i> (2018) |
| 5. Revenues | Oregon (US) Andalusia (Spain) | DiNatale <i>et al.</i> (2018) Rodríguez-Pérez de Arenaza <i>et al.</i> (2019) |
| | New York City (US) Porto (Portugal) Toronto (Canada) | Wachsmuth and Weisler (2018) Chamusca <i>et al.</i> (2019) Gridale (2019) |
| | Lombok (Utrecht, Netherlands) | Ioannides <i>et al.</i> (2019) |
| | | |
| 6. Long-term housing | Oregon (US) Andalusia (Spain) | DiNatale <i>et al.</i> (2018) Rodríguez-Pérez de Arenaza <i>et al.</i> (2019) |
| | New York City (US) Toronto (Canada) | Wachsmuth and Weisler (2018) Gridale (2019) |
| 7. Housholds | New York City-Chicago-Los Angeles (US) | Jiao and Bai (2020) |
| | Barceloneta (Barcelona, Spain) Lombok (Utrecht, Netherlands) Rua dos Remedios (Alfama, Lisbon, Portugal) | Nofre <i>et al.</i> (2018) Ioannides <i>et al.</i> (2019) Cocola-Gant and Gago (2019) |
| | Oregon (US) | DiNatale <i>et al.</i> (2018) |
| | Alfama (Lisbon, Portugal) Rua dos Remedios (Alfama, Lisbon, Portugal) | Nofre and Sequera (2019) Cocola-Gant and Gago (2019) |
| 9. Apartments | Andalusia (Spain) | Rodríguez-Pérez de Arenaza <i>et al.</i> (2019) |
| | Seville (Spain) Barceloneta (Barcelona, Spain) | Jover and Díaz-Parra (2020) Nofre <i>et al.</i> (2018) |
| | | |
| 10. Restaurants and shops | Barcelona (Spain) Venice (Italy) Lombok (Utrecht, Netherlands) | Gutiérrez <i>et al.</i> (2017) Bertocchi and Visentin (2019) Ioannides <i>et al.</i> (2019) |
| | | |
| | | |
| 11. Tourist attractions | Florence (Italy) Paris (France) Seville (Spain) | Celata <i>et al.</i> (2020) Freytag and Bauder (2018) Jover and Díaz-Parra (2020) |
| | | |
| | | |
| 12. Distance to city centre | Barcelona (Spain) Florence (Italy) Lombok (Utrecht, Netherlands) | Gutiérrez <i>et al.</i> (2017) Celata <i>et al.</i> (2020) Ioannides <i>et al.</i> (2019) |
| | | |
| | | |
| 13. Floating city users | Spain Porto (Portugal) | Adamiak <i>et al.</i> (2019) Chamusca <i>et al.</i> (2019) |
| | | |
| 14. Bookings | Oregon (US) Toronto (Canada) | DiNatale <i>et al.</i> (2018) Gridale (2019) |
| | | |
| 15. Short-term rentals | Oregon (US) Rua dos Remedios (Alfama, Lisbon, Portugal) | DiNatale <i>et al.</i> (2018) Cocola-Gant and Gago (2019) |
| | | |
| 16. Rent price | Andalusia (Spain) New York City (US) | Rodríguez-Pérez de Arenaza <i>et al.</i> (2019) Wachsmuth and Weisler (2018) |
| | | |
| 17. Rating | Florence (Italy) Bologna-Florence-Napoles-Palermo-Rome-Venice (Italy) | Celata <i>et al.</i> (2020) Celata and Romano (2020) |
| | | |
| 18. Reviews | Florence (Italy) Granada (Spain) | Celata <i>et al.</i> (2020) García-Álvarez (2019) |
| | | |
| 19. Inmigration | Andalusia (Spain) | Rodríguez-Pérez de Arenaza <i>et al.</i> (2019) |

| Variable | Location(s) Continent Country State/Region (Country) City (Country) Neighbourhood/Street (City, Country) | Study |
|---|--|---|
| | Lombok (Utrecht, Netherlands) | Ioannides <i>et al.</i> (2019) |
| 20. Coastal location | Spain | Adamiak <i>et al.</i> (2019) |
| 21. Daily rate | Oregon (US) | DiNatale <i>et al.</i> (2018) |
| 22. Fee and Tax Rates | | |
| 23. Mortgage | | |
| 24. Vacant units | | |
| 25. Second homes | Andalusia (Spain) | Rodríguez-Pérez de Arenaza <i>et al.</i> (2019) |
| 26. Arrivals | Balearic Islands (Spain) | Valdivielso and Moranta (2019) |
| 27. Fractal tourist city | Bologna-Florence-Napoles-Palermo-Rome-Venice (Italy) | Celata and Romano (2020) |
| 28. Offices | Barcelona (Spain) | Gutiérrez <i>et al.</i> (2017) |
| 29. Panoramic photos | | |
| 30. Shows/ performances | | |
| 31. Airbnb gentrification vulnerability | New York City (US) | Wachsmuth and Weisler (2018) |
| 32. Non-white population | Seville (Spain) | Jover and Díaz-Parra (2020) |
| 33. Elderly rate | | |
| 34. Hostels | | |
| 35. Degree of deterioration in buildings | Alfama (Lisbon, Portugal) | Nofre and Sequera (2019) |
| 36. People of active age | Lombok (Utrecht, Netherlands) | Ioannides <i>et al.</i> (2019) |
| 37. Presence of families with children | | |
| 38. Average housing value | | |
| 39. Apartment bed-places | Barceloneta (Barcelona, Spain) | Nofre <i>et al.</i> (2018) |
| 40. Non-residential properties | Rua dos Remedios (Alfama, Lisbon, Portugal) | Cocola-Gant and Gago (2019) |
| 41. Rehabilitation | | |

Source: Authors

Other works consider static or quantitative indicators that correlate with the following variables: (1) Airbnb offer structure with socioeconomic indicators (Adamiak, 2019); (2) Airbnb price, the distance of the Airbnb location from the city centre, and location of the point of interests (Dudás *et al.*, 2017); (3) socioeconomic and rental housing factors (Mínguez *et al.*, 2019); and (4) Airbnb listings, level of education, family revenue, dwelling area, population density, immigrant community, and distance to city centre and tourist spots (Lagonigro *et al.*, 2020). Thus, it is necessary to correlate variables that are both qualitative and quantitative in nature to show future scenarios and identify short- and long-term trends from a more complex and holistic vision of tourist destinations. Although in this regard, Garcia-Ayllon (2018) defines a mixed model incorporating a new subgroup of variables that focus on the urban transformation, including tourist pressure, increase in rental price, displacement, and social conflict. However, due to the lack of mixed models, research on redefinition and addition of variables is necessary to conduct in-depth measurements of new areas for the development of touristification.

3. Methodology

The methodology proposed is based on an indicator system mainly using open-access databases from several sources (see Table 2) as well as data implementation through GIS. In case regional governments or local administrations cannot access data through open-access platforms, (1) web scraping has been used as a research instrument to gather information on tourist accommodations posted on Google

Maps, and (2) telephone interviews or internet searches have been used to define their bed capacity. In addition, data from the most-read local newspapers have been retrieved to gain insight into citizens' concerns about overtourism (Chamizo-Nieto *et al.*, 2020). Once a comprehensive database is built, operational overlap and comparative statistical analysis by GIS show new areas of progress in tourism gentrification.

Table 2. *Tourism intensification indicators: definition, sources, and unit by neighbourhoods.*

| Indicators | Definition Source(s) | Unit |
|---------------------------|--|--|
| I1. Citizen Initiatives | <p>Citizen platforms, neighbourhood associations, and other stakeholders concerned regarding overtourism for the period up to and including 2019. All of them have been mentioned in the most-read online local newspapers—measured in daily readers from April 2019 to March 2020—according to the <i>Asociación para la Investigación de Medios de Comunicación</i> media audit.</p> <p>City: <i>Name of the newspaper</i> (no. of readers) Malaga: <i>Diario SUR</i> (148,000) <i>Málaga hoy</i> (16,000) <i>La Opinión de Málaga</i> (10,000) Valencia: <i>Levante-El Mercantil Valenciano</i> (163,000)</p> | No. of citizen initiatives/100,000 inhabitants |
| I2. Population | <p>Municipal census data in 2019 form National Statistics Institute.</p> <p>Malaga: Register of inhabitants at 31st December 2019 Datos abiertos–Ayuntamiento de Málaga (2019c) Valencia: Register of inhabitants at 1st January 2020 Oficina d'Estadística–Ajuntament de València (2019b)</p> | No. of residents/ha |
| I3. Airbnb | <p>Airbnb listings collected by Inside Airbnb (Cox, 2016) at 31st December 2019.</p> | No. of Airbnb listings/100,000 inhabitants |
| I4. Tourist Accommodation | <p>Regulated tourist accommodations—(1) peer-to-peer (P2P) accommodation, (2) hotel, (3) tourist apartment, (4) guest house, (5) boarding house, and (6) shelter—registered up to and including the year 2019 and gathered by regional government and local administration.</p> <p>Malaga: (1–5) Consejería de Turismo, Regeneración, Justicia y Administración Local–Junta de Andalucía (2019)/(6) Webscraping from Google Maps to collect the offer first, and subsequently, internet searching to get the total no. of beds posted on official web pages. Valencia: (1–2, 4–6) Dades Obertes–Genralitat Valenciana (2019)/(3) Dades Obertes–Ajuntament de València (2019a) shows tourist apartment buildings but not the sum of bed; therefore, telephone interviews were conducted to obtain the total no. of beds there.</p> | No. of beds/100,000 inhabitants |
| I5. Cultural Equipment | <p>Art and cultural facilities up to and including the year 2019 and listed by the local administration open data.</p> <p>Malaga: Data collection updated monthly since 11th May 2017 Datos abiertos–Ayuntamiento de Málaga (2019b) Valencia: Data collection updated weekly since 5th May 2016 Dades Obertes–Ajuntament de València (2019a)</p> | No. of equipment/100,000 inhabitants |

| Indicators | Definition Source(s) | Unit |
|--------------------|--|--|
| I6. Catering Trade | Restaurants and terraces up to and including the year 2019 and listed by the local administration open data. Malaga: Data collection at 19 th October 2019 Datos abiertos-Ayuntamiento de Málaga (2019a) Valencia: Data collection updated weekly since 5 th May 2016 Dades Obertes-Ajuntament de València (2019a) | No. of restaurants/100,000 inhabitants |

Source: Authors

Regarding the considered variables (see Table 2), the following six indicators have been standardised, taking into account the number of residents (100,000 inhabitants) or the area measured by hectare, all of them by neighbourhood:

- Citizen Initiatives (I1): Number of urban movements, associations, or platforms that take part in the conflict of interests between residents, tourists, and other stakeholders involved. The representation of social movements in the most-read local newspapers serves as a basis for identifying the stakeholders involved for the period up to and including 2019. The significant impact on newspapers is defined by *Asociación para la Investigación de Medios de Comunicación* media audit. Daily readers set out the impact of local newspapers on paper or *Kiosko y Más* and *Orbit* displays from April 2019 to March 2020. After selecting the most-read newspapers, keyword filters show news items about the research topic before the content analysis. Topic-based searches carried out in previous studies are based on topics such as “tourism and inhabitants” and “tourism and residents” (Guizi et al., 2020), or “Airbnb” (Hassanli et al., 2019; Ozdemir & Turker, 2019). To refine research results and make them comprehensive, the selected keywords include (1) “*turistificación*” (touristification), (2) “*gentrificación*” (gentrification), and (3) “*apartamentos turísticos*” (P2P accommodations). The last keyword implies *viviendas turísticas* (holiday housing), *alquiler turístico* (holiday rental), and *apartamentos vacacionales* (holiday apartments). Once the stakeholders have been identified, each one is located on map according to its registered office or address for notification, headquarters, proposed public space, or urban area with which it struggles.
- Population (I2): This refers to the number of residents by neighbourhood, according to the municipal census data of 2019 from National Statistics Institute. To calculate the population density, the number of inhabitants per quarter has been standardised considering the area measured by hectare.
- Airbnb (I3): This includes regulated and nonregulated P2P accommodations, as obtained from the Airbnb site on 31st December 2019, according to the Inside Airbnb platform (Cox, 2016): an open-access dataset about Airbnb listings per city all over the world. Text files are sourced from publicly available information that is monitored monthly. Data are stored in a database along with its geographical coordinates; thus, it has been batched by GIS to assign a sum of listings to every neighbourhood.
- Tourist Accommodations (I4): These refer to the beds offered by regulated tourist accommodations up to and including the year 2019. Typologies of accommodation considered are short-term rentals, hotels, tourist apartments, guest houses, boarding houses, and shelters. Listings with latitude and longitude coordinates were geolocated to measure the supply by neighbourhood as a territorial unit. Not only do official listings come from local administration and regional government platforms (Ajuntament de València, 2019b; Generalitat Valenciana, 2019; Junta de Andalucía, 2019), but scraping Google Maps, internet searches, and telephone interviews also help to complete the database because all data are not available. These tools

enable to gather data, in case they are not openly accessible, which is what universalises this research method.

- Cultural Equipment (I5): Cultural and recreational facilities that were active in 2019 have been mapped using the geographical coordinates from local administration listings. Leisure activities include cultural centres, such as auditoriums, galleries, monuments, museums, showrooms, conference rooms, and theatres.
- Catering Trade (I6): Restaurants and terraces that were offered in 2019 according to open-access platforms from local administration. Official listings with latitude and longitude coordinates make it possible to geolocate all hostelry services by points.

3.1 Case studies

The Mediterranean arc is the location where tourism gentrification processes spread over coastal cities. Thus, the study population is located in the Spanish port cities of Malaga and Valencia. Theirs population sizes are not the same. According to the municipal census data in 2019, there were 580,469 inhabitants in Malaga (Ayuntamiento de Málaga, 2019c) and 801,545 in Valencia (Ajuntament de València, 2019c). However, these two tourist destinations have the following identical features (Calle Vaquero, 2019): (1) aerial accessibility because of low-cost airlines, (2) cruise ship dock, and (3) significant cultural and leisure offers. These tourist services have facilitated tourism intensification from 2009 to 2019 (see Table 3):

- (1) The sum of air passengers arriving in Malaga and Valencia has seen nearly the same increase over the same period: an average growth rate of 175% (Aeropuertos Españoles y Navegación Aérea [AENA], 2009, 2019).
- (2) According to the quality and innovative cultural offer ranking from Spain in 2019, Malaga ranks fourth and Valencia is in fifth place (Observatorio de la Cultura, 2019). Just 2.6 points between both cities made them enter in the top 5.
- (3) In 2019, Valencia almost equaled Malaga in terms of the number of visitors arriving by cruise ship. Both cities were closely ranked in the 2019 national port ranking: they were separated by just one position after a decade.

In both cities, the municipalities are the focus of this study. This territorial scale is part of the Local Administrative Units (LAU) as defined by Eurostat (European Commission, 2019) in 2017. Thus, the neighbourhood is a territorial unit defined to analyse the whole municipality of Malaga (N = 417) and Valencia (N = 88). Despite the fact that census sections consider smaller areas than neighbourhoods, the former was not taken into account because it responds to electoral division instead of urban pattern. Even though the sum of neighbourhoods differs in both cities, this work presents a tourism intensification analysis of both cities to establish spatial relationships between them. In this regard, every case study is analysed separately using the same methods. Polygons/neighbourhoods shape files posted on open-data platforms from local governments (Ajuntament de València, 2019d; Ayuntamiento de Málaga, 2019b) serve as the base geography. However, coastlines were redefined to mark the real land area because population (I2) is standardised by hectare to calculate the number of inhabitants per neighbourhood. Likewise, the rest of the indicators (I1, I3–I6) have been standardised per 100,000 inhabitants. This is to ensure a comparative analysis between neighbourhoods within and among cities.

Table 3. Spanish tourism data about airline and cruise passengers, and cultural activities over the decade from 2009 to 2019.

| Spanish tourism data | | Malaga | | | Valencia | | |
|--|------------------|------------|------------|-----------|-----------|-----------|----------|
| | | 2009 | 2019 | Δ | 2009 | 2019 | Δ |
| (1) Airline passengers (AENA, 2009, 2019) | Travellers (no.) | 11,622,429 | 19,858,656 | +170.86 % | 4,748,997 | 8,539,579 | +179.82% |
| | Ranking (#) | 4 | 4 | = | 9 | 8 | +1 |
| (2) Cultural activities (Observatorio de la Cultura, 2009, 2019) | Score (%) | 2 | 54.8 | +52.8 | 35.5 | 52.2 | +16.7 |
| | Ranking (#) | 19 | 4 | +15 | 4 | 5 | -1 |
| (3) Cruise passengers (Puertos del Estado, 2009, 2019) | Travellers (no.) | 487,955 | 476,973 | -2.25% | 184,909 | 435,616 | +235.58% |
| | Ranking (#) | 5 | 6 | -1 | 8 | 7 | +1 |

Source: Authors.

3.2 Data analysis

Once an indicator system has been defined and all data have been obtained, it is necessary to explain the research tools that have been developed via GIS to normalise the data considering neighbourhoods as territorial units. Every research stage measures the level of tourism intensification through several variables, which tag every quarter from its residential, economic, and sociocultural activities. Data collection and curation aim to build a database that gathers files in different formats, such as texts, registers, addresses, or coordinates. To do so, GIS software—ArcGIS 10.8 and QGIS 3.10—were used to develop tabulation processes, data binding, geocoding, and georeferencing of data from several sources. After the layers were geolocated, spatial join geoprocessing was used to match data with every polygon/neighbourhood from both case studies. This step enabled the summation of all citizen initiatives, residents and tourist accommodations, and facilities located in each quarter to show a spatial analysis of urban patterns by GIS mapping. Once the data were classified by neighbourhood, the dataset was standardised by considering the number of residents per 100,000 inhabitants (I₁, I₃–I₆) or the area measured in hectares (I₂) to compare quarters between them. Moreover, data were analysed using the statistical package IBM SPSS v23 to define Pearson correlations among the indicators considered to be established by neighbourhoods but separately in each city.

4. Results and discussion

The six indicators have been standardised through intervals or ranges (see Table 4) to compare both cities and identify common patterns. A red colour gradient has been defined to measure every indicator by neighbourhood to identify which quarters concentrate the offer in a comparative way between neighbourhoods and cities. The criteria established by the defined ranges are as follows: R₄ identifies those neighbourhoods where the values are higher, whereas R₁ refers to those whose values are lower; Ro means there is no value or it is not significant.

It should be noted that the entire municipalities in both cities have been analysed; therefore, the neighbourhoods that cover areas outside the urban footprint and those that are far away from the “city” boundaries have been considered. This means that rural areas do not have centralised tourist facilities like urban areas. As a result, the neighbourhoods beyond the urban city have high index values because of low population densities and large areas. Furthermore, citizen initiatives mainly take place in urban areas close to city centre. Focusing on these active neighbourhoods (see Tables 5 and 6), it is clear that

an increase in the presence of citizen initiatives results in higher tourism intensification values and a lower population density.

Table 4. Indicator system standardised through ranges.

| Ranges (R) Interval notation | I1 Citizen Initiatives No. of citizen initiatives/ 100,000 inhab. | I2 Population No. of residents/ha | I3 Airbnb No. of listings /100,000 inhab. | I4 Tourist Accom. No. of beds/ 100,000 inhab. | I5 Cultural Equip. No. of equipment/ 100,000 inhab. | I6 Catering Trade No. of restaurants/ 100,000 inhab. |
|---|---|--|--|--|---|--|
| R0 | [0, 1) | [0, 1) | [0, 1) | [0, 1) | [0, 1) | [0, 1) |
| R1 | [1, 30) | [1, 75) | [0, 500) | [1, 1,500) | [1, 50) | [1, 100) |
| R2 | [30, 100) | [75, 120) | [500, 1,000) | [1,500, 5,000) | [50, 250) | [100, 200) |
| R3 | [100, 300) | [120, 350) | [1,000, 3,000) | [5,000, 15,000) | [250, 1,000) | [200, 1,000) |
| R4 | ≥300 | ≥350 | ≥3,000 | ≥15,000 | ≥1,000 | ≥1,000 |

Source: Authors.

Both tables (see Tables 5 and 6) present the indicators that relate directly to them. This indicator system may serve as a basis for formulating short- and medium-term urban policies to deal with tourism gentrification. In addition to the selected Spanish case studies, coastal and inner cities across the world fit into the current work because touristification is a global phenomenon. Results through ranges show common patterns between the indices of citizen initiatives (I1) and tourist accommodations and facilities (I3–I6). However, the relationship between the first indicator and the population index (I2) is indirect, as expected. In those neighbourhoods where there are several citizen protests, the sum of inhabitants is on the decrease. Both relationships are more significant in Malaga than in Valencia because the touristification process is mainly concentrated in the city centre of Malaga, while in Valencia, the phenomenon takes place at the historic centre and neighbourhoods close to it. Several reasons explain the difference between both cities (see Tables 5 and 6):

- The coastal line in Valencia is not as close to the city centre as it is in Malaga.
- The city centre in Valencia is called Ciutat Vella and comprises six neighbourhoods: El Carme, El Mercat, El Pilar, La Seu, La Xerea, and San Francesc; thus, it does not work as a whole. However, the old town of Malaga is just one quarter.
- Valencia is the capital in the region of Comunitat Valenciana, but Malaga does not lead the autonomous community of Andalusia whose capital city is Seville. This could explain why more citizen initiatives are promoted by the administration and geolocated in Valencia.

4.1 Dataset mapping

Each indicator considered in the present work for the Spanish coastal cities as a comparative case study is measured using GIS mapping (see Figures 1 and 2). This shows every variable using the same colour code as in the ranges presented above. The colour gradient is spatially more homogeneous in Malaga than in Valencia. This fact shows how the supply of beds and facilities is more concentrated in a few neighbourhoods in Malaga. In contrast, the offer spreads over the city of Valencia without solely depending on the Ciutat Vella city centre. As presented previously in the statistical results (see Tables 5 and 6), the cluster of citizen initiatives (I1) is located in the old town in both Malaga and Valencia cities. This is due to the spread of touristification processes in the city centre where sightseeing attractiveness is at the top. In Valencia, citizen initiatives take place in the historic centre as well as in the port.

Table 5. Tourism intensification indicators in the neighbourhoods with citizen initiatives involved in the city of Malaga (N = 26/417).

| Active neighbourhoods (N = 26) No. of citizen initiatives in absolute terms (Σ) | I1 Citizen Initiatives No. of citizen initiatives/ 100,000 inhab. | I2 Population No. of residents/ha | I3 Airbnb No. of listings/ 100,000 inhab. | I4 Tourist Accom. No. of beds/ 100,000 inhab. | I5 Cultural Equip. No. of equipment/ 100,000 inhab. | I6 Catering Trade No. of restaurants/ 100,000 inhab. |
|--|--|---|--|--|--|---|
| ① Parque del Morlaco 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| ② Puerto 2 | 0 | 0 | 0 | 0 | 5 | 0 |
| ③ La Trinidad 1 | 5.59 | 284 | 1,952.45 | 12,408.39 | 55.94 | 156.64 |
| ④ La Luz 1 | 11.35 | 650.44 | 181.67 | 397.41 | 0 | 204.38 |
| ⑤ Pol. Alameda 1 | 15.83 | 158.93 | 569.71 | 2,959.33 | 15.83 | 474.76 |
| ⑥ Pol. Ctra. de Cártama 1 | 16.43 | 172.95 | 98.55 | 8,065.05 | 32.85 | 65.7 |
| ⑦ Jardín de la Abadía 1 | 16.8 | 279.78 | 655.35 | 4,016.13 | 33.61 | 235.25 |
| ⑧ El Ejido 1 | 18.72 | 223.94 | 3,819.51 | 13,405.73 | 131.06 | 187.23 |
| ⑨ La Malagueta 1 | 21.77 | 182.62 | 4,071.41 | 31,809.28 | 108.86 | 587.85 |
| ⑩ El Molinillo 1 | 27.96 | 322.74 | 2,376.96 | 14,401.57 | 27.96 | 55.93 |
| ⑪ La Noria 1 | 38.39 | 120.88 | 38.39 | 0 | 0 | 0 |
| ⑫ Dos Hermanas 1 | 47.6 | 100.72 | 618.75 | 999.52 | 0 | 95.19 |
| ⑬ El Candado 1 | 73.69 | 19.06 | 3,537.21 | 19,749.45 | 0 | 0 |
| ⑭ Playas del Palo 1 | 111.86 | 52.22 | 3,579.42 | 19,015.66 | 0 | 1,901.57 |
| ⑮ Las Palmeras 1 | 127.23 | 73.25 | 636.13 | 2,671.76 | 127.23 | 0 |
| ⑯ San Felipe Neri 2 | 175.75 | 214.72 | 12,565.91 | 59,578.22 | 702.99 | 0 |
| ⑰ Plaza de Toros Vieja 6 | 218.26 | 277.96 | 1,818.84 | 46,780.65 | 109.13 | 145.51 |
| ⑱ Ensanche Centro 6 | 240.67 | 79.42 | 7,420.78 | 110,830.32 | 922.58 | 1,925.39 |
| ⑲ Lagunillas 4 | 243.01 | 384.58 | 5,832.32 | 34,690.15 | 303.77 | 0 |
| ⑳ La Merced 4 | 300.53 | 172.86 | 27,648.38 | 204,132.23 | 1,051.84 | 2,404.21 |
| ㉑ Centro Histórico 16 | 373.31 | 86.06 | 27,601.49 | 221,605.23 | 2,473.17 | 7,186.19 |
| ㉒ La Araña 1 | 384.62 | 8.03 | 384.62 | 2,307.69 | 384.62 | 0 |
| ㉓ Tabacalera 1 | 531.91 | 28.14 | 6,914.89 | 75,531.91 | 2,127.66 | 0 |
| ㉔ Baños del Carmen 1 | 1,298.7 | 13.44 | 22,077.92 | 23,376.62 | 0 | 0 |
| ㉕ Arraijanal 1 | 25,000 | 0.06 | 100,000 | 0 | 0 | 0 |
| ㉖ Ciudad Universitaria 2 | 200,000 | 0.01 | 300,000 | 500,000 | 400,000 | 100,000 |

Note: These active neighbourhoods have been listed according to I1, with the lowest at the top and the highest at the bottom. Data have been tagged by ranges in a sequential colour code (see Table 4): the highest values are red and the lowest ones are white. Source: Authors.

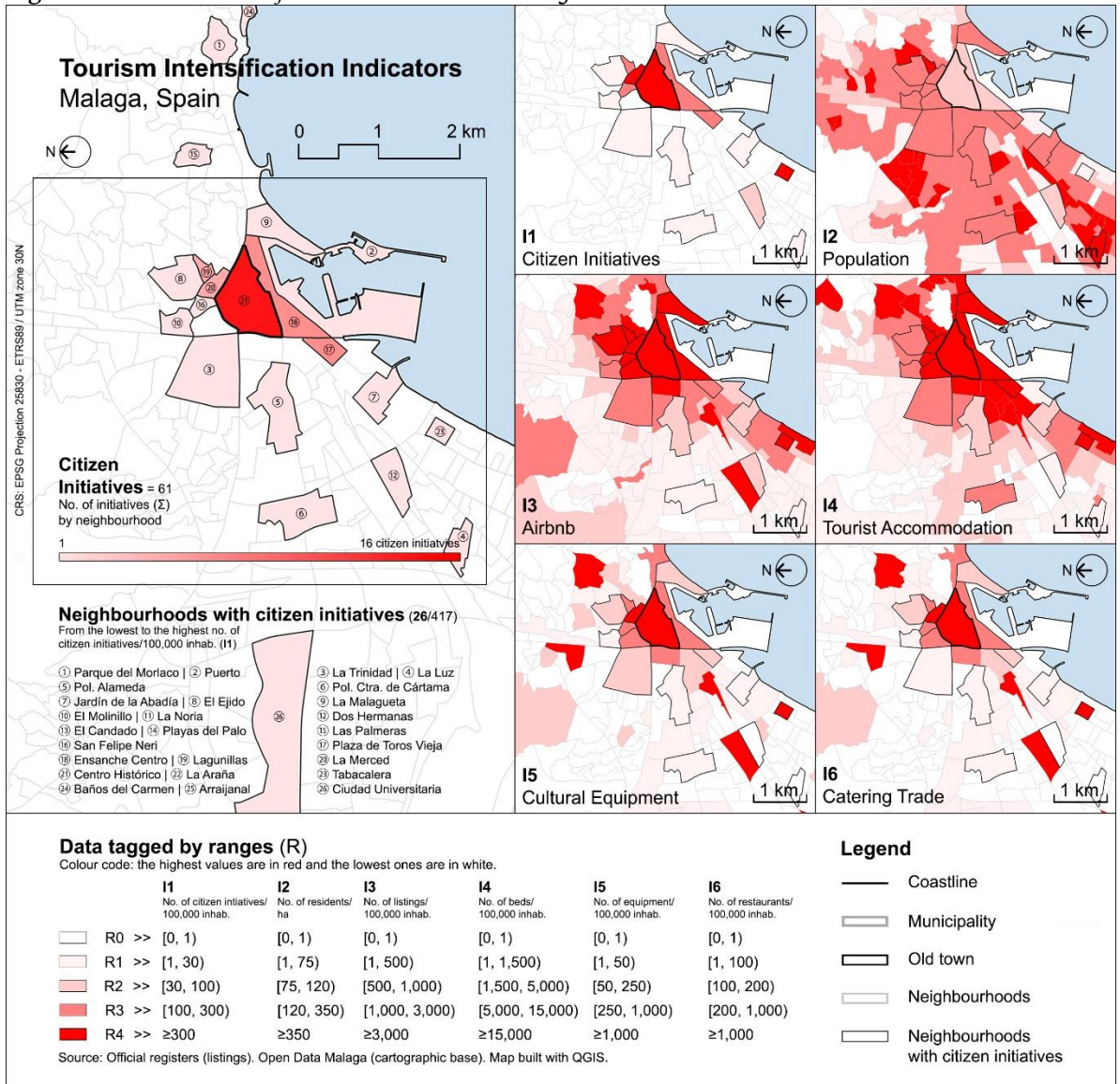
According to residential usage, population density (I2) is highest in the neighbourhoods around the city centre in Malaga than in Valencia. This may be because of urban regeneration plans, which promote sightseeing attractiveness and displace residential use for tertiary use. However, displacement of residents is more significant in Malaga than in Valencia. This could be due to participatory monitoring by stakeholders involved in the different urban project stages in Valencia, as it is registered in the news items read to build I1 dataset. Nonetheless, the distance between the city centre and port makes citizen initiatives sprawl all over the city and balances Valencia's tourist charge.

Table 6. *Tourism intensification indicators in the neighbourhoods with citizen initiatives involved in the city of Valencia (N = 31/88).*

| Active neighbourhoods (N = 31) No. of citizen initiatives in absolute terms (Σ) | I1 Citizen Initiatives No. of citizen initiatives/ 100,000 inhab. | I2 Population No. of residents/ha | I3 Airbnb No. of listings/100,000 inhab. | I4 Tourist Accom. No. of beds/100,000 inhab. | I5 Cultural Equip. No. of equipment/ 100,000 inhab. | I6 Catering Trade No. of restaurants/ 100,000 inhab. |
|--|--|--|--|---|--|---|
| ① L'Hort de Senabre 1 | 5.86 | 400.14 | 169.97 | 216.85 | 11.72 | 0 |
| ② La Raiosa 1 | 6.45 | 412.71 | 619.63 | 316.27 | 0 | 6.45 |
| ③ La Petxina 1 | 6.65 | 302.8 | 817.82 | 1,136.97 | 33.24 | 19.95 |
| ④ Penya-Roja 1 | 8.06 | 136.25 | 878.04 | 31,045.6 | 8.06 | 96.67 |
| ⑤ La Gran Vía 1 | 8.42 | 253.48 | 597.74 | 2,862.44 | 33.68 | 286.24 |
| ⑥ Sant Isidre 1 | 10.03 | 201.29 | 10.03 | 0 | 20.06 | 0 |
| ⑦ Sant Antoni 1 | 10.2 | 392.71 | 356.92 | 499.69 | 20.4 | 10.2 |
| ⑧ El Grau 1 | 10.63 | 18 | 2,072.7 | 5,548.47 | 85.03 | 31.89 |
| ⑨ Nou Moles 3 | 11.52 | 352.23 | 483.67 | 525.89 | 11.52 | 0 |
| ⑩ Tormos 1 | 11.59 | 308.25 | 428.84 | 440.43 | 11.59 | 11.59 |
| ⑪ Trinitat 1 | 12.81 | 131.06 | 909.44 | 1,537.09 | 102.47 | 12.81 |
| ⑫ Arrancapins 3 | 13.33 | 257.41 | 924.12 | 1,621.64 | 44.43 | 57.76 |
| ⑬ Mestalla 2 | 13.66 | 173.61 | 696.44 | 5,783.15 | 68.28 | 198.01 |
| ⑭ Ciutat de les Arts i de les Ciències 1 | 14.18 | 71.27 | 865.25 | 19,673.75 | 113.48 | 70.92 |
| ⑮ Castellar-L'Oliveral 1 | 14.71 | 22.74 | 58.82 | 0 | 29.41 | 0 |
| ⑯ Exposició 1 | 14.86 | 176.36 | 490.34 | 1,708.76 | 118.87 | 44.58 |
| ⑰ El Botànic 1 | 15.11 | 178.87 | 2,280.97 | 8,504.53 | 166.16 | 45.32 |
| ⑱ Natzaret 1 | 16.69 | 65.33 | 467.37 | 333.83 | 33.38 | 0 |
| ⑲ Benimaclet 4 | 17.16 | 313.59 | 502.02 | 802.37 | 12.87 | 25.74 |
| ⑳ Marxalenes 2 | 18.82 | 272.26 | 602.13 | 536.27 | 18.82 | 18.82 |
| ㉑ Morvedre 2 | 19.57 | 238.72 | 1,213.07 | 929.37 | 68.48 | 19.57 |
| ㉒ Tres Forques 2 | 22.2 | 171.05 | 421.71 | 133.17 | 22.2 | 0 |
| ㉓ La Roqueta 1 | 22.48 | 192.93 | 3,371.54 | 12,587.1 | 179.82 | 67.43 |
| ㉔ Russafa 7 | 29.48 | 270.5 | 2,324.99 | 3,542.25 | 29.48 | 75.82 |
| ㉕ Cabanyal-Canyamelar 6 | 30.77 | 144.51 | 3,585.17 | 7,873 | 66.68 | 87.19 |
| ㉖ La Xerea 4 | 102.35 | 125.42 | 3,607.98 | 27,047.08 | 1,049.13 | 153.53 |
| ㉗ El Carme 7 | 110.36 | 165.14 | 5,265.65 | 9,475.02 | 646.38 | 173.42 |
| ㉘ El Pilar 6 | 129.76 | 286.14 | 4,000.87 | 5,493.09 | 129.76 | 64.88 |
| ㉙ Sant Francesc 10 | 177.81 | 128.2 | 6,009.96 | 53,645.09 | 604.55 | 408.96 |
| ㉚ La Seu 6 | 199.14 | 136.27 | 7,832.72 | 33,222.71 | 1,593.1 | 564.22 |
| ㉛ El Mercat 11 | 309.16 | 205.9 | 9,106.24 | 30,747.61 | 534.01 | 196.74 |

Note: These active neighbourhoods have been listed according to I1, with the lowest at the top and the highest at the bottom. Data have been tagged by ranges in a sequential colour code (see Table 4): the highest values are red and the lowest ones are white. Source: Authors.

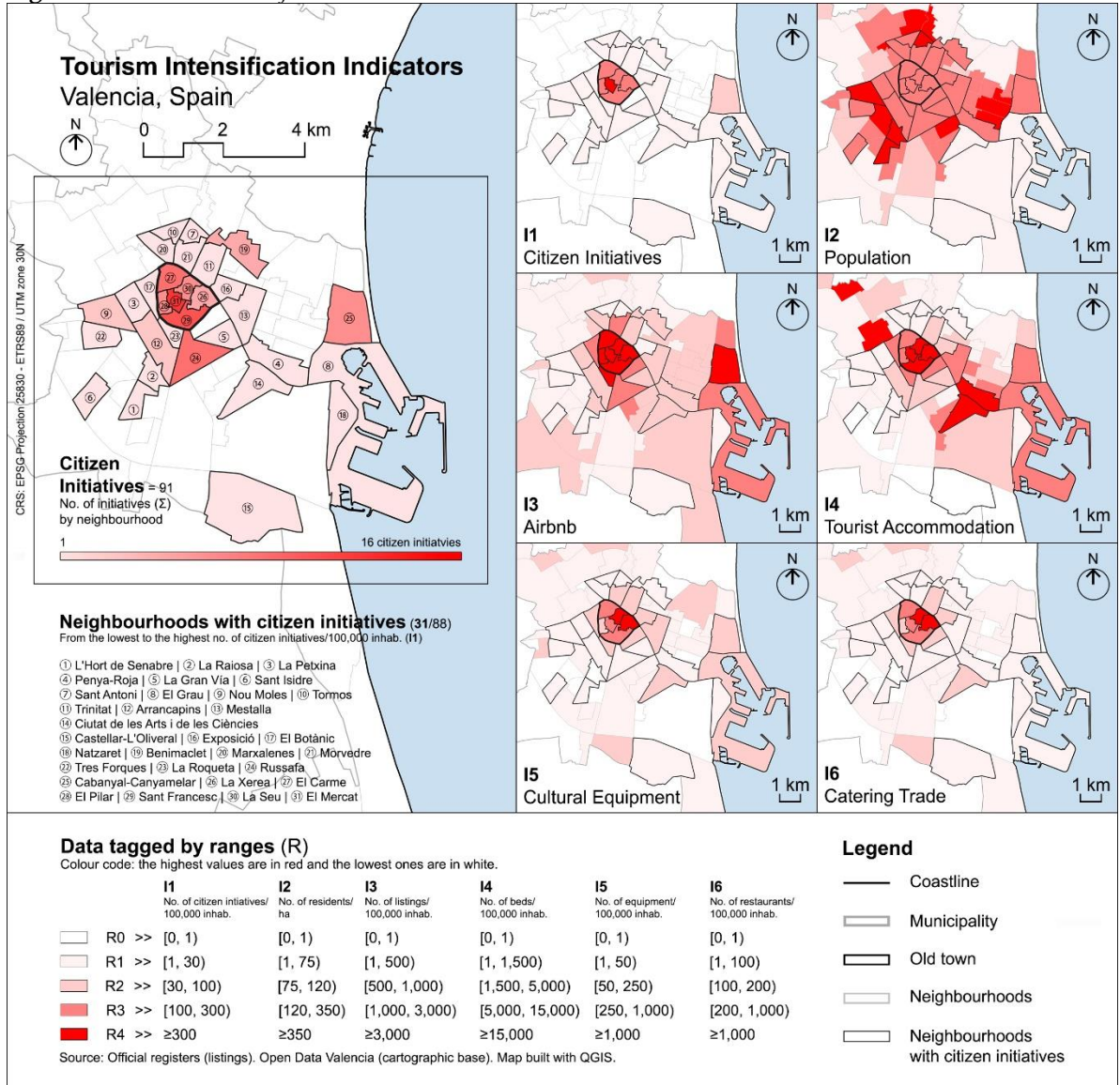
Figure 1. Tourism intensification indicators in Malaga.



Source: Authors

Focusing on the spatial distribution of Airbnb offers (I3), both city centres and their surroundings concentrate on the supply. It should be noted that the port of Valencia is one of the most urban areas where the Airbnb listing is at the top. In Malaga, the Airbnb supply spreads along the coastline far away from the port. The same urban pattern occurs in tourist accommodations (I4): bed supply spreads over several neighbourhoods, but the old town stands out in both cities. However, the port of Valencia gathers accommodations, unlike Malaga.

Figure 2. Tourism intensification indicators in Valencia.



Source: Authors

The cultural and recreational activities have different spatial distributions in relation to the tourist accommodations. On the one hand, cultural facilities (I5) are mainly concentrated in the old town in both cities as a cluster. This network of creating spaces shows the old town as a city of museums within the city. The dependence on the city centre is evident in Valencia because of its urban development. Nevertheless, both the historic centres and the areas around the waterfront stand out for their network of leisure activities. On the other hand, the catering trade (I6) spreads mainly in the city centre in both cities but it extends toward the neighbourhoods close to it. In Malaga, the coastline is considered to be a new growth area for restaurants and terraces.

4.2 Pearson correlation analysis

After analysing the tourism intensification indicators separately by neighbourhoods in both cities, Pearson correlation analyses (see Tables 7 and 8) show the correlations between variables analysed by neighbourhoods from Malaga and Valencia separately. It is highlighted that there is statistically significant correlation between citizen initiatives (I1) and Airbnb (I3) indices, and the former and cultural equipment (I5) in Malaga ($r = 0.626, p < 0.001$; $r = 0.962, p < 0.001$) respectively. These significant correlations between the I1 and I3 indices, and the I1 and I5 ones are also pointed out in the case of Valencia ($r = 0.877, p < 0.001$; $r = 0.752, p < 0.001$). At the same level of significance but with a moderate correlation coefficient, there is an inverse relationship between citizen initiatives (I1) and catering trade (I6) indices in Malaga ($r = -0.602, p < 0.001$), whereas the former is positively correlated with tourist accommodation (I4) in Valencia ($r = 0.615, p < 0.001$). According to the tourist accommodation index, Airbnb (I3) is partially considered: not only illegal supply but also regular offer is counted for the former. Thus, colinearity could occur between the I3 and I4 indices. Correlation analysis also shows a highly significant correlation between Airbnb (I3) and cultural equipment (I5) in both cities ($r = 0.649, p < 0.001$; $r = 0.742, p < 0.001$) respectively.

Table 7. Pearson correlations among tourism intensification indicators in Malaga (N = 417).

| Indicators | I1 Citizen Initiatives No. of citizen initiatives/ 100,000 inhab. | I2 Population No. of residents/ha | I3 Airbnb No. of listings/100, 000 inhab. | I4 Tourist Accom. No. of beds/100,000 inhab. | I5 Cultural Equip. No. of equipment/ 100,000 inhab. | I6 Catering Trade No. of restaurants/ 100,000 inhab. |
|------------|--|--|---|---|--|---|
| I1 | - | | | | | |
| I2 | 0.043 | - | | | | |
| I3 | 0.626*** | -0.106* | - | | | |
| I4 | 0.051 | -0.057 | 0.082 | - | | |
| I5 | 0.962*** | -0.059 | 0.649*** | 0.188*** | - | |
| I6 | -0.602*** | -0.081 | 0.366*** | 0.039 | 0.597*** | - |

Note: * $p < 0.05$, *** $p < 0.001$. Source: Authors.

Comparing the two correlation analyses, it is noted that there are significant correlations and over moderate correlation coefficient values between indicators ($r = 0.4-0.69$; $p < 0.05$) in Valencia rather than in Malaga. This could be because the count of significant correlations is lower in Malaga, as the sum of neighbourhoods in Malaga (N = 417) is considerably greater than that in Valencia (N = 88). To avoid these differences in neighbourhood sizes, a smaller territorial unit, such as a census district, could be considered in new research if data are available for this territorial unit. Likewise, both tables show negative correlations between population (I2) and the other variables with low correlation coefficients. Current studies consider population density in relation to tourist accommodation, especially Airbnb, spatially (see Table 1). This is because Airbnb offers spread across old towns and surroundings, resolving the deficiency in the supply of regulated tourist accommodations as observed in Barcelona (Gutiérrez et al., 2017). This implies that there is a displacement of inhabitants to the city edge because of short-term rentals (Ioannides et al., 2019; Jover & Díaz-Parra, 2020). However, the population index (I2)

Table 8. Pearson correlations among tourism intensification indicators in Valencia (N = 88).

| Indicators | I1 Citizen Initiatives No. of citizen initiatives/ 100,000 inhab. | I2 Population No. of residents/ha | I3 Airbnb No. of listings/ 100,000 inhab. | I4 Tourist Accom. No. of beds/100,000 inhab. | I5 Cultural Equip. No. of equipment/ 100,000 inhab. | I6 Catering Trade No. of restaurants/ 100,000 inhab. |
|------------|--|--|--|---|--|---|
| I1 | - | | | | | |
| I2 | 0.011 | - | | | | |
| I3 | 0.877*** | -0.045 | - | | | |
| I4 | 0.615*** | -0.161 | 0.628*** | - | | |
| I5 | 0.752*** | -0.122 | 0.742*** | 0.622*** | - | |
| I6 | 0.258* | -0.203 | 0.287** | 0.34** | 0.373*** | - |

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Source: Authors.

significantly correlates with the Airbnb index (I3) in Malaga city. This indicator has been defined according to the Municipal Register in 2019; therefore, new research could consider redefining this indicator to evaluate the increase or decrease of residents for several years when touristification occurs. This might reveal if this indicator correlates with the others.

Focusing on Malaga, there is a strong and significant correlation between citizen initiatives (I1) and cultural equipment (I5) indices (see Table 7; $r = 0.962$, $p < 0.001$). This could be because the local administration increased cultural institutions for the European nomination of *Málaga Ciudad de Museos: Donde habita el arte* in 2016. Thus, the number of museums has risen from 22 in 2007 (Ramos Lizana, 2008) to a total of 40 galleries currently (Área de Turismo del Ayuntamiento de Málaga, 2021). This increment in the sum of cultural activities in the old town led to the establishment of a cluster of museums. This has improved its sightseeing attractiveness to franchises that displace day-to-day commerce (Barrera-Fernández *et al.*, 2019). The contribution to business premises in 2017 went up to above 45% compared with local trade within the historic centre. This has affected the habitability of the city centre in terms of a reduction in the number of inhabitants in the range of about 15% from 2009 to 2019 (Ayuntamiento de Málaga, 2009, 2019c). This situation has inspired and motivated emerging citizen platforms (Cátedra Tecnologías Emergentes para la Ciudadanía, 2018) to promote the right to the city (Blanco-Romero *et al.*, 2019; Calle Vaquero, 2019). In Valencia, there is another significant association between Airbnb (I3) and tourist accommodation (I4) variables (see Table 8; $r = 0.628$, $p < 0.001$). This could be due to the short-term rental and hotel intensifications from 2016 to 2019 in Ciutat Vella city centre (García-Amaya *et al.*, 2021). However, a higher correlation coefficient was expected despite the possible colinearity mentioned above. This moderate correlation might have been due to the limited growth of new hotel bed capacity in the old town since 2018 and the Russafa and Cabanyal-Canyamelar neighbourhoods from 2016 to 2018 and 2019 respectively (García-Amaya *et al.*, 2021).

Pearson correlations among tourism intensification indicators may serve as a basis for guiding local administrations in the elaboration of urban policies about tourism, with special attention to the touristification of city centres. Citizen initiatives (I1) mapping shows where protest and resistance about urban tourism take place in the tourist city. The spatial relationship between these citizen initiatives (I1) and the Airbnb listings (I3) shows which urban areas are under tourism pressure. This correlation reveals the need to regulate P2P accommodations as population density is on the decrease where they are located as a cluster. To do so, several strategies to ensure residential use on cities may be implemented to deal with overtourism in certain areas with a high tourism intensification, such as:

- moratorium on the issuing of licences for holiday renting homes,
- regulation of terraces on public spaces to ensure sidewalk track section,
- promotion of social housing and long-term rentals,
- relocation of tourism facilities reducing dependence on the city centre, or
- day-to-day commerce support by restricting the use of franchises to secure residential services.

The spatial analysis of tourism intensification shows which areas can support new tourist facilities in order to spread the oversupply in certain urban environments. Likewise, the monitoring of measuring indicators over time is possible thanks to Infrastructure for Spatial Information in the European Community directive. Thus, this longitudinal information on tourism intensification variables could also fix maximum thresholds to avoid overtourism issues.

5. Conclusions

This study defines an indicator system that is used in urban neighbourhoods under processes of tourism intensification. Compared to previous studies, which are mainly based on quantitative variables, this research focuses on defining a mixed system of quantitative and qualitative variables, including the citizen initiatives index (I₁), which is dynamic in nature and values the associative network from tourist destinations. Every indicator has been registered, quantified, standardised, and analysed. This enables the establishment of correlations between variables and defines common patterns in different tourist scenarios.

Relationships have been established between the number of citizen initiatives involved in a conflict of interest due to overtourism, regulated and nonregulated P2P accommodations from Airbnb, and other tourist accommodations, the sum of cultural and recreational facilities, or the total number of residents from different neighbourhoods. Every variable has been spatially analysed through GIS mapping to clarify where the tourism phenomenon spreads. This geospatial information serves as a basis for understanding the tourism gentrification processes in relation to the urban features: where are the most affected areas, how do they extend to other neighbourhoods in the city, and which quarters are at risk of being touristified or at risk of population decline.

This mixed model provides a new tool for local authorities to establish measures and urban policies to tackle overtourism in the short and medium terms. The presented indicator system has allowed the identification of not only urban areas with significant problems of touristification but also new ones in the process of being gentrified in the future. Thus, the administration may reach different actions to establish specific regulations, monitoring, and prevention in specific neighbourhoods according to their degree of touristification because of tourism intensification.

Finally, this research can be progressed in several ways: (1) the redefinition of variables and additional correlations, (2) testing the presented methodology in new case studies to define the scope of touristification by quarters or census districts as a territorial unit, and (3) checking the datasets with fieldwork.

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