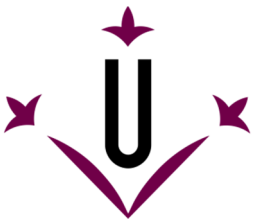

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Characterizing the location of tourist images in cities. Differences in user-generated images (Instagram), official tourist brochures and travel guides.

Paül i Agustí, Daniel

Highlights

- We compare spatial distribution of user-generated images and projected images.
- A partial overlap between the locations captured in these sources was identified.
- User-generated images are clearly wider than that from official sources.
- To obtain a consistent representation of the city we need to analyse various sources.

Abstract

This study analyses the extent to which there is an overlap in the territorial distribution and attractiveness of tourism images distributed via three different media: official tourist brochures, travel guides and user-generated content (Instagram). We applied a mixed-method approach, which included spatial analyses and cartography, to study the promotion of tourism in Montevideo (Uruguay). The results indicated a partial overlap between the locations captured in user-generated images and those promoted by official tourist brochures and travel guides. The findings suggest a territorial distribution of tourism images that is clearly differentiated according to the source(s). This provides useful insights for applications of social media into future geographical and image management research.

Key words

Representative dissonance, official tourist brochures, travel guides, user-generated content, Instagram, Montevideo.

1. Introduction

Tourists' behaviour in cities has a clear spatial component (Lee, Hitchcock & Lei, 2017). Through the tourist's expectations, decisions and comments, he or she creates a series of interactions with the spaces visited (Larsen et al., 2007; Katsoni, 2014; Marine-Roig & Anton Clavé, 2016). It is a behaviour that contributes to the modification of the image of urban spaces (Coleman y Crang, 2002; Stylianou-Lamber, 2012). The importance of these interrelationships has recently been boosted by the digitalisation of images and the popularisation of social media (Stepchenkova & Zhan, 2013). However, few studies have focused on identifying the spatial differences that the different representations of a place's image may have.

Phelps (1986) differentiates between primary and secondary images. Primary images (perceived) are those formed by the visitor's and residents' experiences (Hunter, 2016). They are usually subjective images (Wolcott, 1995). Given that they are generally produced by tourists who are unpaid, they tend to be seen as impartial and highly credible (Mak, 2017). Secondary images (projected) are created by the various tourist agents. These precede the visit and aim to be objective or to meet commercial criteria (Mackay y Fesenmaier, 1997). They synthesise the characteristics, concepts or values that the location wants to promote (Picazo et al., 2017).

A comparison of both sources enables various attributes of the destination's tourist image to be identified (Stewart, 2005; Almeida Santos & Buzinde, 2007). However, the scholarly literature shows that they are often treated independently, and studies based on a single source are commonplace (Llodrà-Riera, 2015). This situation pays very little attention to the potential differences between perceived images and projected images (Picazo, et al., 2017).

Cartography is one of the fields in which there is a shortage of studies. Despite the significant differences between projected and perceived images, there is a lack of understanding of the territorial distribution of such images. Among existing studies, Stepchenkova and Zhan (2013) use geo-maps representing projected and perceived images of Peru. Or Tammet et al. (2013), who used various geotagged databases to identify the main points of tourist interest. However, very few studies have sought to analyse the geographic locations of tourist attractions and the degree to which the projected and perceived images overlap (Marine-Roig & Ferrer-Rosell, 2018).

A partial study of image components may affect the representativeness of the results (Stewart, 2005; Almeida Santos y Buzinde, 2007). If a study is based on one of the sources alone, it may disregard a significant part of a destination's image and offer a fragmented result. For example, it is broadly accepted that the greater the similarity between the projected image and the perceived image is, the better the marketing results will be (Mackay & Fesenmaier, 1997).

Applying the geographical location of tourist sights to ideas relating to perceived and projected images may serve as an important tool for analysing and improving a destination's image (García-Palomares, Gutiérrez & Mínguez. 2015). Based on this premise, our research analyzes how images can play a fundamental role in helping us to

understand relationships between tourism and territories (García-Palomares, Gutiérrez & Mínguez, 2015).

The present work focuses on the application of a methodology that enables the spatial differences between the projected image and the perceived image to be identified. More specifically we will compare the territorial location of the images used in official tourist brochures and travel guides (projected image) and Instagram user-generated content (perceived image). However, the demonstrated methodological framework is not restricted to these source, and it can be applicable to others sources. The use of cartography to compare a city's various tourist attractions is one of the novelties of this research. Montevideo (Uruguay) was used as a case study destination. The main objective is to obtain urban cartography that visualises the spatial differences in the representation of projected and perceived images. This will enable the similarities and differences between the analysed sources to be identified.

2. Review of relevant literature

2.1. Tourism destination image

Destination image theory continues to stand as one of the basic modes of inquiry in tourism research (Hunter, 2016). It can be defined as "the sum of beliefs, ideas, and impressions that a person has of a destination" (Crompton, 1979, 18). A complex, individual representation created by organizations, local residents or anonymous agents (Tasci & Gartner, 2007). It is an individual's mental representation of the knowledge, feelings and overall perception of a destination (Fakeye & Crompton, 1991). Some authors believe that the image of the destination is a 'nebulous concept' (Hughes & Allen, 2008, 30). Others point out that the promotion of tourism does not play a key role in forming the image of the destination (Govers & Go, 2005). However, the majority of authors coincide in identifying this as a 'multidimensional concept' (Gallarza, Saura, & Garcia, 2002).

Imagery is a useful tool for examining the representation of a place (Yan & Santos, 2009). Visual elements, such as photography, are a significant part of projecting a strong destination image (MacKay & Couldwell, 2004; MacKay & Fesenmaier, 1997). However, also have a component of being synecdochical representations. A part can represent the whole, or the whole can represent a part. The representation of a place by an image summarises the complexity of the city visited and makes it accessible to the tourist (Smith, 2005).

The act of fixing a certain image in the collective imagination therefore depends on a number of filters that may take the form of realities, experiences, or - as in the case of this article - specific urban spaces. Tourists interact with the image of the destination before, during, and after their visits (Tasci & Gartner, 2007). A widely accepted conceptualization divides tourist destination image in two interrelated components: cognitive and affective images (Baloglu, 1997). Cognitive image involving individuals' beliefs and knowledge about the destination. Affective, refers to emotions and feelings about this destination (Deng & Li, 2018). Some authors include a third filter, conative,

derived from the previous two. This would include acting, doing or striving as a reaction to the previous inputs (Marine-Roig & Ferrer-Rosell, 2018).

Images reproduce symbols with meanings that have been socially constructed and disseminated. They are individual perceptions and subjective reflections that have been shaped in the mind (Galí & Donaire, 2005). The study of the image is therefore a complex one, with many intangible facets. The main difficulty lies in the fact that images cannot speak for themselves; instead, it is necessary to speak about and associate them (Miossec, 1977). This combination of factors complicates the interpretation of images, as we do not receive 'the world as it is, but rather the world as it is perceived, experienced and enacted' (Staszak, 2014, 597). As a result, comparing the image generated by a space and that reproduced in photographs taken by tourists can provide relevant information that can help us to understand the different ways in which a given image can be interpreted.

2.2. The user-generated content and the image of the destination

The difference between the projected image and the perceived image is not unanimously accepted. Some authors state that the boundaries "may be blurred" (Stepchenkova & Zhan, 2013: 591). They see the destination images and their circulation as one hermeneutic circle of representation (Urry, 1990). Destination marketing organizations convey images of a destination to potential tourists. Tourists are interested in the location and define their image of it, which has been acquired from other sources too (Paül i Agustí, 2009). At the time of the visit, this image guides tourist's gaze at a destination. When they take photos, tourists close the hermeneutic circle of destination representation: "consciously or unconsciously, tourists look for scenes and images that replicate their existing perceptions" (Stepchenkova & Zhan, 2013: 591). At a spatial level, this leads tourists to visit places that they have already seen in travel guides and on websites (Caton & Santos, 2008).

This vision would be valid within certain contexts, where visitor numbers are low and the pre-existing image is powerful (Echtner & Prasad, 2003). However, within today's context, the movement of people, objects, goods, capital and ideas has accelerated both quantitatively and qualitatively. Tourists are no longer seen as mere spectators, but also as veritable actors, who interact with the places that they visit (Larsen et al, 2007). Photography becomes an important element for democratising mobility (Picazo & Moreno-Gil, 2017). Images drive social - but also physical – relations, allowing the public to actively participate in the planning and development of tourism (Coleman & Crang, 2002).

As Stylianou-Lamber (2012) observed, tourists are active performers. They are able to create, through their leisure activities, unique places and experiences. The growing diversity of the ways in which tourists act, their reasons for visiting different locations, and the increasing ease with which photographs can be taken have produced new types of behaviour (Stepchenkova & Zhan, 2013). As a result, each kind of tourist may have their own motives and expectations and this tends to produce different types of spatial behaviour (MacKay & Couldwell, 2004).

Furthermore, the advent of digital photography has led to a notable increase in the number of photographs taken per trip. Photographs are no longer shared in strictly private contexts but could now also be considered to form part of many social events. Online, the destination image can be seen as a soft power, at the same time as introducing sympathetic sentiments and brand image 'trust' (Hunter, 2012). Virtual communities are gradually becoming significantly influential in tourism, as consumers increasingly trust their peers rather than the marketing messages that they receive (Katsoni, 2014, 109).

However, we should not overlook the distinction between attractiveness and attraction. As noted by Husband (1983, 292), "attractiveness is closer to some innate quality of a place and need not be directly related to attraction (...) attraction, on the other hand, has more to do with the actual levels and patterns of visitation". This study includes both aspects: attractions, understood as spaces visited and evidenced by images posted to Instagram; and the attractiveness of spaces, i.e., spaces disemminated by official tourist brochures or travel guides, from which we cannot directly extract the number of visitors.

Using both sources enriches the study of the image of cities. Images from traditional sources, such as official tourist brochures and travel guides, used to aspire to be objective (Wolcott, 1995) or to respond to commercial criteria (Mackay & Fesenmaier, 2000). The online image incorporates new nuances. They make it possible to observe spatial relations without imposing any particular type of authority (Hunter, 2012). The increase in the number of authors who photograph the city (Stewart, 2005) therefore encourages the incorporation of new spaces in the imagery of tourism (Hunter, 2016).

In actual fact, projected and perceived images occasionally interact with one another. In certain combinations, they could work to manifest a particular type of destination image "that is neither projected nor perceived, but constructed through the accumulation of individual actions" (Hunter, 2016, 223). These types of approach, in which the projected and perceived image interact, is what we will investigate in the present article.

2.3. The importance of mapping the image of tourist destinations

The location of tourist attractions is not neutral. Historically, the effects thereof have tended to be analysed individually (Paül i Agustí, 2014). However, there may be relationships between and among several tourist attractions. As noted by Crompton and Gitelson (1979), two nearby attractions may both attract some visitors who had initially only planned to visit one of them. Mapping tourism destination images of the various attractions can therefore help to visualise such interrelationships.

Tourism destination images have been considered an element which provides outstanding qualitative information that can help us to better understand the impact of tourism on the urban space (Brown, 1995). They have also demostrated that geo-tagged photos can indicate tourists' preferences (Gilbert & Barton, 2013). It reflects a mental projection of the modern-day city (Zhou, 2014). Examining tourist space through the lens of tourism destination image helps us to identify the representations of urban spaces (García-Palomares, Gutiérrez & Mínguez, 2015).

Nevertheless, studying tourist images can have certain limitations (Su, et al, 2017). The simple geolocation of images on a map may not be enough to identify local behaviour (Marine-Roig & Anton Clavé, 2016). Some photographed locations are closely linked to specific monuments (Capone & Boix, 2008). We also find a certain number of images that are evenly distributed throughout the city. To avoid this situation, this study interrelates various values, putting them within a territorial context. This enables values to be obtained that represent the complexity of each area, identifying isolated types of behaviour and interrelationships that would be hard to observe in absolute values. Studies like these are especially interesting because previous research has found that tourism flows are influence by not only the local characteristics but also by those of the neighboring areas (Su et al., 2016). Mapping them it's possible to reflect on the behaviour of the tourist. Showing the existing spatial interrelationships and seeing - following the line identified by Tobler (1970) - that everything is related to everything else, but near things are more related than distant things.

The formation of a destination image is not a linear process. It is a complex process that must be analysed from different perspectives, distancing ourselves from standardized statistical models (Ryan & Cave, 2005). They must be examined not only in terms of tourism, but also in terms of the city. The cartography of tourism destination images incorporates a qualitative element into the debate about the impact of tourism on the urban space, reflecting visitor experiences at tourist destinations (Balomenou & Garrod, 2014). Thus, the number of images, their location and the comparison between sources can be used to indicate tourist preferences across cities (Paldino et al., 2015).

Different from previous studies, this paper focuses on the urban level. The main purpose was precisely that of comparing the interrelations in spatial localisation of tourism destination images based on three different sources: official tourist brochures, travel guides and user-generated content. The comparison between various sources should help to obtain a more detailed map of a city's tourist potential. This contributes to the development of new analysis tools to characterize tourist preferences across space.

3. Methodology

3.1 The study area

Montevideo, the capital of the Oriental Republic of Uruguay, is home to 1.3 million of the country's 3.4 million inhabitants. Tourism is a significant economic activity in Uruguay, providing 7% of the country's GDP in 2015. With International visitor numbers reaching 3.3 million in 2016, the main countries of origin of the tourists visiting Uruguay were Argentina and Brazil. The city of Montevideo was the country's biggest tourist destination, being visited by 31.6% of foreign visitors (Sosa, 2016). It should also be mentioned that Montevideo is an important port of call for cruise ships, with 196,000 visitors disembarking in the city during the 2015-2016 season.

Montevideo combines several types of tourism. Leisure tourism is concentrated in the historic centre, where there is a variety of museums, squares and fine buildings. To the east of this space, we find a modern area of city enlargement, with a considerable commercial presence. In addition, the city has several beaches and promenades.

Outside this central area, there are some additional tourist attractions, such as the beach and Casino Carrasco, Parque Batlle (park) and Fortaleza "General Artigas" (fortress). Nightlife venues dotted across the city and carnival celebrations are also tourist attractions.

The existence of a good transport and hotel infrastructure and high standards of security compared to other Latin American countries contributes to the development of other types of tourism, such as business and sports tourism. Food and restaurant offerings are also significant. In addition, Montevideo has recently begun to position itself as a language-learning destination and as a gay-friendly city. These facts and figures mean that Montevideo could be considered an excellent location for evaluating the behaviour of tourists visiting a particular location. These characteristics should allow any observations made to be readily extrapolated for other similar tourist destinations.

The present study focused on the central area of the city of Montevideo. To be more precise, it examined a specific area covering approximately 32 km^2, which encompasses the downtown district and the Old City. This coincided with the area covered by the tourist map published by the Montevideo Tourism Bureau, an organisation which includes the *Intendencia* (Provincial Government) of Montevideo, the Uruguayan government and a number of private agents. It is also the area highlighted in the majority of travel guides.

3.2 Data collection

This study is based on photos of the destination Montevideo appearing in three sources: tourist brochures published by official public institutions (hereafter referred to as 'brochures'), travel guides and user-generated images. Using different sources enlarges the results in terms of managing the tourist experience (Govers & Go, 2005). The three sources used in our study coincided with those examined in other works that have analysed tourism destination images (Hunter, 2016).

The material published in brochures was compiled during the months of February and March 2017. During this period, two visits were conducted to the five tourist information centres in Montevideo (three of which are managed by the Ministry of Tourism and the other two by the *Intendencia*). In terms of the methodology devised by Stylianou-Lamber (2012), the sample would be considered to have reached saturation and was considered to be representative when subsequent visits failed to provide any newly published material to add to it. The total amount of material collected consisted of:

- The 'Discover Montevideo' guide
- The Montevideo tourist map (3 versions)
- The 2017 Cultural Calendar for Montevideo
- 12 leaflets focusing on specific aspects of the city

With regard to the travel guides, we analysed the information contained in sources published in Spanish. All of the available travel guides published since 2010 were

studied[1]: Anaya Touring (Pagella, 2013), Bradt (Burford, 2011), Lonely Planet (Bao, 2015) and Guía Azul (Monreal, 2012).

The material published by the official public institutions and in tourist guides was studied to identify the main attractions that they promoted, their location and other more qualitative data. The data obtained were then quantified using a formula (Index of impact) that identified the importance of the information provided. To be more specific, we proceeded according to the formula proposed by Serrano and Imbert-Bouchard (2009, 391):

Index of impact = ((A*10/Amax)*0.4) + ((B*10/Bmax)*0.2) + ((C*10/Cmax)*0.2) + ((D*10/Dmax)*0.2)

A = Number of words written about the attraction
B = Size of any photographs and/or graphics related to the attraction
C = Rough map showing the location of the attraction
D = Objective/subjective treatment of the attraction

It was possible to study the information provided by the two traditional types of media in its entirety, whereas this was not possible in the case of the third source: Instagram. As a result, it was necessary to delimit the type of information to study. Instagram is a mobile photo-sharing application and service that allows users to share pictures either publicly or privately. For the purposes of our research, only publicly available images were used. Ours was therefore not a study of all tourists but only of those who took photographs and shared them via Instagram.

The platform allowed us to conduct preliminary research into the places where the photos had been taken. In our research, two specific locations were used: 'Montevideo' and 'Ciudad de Montevideo' (The City of Montevideo). Although other parts of the city were highlighted in Instagram, the two places selected were the ones with the highest registered levels of activity. To be precise, the tag 'Montevideo' generated approximately 1,200 photographs per day, while 'Ciudad de Montevideo' generated around 250. For the study, we analysed images generated during two different periods: 1st-15th November 2016 and 8th-25th February 2017. These two periods were chosen with the aim of minimising the seasonality of certain images. In doing this, we again followed the methodology devised by Stylianou-Lamber (2012, 1824). The sample was considered to have reached saturation, and therefore to be representative, when an analysis of any subsequent days failed to add any further locations of tourist interest to the sample. In total, we obtained around 37,000 images, of which 3,800 were mapped. This figure is consistent with other studies, like those by Galí and Donaire (2015), based on 34,200 images from Flickr; and clearly exceeding other studies, such as that by Stylianou-Lambert (2012), which analysed only 400 photos shared on Flickr and Picasa.

[1] Between 2004 and 2009, the number of tourists visiting Uruguay plateaued at around 1.9 million arrivals. From 2010 to the time when the study was conducted, tourism had increased. We considered this growth period as a case study.

Data was retrieved manually from Instagram. On this point, we would draw attention to the limitations of the Instagram API when it comes to automated data retrieval. This constrains its use for research purposes and makes it necesssary to perform a more labour-intensive manual geo-tagging process. However, we cannot fail to recognise the importance that Instagram currently has as a space for sharing images of tourist destinations. The methods used to exploit it should therefore be as replicable as possible.

In our study, the first step in the process of categorising the images was to discard those generated by local residents. Local residents were identified by referring to the user profile information provided by Instagram. Instagram allows us to see where images from previous months were taken. If images from the last month were mostly of Montevideo, the user was not considered to be a tourist. This main source of information was supplemented by secondary sources, such as observing the language in which they had written their caption messages and the attitudes and poses of the people featured in their images. However, if the identity of the photographer was not sufficiently clear, the photograph was discarded. Following Stylianou-Lamber's methodology (2012, 1825), a series of guidelines were established to avoid subjectivity and a pilot study was conducted. In this study, two coders used the same categories to code 20 different images. In our case, the initial rate of overlap was 90%. After discussing any elements which caused disagreement, the different criteria were further clarified and homogenised. When the pilot study was repeated, the inter-coder reliability rose to 95%. This approach enabled us to determine that 15% of the images (5,751 photographs) had been taken by tourists.

Once all of the photographs taken by tourists had been identified, it was then necessary to analyse those that we could locate on the map. The first criterion applied was that of discarding any photographs that did not allow us to identify the location. The images that allowed us to identify their location were categorised: monuments, spectacles, restaurants, shops, etc. The 'eye-catchers' approach was adapted. Eye-catchers are illustrations in which 50% or more of the image is occupied by an eye-catching device designed to capture the observer's attention (Pritchard & Morgan, 1995, 28). If over 50% of the image was taken up by something that was not related to the specific location - as in the cases of photos of people's faces (selfies), photographs of details, sunsets, or images of clouds – the images were discarded. Approximately 26% of the images initially selected fell into this category.

We then searched for the map locations of the 4,250 remaining photographs. This was done in four different ways. Firstly, by reference to comments made on the app which allowed us to directly identify the different places in question. Secondly, by us being able to recognise locations in the various images (due to photographs showing the names of shops or addresses, etc). Thirdly, by using the Google images app that allows users to search for images, with the results providing links to pages with similar images in which the location often appeared. Finally, for images that it was not possible to identify using any of the first three methods, several specialists in tourism working in Montevideo were contacted in the hope that their expert knowledge of the city could help us. In these cases, the images were matched to their respective locations in situ. In total, we

were able to locate 3,742 images, representing 88% of the images linked to specific places that had been uploaded to Instagram by tourists during the study period.

An impact factor was developed for the user-generated images. The impact factor was based on the values of all the images identified. It can therefore be understood as a mean value of the set. The aim of the impact factor was to nuance the various repercussions that an image on Instagram might have. To choose the criteria, consideration was given to how viewers received and reacted to the images, according to Deng and Li (2018). This respected the structure of the impact factor used by the travel guides and brochures, but adapted the categories to the information provided on Instagram:

Impact factor = ((A*10/Amax)*0.4) + ((B*10/Bmax)*0.2) + ((C*10/Cmax)*0.2) + ((D*10/Dmax)*0.2)

A = Word count of the commentary caption
B = Number of likes
C = Number of hashtags
D = Treatment as a Top Post (Dmax = 1)

The final step was to code the locations of the different elements using a geographic information system (GIS). Here, it should be noted that in this process, the places photographed were marked on the map rather than those from which the photographs were taken. There were fewer than 100 photographs in which there was obviously a significant distance between the two points; such cases occurred when photographs were taken from one of the city's viewpoints using a zoom lens. In these cases, the resulting photographs were discarded.

3.3. Data analysis

To map and spatially compare the values obtained from the impact factor, we used two methods: Inverse Distance Weighting (IDW) and Kernel Density Estimation (KDE).

IDW is a common interpolation method that is widely used in GIS (Haklay, 2007). Spatial interpolation techniques enable discrete measurements to be converted into a continuous spatial distribution. Like any interpolation function, IDW works with a set of sample points (L1, L2, ... Ln) and calculates the value for a new location L. IDW interpolation explicitly works on the assumption that things that are close to one another tend to be more similar than those that are further apart. This approach also allowed us to include examples of exceptional behaviour within the data set, such as places with a high impact factor located in areas with few sights.

The results were treated with a GIS tool (ArcGis 10.4.1). The default values were used. The interpolations were established on the basis of the 12 spatially closest values. Two IDW processes were performed (for printed materials and Instagram) according to the geographical location of the elements analyzed, obtaining a Z-weighting value corresponding to the impact factor of each of the two sources. The observed differences were mapped using the resulting rasters.

The scholarly literature shows that the use of IDW to identify spatial behaviour is commonplace. In the field of tourism, it has been used to identify the tourist potential of rural spaces (Dona & Popa, 2013), the potential interrelationships between tourism and wetlands (Lupei et al., 2017) or the mapping of emotions in urban space (Shoval et al., 2018).

The second calculation method used was KDE. It is a non-parametric method to estimate the probability density function of a random variable (Terrell & Scott, 1992). It is based on an inference process from a sample of known points to estimate the local densities of the set of points. The default values of ArcGIS 10.4.1. were also used.

KDE calculates the density of point features around each output raster cell. The surface value is highest at the location of the point and diminishes with increasing distance from that point, descending to a value of zero at the search radius distance from the reference point. This approach allows us to attribute more weight to the most significant points. As it also penalises exceptional behaviour, it provides a good method for synthesising behaviour within specific areas. Thus, KDE was used to analyze tourist behaviour (Miah et al., 2017) or to delimit the downtown districts through Flickr tags (Hollenstein & Purves, 2010).

4. Results

4.1. Introduction

The first finding to note from the research results was the large number of tourist attractions identified. The source that contributed the fewest attractions was brochures, which highlighted only 122 sights. Travel guides featured a few more: 140 different sights, while user-generated images on Instagram identified 366 different sights. The published materials only reflected a small number of the attractions that tourists considered to be of photographic interest (with only 33.3% of the places photographed appearing in the brochures and 38.3% in the travel guides).

Comparing the data from the different sources also revealed several interesting overlaps (table 1). We did not find any references on Instagram to 11.5% of the sights that appeared in the brochures; the percentage was 15% for sights not included in the travel guides. It may therefore be said that some of the sights promoted by official channels and travel guide books do not seem to be of sufficient interest for tourists to take photographs of them.

Table 1. Number of sights identified and overlaps between the different sources analysed.

	Number of sights	% of the total number of sights	% images on Instagram
Brochures	122	30.7	88.5

Travel guides	140	35.3	85.0
User-generated images on Instagram	366	92,2	100
In some of the sources	397	100	
In brochures & travel guides[2]	80	20.2	
In brochures & on Instagram	108	27.2	
In travel guides & on Instagram	119	30.0	
In brochures & travel guided & on Instagram	75	18.9	

Source: author's own research

The three sources featured a total of 397 different sights, which covered what is known as a 'long tail'. The image of the destination was dominated by a few very popular sights, but which contained a large number of references associated with small niches (Pan & Li, 2011, 132). The brochures and travel guides mostly promoted the best-known sights, while the images uploaded to Instagram showed a wider series of complementary sights. The three sources combined therefore provided a diverse and highly varied image of the city. In this sense, the incorporation of user-generated images clearly helped to enrich the vision provided.

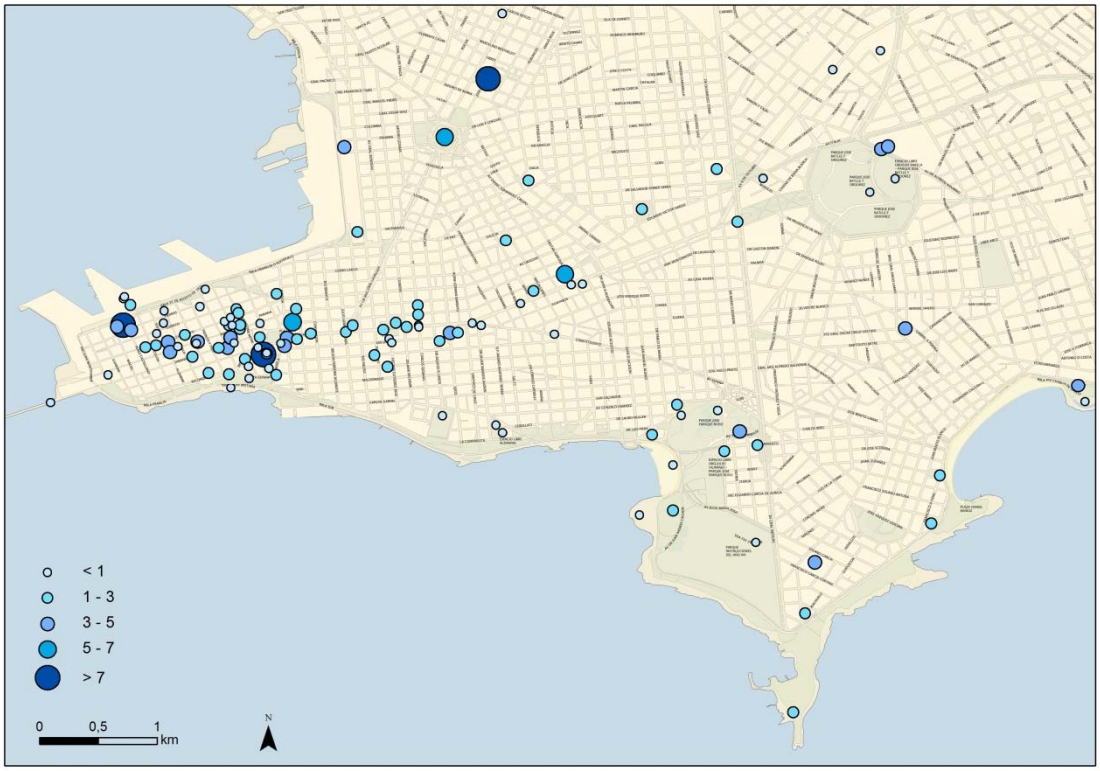
4.2. Location of the sights

Once the sights had been identified, we were able to analyse their spatial distribution. As previously mentioned, the brochures featured the fewest sights, with these also tending to be highly concentrated. As observed in figure 1, the majority of the sights selected by this source were located on the west part of the map, in the area known as *Ciudad Vieja* (Old City). Very few other sights were identified outside this area. Furthermore, very few attractions appeared in various different publications and had a high impact factor (or were accompanied by photographs and detailed explanations, etc.), which again related to the "long-tail" concept. In fact, only five of the 122 sights identified in the brochures appeared in more than five publications and had a high impact factor (greater that 6)[3]. The majority of sights only appeared in a single publication and had an impact factor of significantly less than 0.5. This revealed a notable concentration of sights, both in terms of their spatial location and the quality of the information provided.

Figure 1. Sights in the brochures (impact factor)

[2] It could be considered that these 80 references are not attractions in the strict sense of the term because we did not locate any photo indicating tourist visits. However, they could be considered as attractiveness.

[3] Teatro Solís (theatre), Mercado del Puerto, Mercado Agrícola (markets), Palacio Legislativo (Parliament) and Feria de Tristán Narvaja (fair).



Source: author's work based on the cartography of the *Intendencia* of Montevideo.

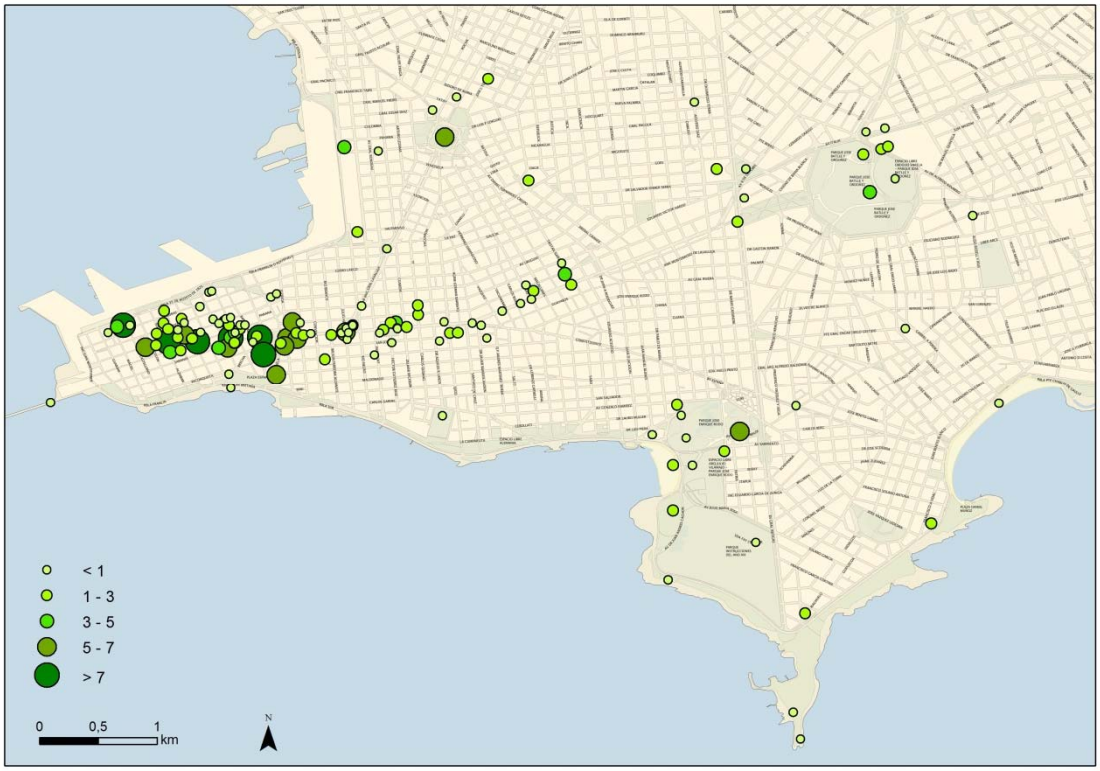
Analysing the travel guides (figure 2) revealed a similar pattern. Although this source identified almost 15% more sights, their distribution was clearly comparable with that of those highlighted in the brochures. In terms of spatial distribution, the sights in the travel guides tended to be located in the same places as those promoted in the brochures. The same could be said of their impact factor, which was also similar. A Pearson's product-moment correlation between these two values produced a result of 0.933[4]. Although there was a high correlation between the data obtained from these two sources, it should be underlined that, - as in the case of the brochures - the majority of the sights listed were only included in a single guide; only seven sights appeared in all the guides[5]. In terms of the impact factor, only six sights registered values of greater than six[6]. This led us to the conclusion that the brochures and travel guides tended to promote similar spaces.

Figure 2. Sights in the travel guides (impact factor)

[4] All of the correlations commented on had confidence levels of 95%, a 5% margin of error and a significant correlation of 99.9%, ($p<0.01$)

[5] These were the Mercado del Puerto (market), Museo de las Artes Decorativas, Museo Nacional de Artes Visuales and Museo Histórico Nacional (museums), Plaza Matriz (square), Teatro Solís (theatre) and Palacio Salvo (palace).

[6] These were the Plaza Independencia (square), Mercado del Puerto (market), Museo Torres García, Museo Histórico Nacional and Museo de Artes Decorativas (museums) and Teatro Solís (theatre).



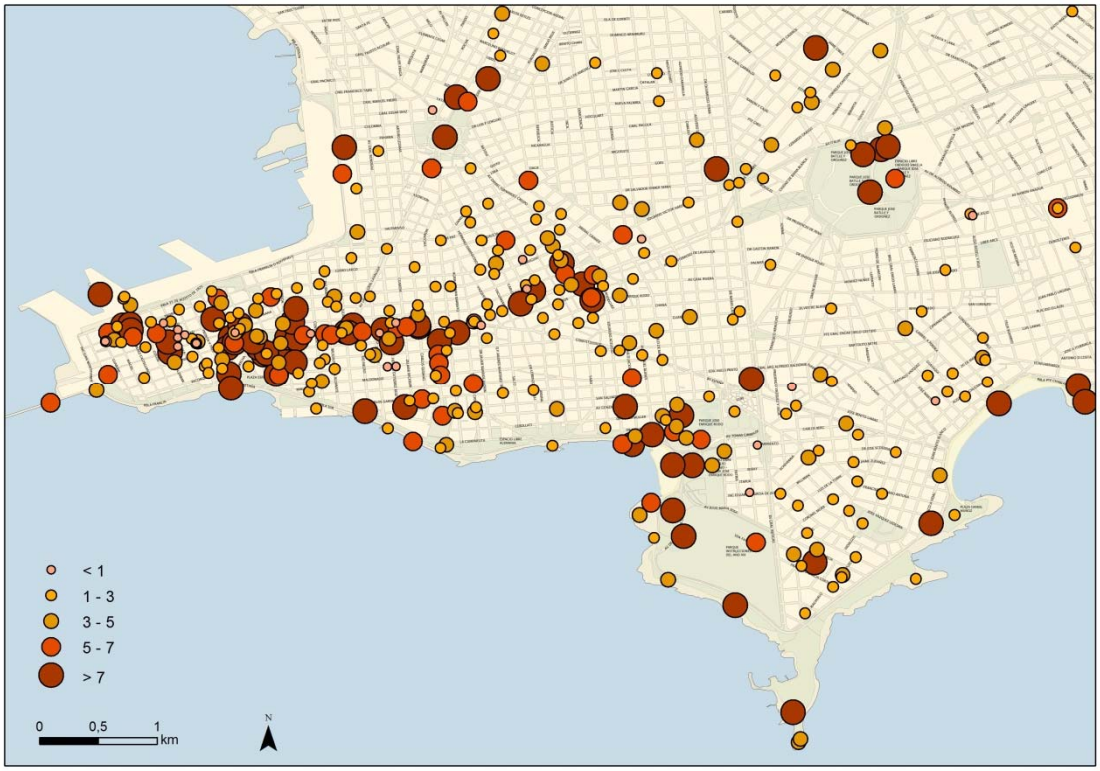
Source: author's work based on the cartography of the *Intendencia* of Montevideo.

The situation was different for the user-generated images (figure 3). Although the areas featuring a concentration of sights in the previous sources overlapped with those containing a high presence of user-generated images, the density of the locations for the user-generated images was higher. In the remainder of the area, the presence of user-generated images was much more widely spread than that of the former sources and, indeed, many parts of the city were only captured in the user-generated images.

The same could be said about the impact factors, with the values obtained for the user-generated images tending to be higher. In fact, the number of sights shown in one or two photographs was relatively low: only 22.7%. In contrast, as many as 12 sights were represented over 20 times[7]. The spatial overlap between the user-generated images and the other sources was lower than that observed between the brochures and the travel guides. More specifically, the Pearson correlation between the user-generated images and the brochure material was 0.522, while with respect to the travel guides it was 0.417. These values corresponded to no more than an average correlation.

Figure 3. Sights in user-generated images (impact factor)

[7] Mercado del Puerto (market), Plaza Independencia (square), Teatro Solís (theatre), Palacio Salvo (palace), Cabildo de Montevideo (council hall), Estadio Centenario (sports stadium), Plaza Matriz and Plaza Zabala (squares), Casa de Gobierno (house), Torre Antel (tower), Plaza Fabini (square) and Cartel Montevideo (barracks).



Source: author's work based on the cartography of the *Intendencia* of Montevideo.

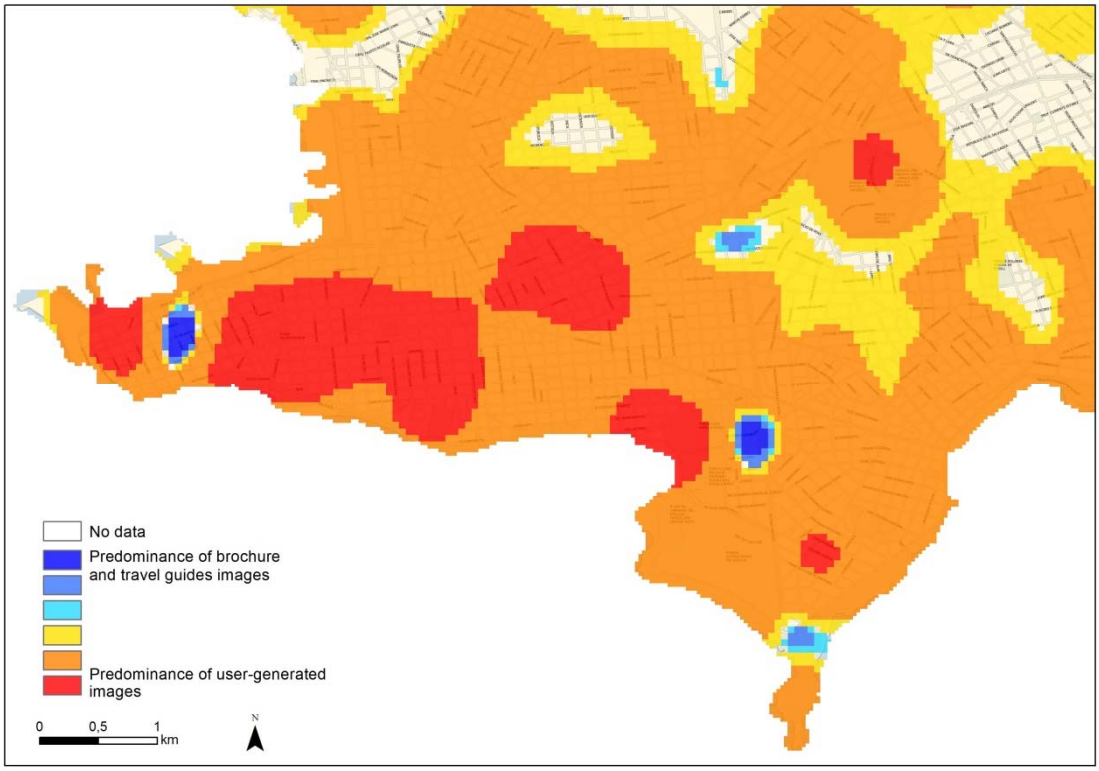
In the case of the data interrelating the locations and impact factors, there was a significant correlation between the places that the brochures and travel guides tended to promote. This led us to consider these two sources as being comparable (hereafter referred to as printed materials). In contrast, in user-generated images, the correlations were much weaker. We can therefore affirm that the user-generated images collected from Instagram tended to exhibit a distribution pattern that was clearly different - and much more varied - than those observed for the other two sources.

4.3. Overlaps and differences between sights based on source

Comparing the three sources on a single map allowed us to obtain an image that synthesised the differences in the spatial distributions of the different sights.

The first synthesis map was based on an KDE calculation (figure 4). KDE penalises exceptional behaviour. The resulting map can therefore be seen as a synthesis of the main types of tourist behaviour in the area. The results obtained further highlighted the presence of user-generated images in the majority of the areas of the city (with 13% of the area under clear predominance and 76% with predominance, table 2). The presence of the other sources was only relevant at a limited number of locations (1.4%): *Ciudad Vieja* (the western part of the city), the area around the *Museo de Artes Visuales* (city centre), the *Obelisco de los Constituyentes* (centre-north) and the *Museo Zorrilla* (south). It should also be underlined that in some areas (9.7%) we have not identified any tourist images. This helps to further highlight the differences between the sights included in each source.

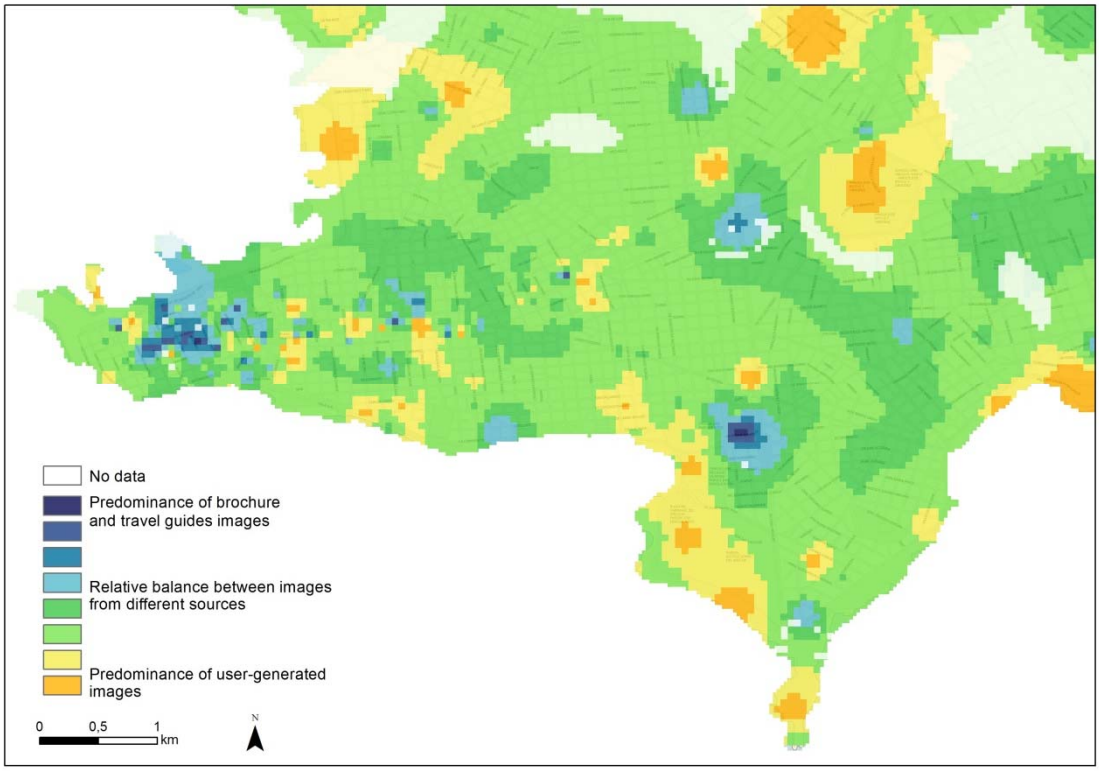
Figure 4. KDE and raster calculator map (difference in concentration)



Source: SCT SIG UdL plus author's own data based on the cartography of the Intendencia of Montevideo.

The distribution in the second map, based on IDW (figure 5), differs from the previous one. It is worth recalling that IDW includes exceptional behaviour. It is therefore a good tool for analysing the set of tourist images as a whole, and not just the predominant ones.

Figure 5. IDW and raster calculator map (difference in concentration)



Source: SCT SIG UdL plus author's own data based on the cartography of the Intendencia of Montevideo.

The map shows a clearly more fragmented distribution of the weight of the images from the different sources. The printed materials played a predominant role in a very limited part of the total surface area. Around this space, there is an area in which it is generally possible to observe an equilibrium between the officially promoted images and those generated by users. This area tends to be limited to a radius of 250 to 500 metres around the main sights promoted in the printed materials. Within it, tourists usually visit the spaces that these publications promote, but they also complement these visits by capturing images of other elements present in the same spaces that are not promoted via the printed materials. Across the remainder of the area, the importance of user-generated images is clearly much greater.

The spatial distribution of the values can also be observed in terms of their concentration (Table 2). In less than 1% of the 32km^2 area analysed, the most important images were those promoted by the printed materials. The spatial coverage of the user-generated images was therefore much greater, with 70.5% of the area being dominated by this source and a further 15.8% being clearly dominated by it.

The maps therefore show the differences in treatment that tourist spaces receive according to the sources analyzed. This has two important implications. First, as shown in Table 2, no single source was predominant across the entire area. A study based solely on Instagram images would have disregarded the weight of printed images in the historic centre of Montevideo. The result would have been a partial image of the city's sights.

Table 2. Raster calculator map values distribution

	KDE		IDW	
	Surface (km^2)	**%**	**Surface (km^2)**	**%**
Clear predominance of printed images	0,13	0,40	0,09	0,30
Predominance of printed images	0,30	0,95	0,17	0,55
Relative balance between images from different sources	0	0	0,97	3,06
Predominance of user-generated images	24,03	75,91	22,32	70,52
Clear predominance of user-generated images	4,12	13,01	5,01	15,84
No data	3,08	9,73	3,08	9,73
Total	31.65	100	31,65	100

Source: research by the author

The second implication is the representation of spatial differences. Cartography helps to show the need for a detailed analysis of the sources. In this respect, the difference in the distribution of attractions depending on whether we take into account exceptional behaviour (IDW) or not (KDE) is highly significant. The IDW map shows a clear fragmentation of the predominant tourist images of the city. This points to types of behaviour that are clearly more complex than those that can be obtained through a simplified analysis of a single source.

Therefore, the use of various sources is important, and so too is the treatment thereof. A study that does not take into account exceptional behaviour or is based on a single source may lead to a segmented vision of the tourist image of the city. In contrast, the dual approach presented here enables nuances to be identified, which are important for correctly identifying the richness of a city's image.

5. Conclusions

The current literature shows that there is a tendency to use a single source – generally user-generated images – to map tourist behaviour. The methodology used in this research has enabled it to be demonstrated that user-generated images only partially overlap with the images used in printed materials. The differences between sources had already been identified at a thematic content level by authors such as Hunter (2016), albeit without applying the spatial distribution component to them. This research incorporates the spatial component into aspects that may be affected by the use of a single source.

The results of the research underscore the importance of analysing different variables when locating a city's tourist attractions. Otherwise, we only manage to obtain a segmented image because the attractions identified in printed materials appear as being

opposed to the preferences expressed by those who use social media. It also shows the usefulness of cartography as a means of locating differences. It is thus confirmed that the differences between sources also exist at the tourist sights spatial distribution level. A study based on the cartographic representation of various sources could, in turn, help to reshape the tourist image of the city as a whole, thereby avoiding a fragmented image that focuses too much on certain areas. The application of spatial indexes to the study of the urban tourism image enables a better understanding of its formation while providing new tools to improve spatial management.

The results also indicate, following the line established by Stylianou-Lamber (2012), that tourists do not only reproduce a limited number of images. Although the city's icons have been reproduced by tourist photographers, tourists have also photographed new images of the city. We can therefore affirm that the presence of tourists in a city extends well beyond the spaces that it officially promotes.

It has traditionally been said that the vision of the tourist is shaped and constructed by numerous professionals and reinforced by images found in travel guides, on postcards and in other promotional materials. Today, user-generated images must also be considered a relevant element of image creation. Their mapping makes it possible to show how they help to develop and reinforce new spaces of tourist interest. As shown, however, it is not the only possible source.

We should point out that the study enables new lines of research to be developed, a first one being the implications that the differences identified may have for urban spatial planning and management. It opens the doors to an analysis of urban space at different moments during the day or even the year, which could shed greater light on the repercussions of tourism on a city. Similarly, it could distinguish between the spaces examined, e.g., by their thematic area or by free admission to them. It would also be positive to diversify some of the sources, which are currently analyzed as if they were just one. This is particularly the case for social media. The comparison of various social media platforms may reveal different types of behaviour.

Attention must also be given to certain features that have yet to be analysed in depth. These include: the motives that lead a user to share a specific image via the internet; the limitations imposed by a lack of Wi-Fi access when travelling; the similarities and differences between images posted on the first visit and those posted on subsequent visits, and: identifying the extent to which photographs shared via Instagram are representative of tourism as a whole and not only of that involving the users of social media.

Finally, it should be remarked some limitations derived of the method implemented in this paper. The restricted access to information generated by Instagram users have implied a manual collection and exploitation of all the data required in this research. An automatized system of data exploitation and analysis would help to study complex tourism destinations. Moreover, an automatized system for obtaining data on Instagram users' profile would help to define different tourist profiles and behaviours. Additionally, it would be of interest to compare the concentration of images in Instagram with other

variables, as number of visits of a site, time of the visits or tourists' expenditure level. This data would provide highly significant information about how tourists consume space. It merits particular attention as it would help us to better understand the behaviour of tourists within the urban space.

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