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**GEOSPATIAL TECHNOLOGY-BASED STUDY ON TOURIST
ACCOMMODATION IN BUCHAREST METROPOLITAN AREA– IN
RELATION TO PASSENGER TRAFFIC IN MAJOR TRANSPORTATION
HUBS**

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ABSTRACT

The driving role of technology in building a sustainable and resilient future has been long acknowledged. As one of the most resilient industries, the hospitality sector is the focus of this research, particularly the hotel lodging industry in the Bucharest metropolitan area (Romania’s capital city) as it relates to passenger traffic at two important international transportation hubs: the international airport and railway station. The site selection, or selection of an appropriate location for lodging, is a strategic choice. The distinction between success and failure is also determined by other external factors as well as internal company factors. There is a wealth of literature on business

location, and the main approaches are highlighted in the section on literature reviews. Future research will need to address the issue of business location in relation to transportation hubs that can attract potential customers. There are two specific questions to reach the research objective: to find out if the traffic from the transit terminals influences the number of accommodation facilities and if there is a specific pattern for choosing the location of tourist accommodation facilities (hotels) in the studied area. The investigation methodology consists of both secondary sources and primary research, respectively: national statistics as well as international databases such as *Google Maps* and *OpenStreetMap*, extensively use the geographic information system (GIS) database and software tools (*QGIS 3.22* and *Google Earth Pro 7.3.4.8573*). The intent is to find whether there is a relationship between the two databases studied. It can be concluded that the number of tourist accommodation facilities and its locations are related to the main passenger traffic flows – from/to the Bucharest “Henry Coandă” International Airport (OTP) and Bucharest North Railway station. The results, which are presented in both tabular and dynamic graphical formats, are beneficial for scholars and mostly for practitioners and businesspeople. Besides, the findings from this study is valuable for policymakers and strategists at a macroeconomic level, as well as for tourism and hospitality entrepreneurs and managers. The implications are highlighted, and recommendations are presented in this paper.

Keywords: Business location, Hospitality industry, Hotel accommodation, Accommodation cluster, Passenger traffic.

INTRODUCTION

Business development has a long history and a wide geographic scope; it has followed the evolution of human society (the history of humanity), starting locally and aspires to become globally, moving from rural to urban, from family households to large corporations, and from the micro to macroeconomic levels (Table 1).

Table 1

Business development in space and time.

Socio-economic progress		Human society evolution – in time →	
Demographic	Economic level	Early	Contemporary
Urban	Macroeconomic	↑ ... → ...	Globalization → 'Glocalization' ↓
Rural → Smart cities	Microeconomic	Rural households	'Globalization reinvented' Sustainable, smart cities

A detailed analysis of humankind's evolution the foundation of this study. However, it is crucial to comprehend the direction and driving force of technology in the development of business and trade as well as in human society.

Globalization reinvented: sustainable and resilient development.

The concept of *globalization* has evolved over the last six decades (James, 2014) to a more balanced *global and local* tourism and hospitality industry (Scarlat, Kasim & Ghiță, 2008). Glocalization is a term that was just recently coined (Sharma, 2009) to describe the current trend of "globalisation reinvented," as described by The Economist (2022c). The need for reinventing globalization is a result of a series of global turbulences (socio-economic, political, and environmental) that has recently culminated due to the coronavirus pandemic (Napierała, Lesniewska-Napierała & Burski, 2020) and war in Ukraine (Economist, 2022b), impacting the energy sector (Economist, 2022a). Traditional globalization looked for efficiency while the current globalization includes a notion of *sustainability*, requiring *companies to shift from efficiency to security and resiliency* (Ramakrishna, 2022).

Resilience of hospitality industry – hotels

It is significant to note that, according to the number of years since foundation, the hospitality industry appears to be the business type that is the most resilient (Clark, 2022). The top businesses older than 1,200 years are listed in Table 2. Four out of six are companies that are active in the hospitality industry (three Japanese hotels and one Austrian inn).

Table 2

The oldest six companies still operating worldwide.

Company (country)	Year establis hed (C.E.)	Age (years)	Industry
Kongō Gumi (Japan)	578	1,443	Constructions
Nisiyama Onsen Keiunkan (Japan)	705	1,316	Hospitality (hotel)
Koman (Japan)	707	1,314	Hospitality (hotel)
Hōshi Ryokan (Japan)	718	1,303	Hospitality (hotel)
Genda Shigyō (Japan)	771	1,250	Pulp & paper
Stiftskeller St. Peter (Austria)	803	1,218	Hospitality (Inn)

(Source: Clark (2022))

Putting aside the specific environment and cultural subtleties, geography, and history in general, the data demonstrates the following:

(i) Hotels are among the most resilient types of business worldwide, throughout history. Impact of digital technologies: digital strategy and digital transformation.

The strategic shift to resilience does not mean giving up the strategic approach but considering the emergence of digital technologies (Kim, Nam & Stimpert, 2004). Currently, the *strategic thinking and digitalization are inexorably and intrinsically merging* (Panduru, Scarlat & Gherman, 2021) in such a manner that discussion about *digital strategy* (Bones, 2018) includes small businesses (Levy, Morecroft & Rashidirad, 2020; 2022). In general, the digital strategy involves *digital transformation* (Garzoni *et al.*, 2020). According to a report jointly developed by *MIT Sloan Management Review* and *Deloitte* (Kane *et al.*, 2015), researchers agree that *digital*

transformation is driven by strategy and not by the digital technology itself (technology is important; still, it is just a means). When the process of digital transformation is analyzed, it seems that small and medium sized business sectors (SMEs) enjoy more attention from researchers, probably for its dynamism. On the other hand, when a *roadmap for the digital transformation* is defined (Levy, Morecroft & Rashidirad, 2020; 2022), other authors investigated the process of SME digital transformation from different perspectives namely: the capability perspective (Li *et al.*, 2018) or from the eco-systemic perspective (Pelletier & Cloutier, 2019).

The finding that global crises, such as the corona-virus epidemic, may occasionally operate as *digital accelerators* is particularly intriguing (Scarlat & Stănciulescu, 2021; Scarlat, Stănciulescu & Panduru, 2022). It is crucial to emphasize that the present situation, which is represented by the south-eastern quadrant (Table 1), does not involve a return to the "rural" era of earlier times. Instead, *urban agglomerations* are larger, more technologically advanced cities that are currently undergoing a digital transformation. These cities are referred to as future sustainable, *smart cities*.

(ii) *Urban agglomerations become central points for future sustainable, yet highly technologized, smart cities.*

Considering the above (i) and (ii), this study is focused on the localization of hospitality units (hotels) in urban agglomerations, particularly *tourist accommodations in Bucharest (Romania) metropolitan area, with an emphasis on technologies used for business localization*. Therefore, the following section of this paper is organized as follows: broad localization impacting elements, with an emphasis on the Bucharest metropolitan region - examination of airport and train traffic, accommodation capacity layout in Bucharest metropolitan area, and its trends; followed by findings and suggestions, restrictions, and future research avenues.

LITERATURE REVIEW

Literature survey: Localization as a strategic decision. Influencing factors.

Undoubtedly, location-related decisions direct the long-term, future activity of the company entirely, and could even make a difference between business success and failure. There is a great deal of literature on business location, on one side, as well as studies dedicated to geospatial technologies, on the other. However, as the issues investigated (use of geospatial technologies and databases for business location – either for identifying existing locations or strategically planning possible future business locations) are rather new, the corresponding, specific literature is limited. The location theories have a history of almost a century. Their reviews revealed two major approaches:

(i) focusing on cost minimization – as classical or neoclassical location theories (Lösch, 1954; Isard, 1956; McCann & Shepard, 2003); and

(ii) focusing on behavioral theories emphasizing on economic or non-economic influencing elements that impact the strategic choice on site selection (McCann & Shepard, 2003; Rodrigue, 2020).

More than a decade ago the use of information systems and information technologies was signaled as a new trend in managing the supply chains (Shi and Chan, 2010), steel and sawmill industries (Holma & Salo, 2010); despite being internet-based, the geospatial technologies were not mentioned among those information technologies used (Waters, 2010). In business terms, geospatial technologies are currently used mainly in agriculture (Kumar, Suma & Poornima, 2014; Bhanumathi & Kalaivanan, 2018; Praveen & Sharma, 2019) and in a number of industries especially transportation (Kumar, 2022), and supply chain management and distribution networks aiming at transport effectiveness and efficiency, reducing the cost of congestion to society (Struyf *et al.*, 2022). Making the distinction between location and localization, Nigam (2019) defines

geospatial technology-supported localization as “the new technology trend”.

Some authors (Lösch, 1954; Isard, 1956; Henry, 1992) take into consideration only the economic factors and excluding non-economic factors such as legal aspects, socio-cultural and psychological factors, or agglomeration effects. An important economic factor is *access to transportation means*. Yet, this factor is significantly dependent on the industry in the discussion. While analyzing the importance of the transportation factor, the majority of the surveyed papers address only the transportation of raw materials or other goods (Lösch, 1954; Isard, 1956; Krugman, 1991; Porter, 1998; McCann & Shepard, 2003). Recent research related to evolution of the travel industry in the post corona-virus period predicts the acceleration of travel innovation (Bremner, 2020). Novel technologies (as biometrics, digital ID, 5G, IoT, mobility & smart cities) are mentioned as having significant impact in terms of sustainability of the domestic tourism (Bremner, 2020, p.2). However, there is no explicit mention of geospatial technologies among them. Notably, Lee (2022) also proposes a multi-disciplinary approach for developing future smart cities. In other words, the development of future cities (i.e. smart cities) is a matter of integrated urban planning assisted by geospatial technologies. Tourism development in particular, should be done correlating the tourist flows, accommodation facilities and transportation means in the larger context of a sustainable city. Despite the importance of transportation that ensures people’s mobility (as in the case of hospitality industry), *the literature on people’s access to the accommodation site is rather scarce*. In this respect, it is notable to observe the tendency to reconsider the railways as important transportation means, for short and medium distances.

Example 1.

In the Middle East, the railways are witnessing a considerable boom (Economist (2022d, p.33): “From Marrakech in Morocco to Mashhad in Iran, governments are investing tens of billions of

dollars [...] Some 25,000km of the track today is expected to grow by tens of thousands of kilometers by 2040.” Several arguments are listed below.

The first passenger train from Riyadh (Saudi Arabia’s capital city) to Qurayyat (at Jordanian border) was inaugurated in March 2022 on the 1,215 km railroad. The passenger volume in Israel has soared to 70 million to date (from 12 million two decades ago), and the prognosis is to reach 400 million by 2040. In Egypt, the first high-speed railroad (1,100 km) will link the capital city Cairo and the tourist area Abu Simbel; Egypt also plans to upgrade its main railroads as “the passenger volume has risen 15-fold since the 1930s” (*Ibidem*). As business placement is an issue to be raised both at macro- and microeconomic levels. This paper focuses *on micro-location: i.e.* business location in urban areas, mostly in metropolitan areas (specifically Bucharest – Romania metropolitan area). The particular case of mobile location (Yun, Han & Lee, 2013; Baek, 2022) is not considered; for objective reasons, only fixed locations are the subject of this study. Business strategic decisions related to location – both headquarters and operation sites, mostly in urban areas should consider two essential elements as follows:

- (i) External restrictions imposed by the legal system in force (issued by central and local administrations);
- (ii) Internal criteria which are strictly business-related (technology, supply chain, clients and competition, efficiency, *etc.*)

While making longer-impact strategic decisions, it is up to entrepreneurs and companies’ top management to prove their capability and managerial skills to “navigate” in between, to avoid inconveniences and exploit opportunities, maximize their own strengths, and eliminate or cure their weaknesses. A legal provision to stimulate the use of green/clean energy is an opportunity to

catch, while the use of polluting technologies is to be avoided. Often, the *influence of urban planning* is decisive as exemplified in *Example 2*.

Example 2.

The sustainable and integrated urban development strategies of the area (Gallardo-Saavedra et al., 2022) include Soria, a tourist destination in north-central Spain with a long history (middle-age monuments as well as archaeological collections), and which promotes energy efficiency and increased use of renewable energy in urban areas.

In this regard, a large amount of literature deals with issues related to green, and renewable energy namely, solar energy (De Luca *et al.*, 2018; Ayodele, Ogunjuyigbe & Nwakanma, 2021; López, Soto & Hernández, 2022). Traditional location-allocation problem was usually solved by mathematical models – from linear (Kraft & Scarlat, 1985) to non-linear programming to more and more advanced algorithms considering the corresponding restrictions (Rabani, Mokhtarzadeh & Manavizadeh, 2021). Considering the urban planning restrictions, when making the strategic decision on site location, managers from hospitality business usually analyze economic and financial factors – *e.g.* building costs and building regulations, renting, taxation, labor market perspective, transport networks and terminals, resources and suppliers available (Bam, De Bruyne & Schute, 2020). The exact shape and size of the plot of land occupied by each concrete building is a matter of cadaster measurements (Belloiu & Scarlat, 2018).

According to Ulucan (2021), the competitiveness of accommodation business is greatly influenced by site selection, and this decision is mainly influenced by the economic factors and the effects of agglomeration (accommodation clusters). *The growth of the number of enterprises with the same type of activity over time suggests that an increased demand has not yet been met in*

the studied region. Other non-economic factors are important in the case of micro-location studies such as the existence of natural or socio-cultural touristic attractions within metropolitan areas (Ghiță, 2013; Ghiță *et al.*, 2013) or touristic areas (Scarlat, Ghiță & Magano, 2013; Kasim & Scarlat, 2015; Scarlat, 2018; 2020). In the hospitality industry, competition analysis is of great importance, as it reveals customers' preferences regarding the location – denoting that failure in that area is most likely an influence of internal factors (such as service quality, customer satisfaction) rather than external economic factors (Scarlat, 2018; 2020). In a large city, such as Bucharest, most hotel customers are in the city for two main reasons: touristic travel and business travel. In both cases, new businesses can profit from locating in very active areas, next to existing similar businesses by capturing surplus customers, which might imply higher costs because of the location attractiveness (Dixit, Clouse & Turken, 2019).

Smart cities and digital technologies

Smart cities are organically linked to smart energy grids (La Scala, 2017) as well as with critical infrastructures in general (Polinpapilinho *et al.*, 2016; Botezatu, 2022). Applications of artificial intelligence, or AI, are now being employed more and more in urban planning. When it comes to managing urban infrastructure, from design to construction to operation and maintenance, AI and IoT (the internet of things) collaborate to create a true smart city (Lyu *et al.*, 2021). This is known as *smart urbanism* (Alaoui *et al.*, 2022). The future of smart urbanism is to develop and use smart urbanism technologies as “automated urban planning platforms” “in order to improve the quality of management regulations” (*Ibidem*).

There is a large deal of literature regarding *smart cities*, as well as *sustainable smart cities* (Peris-Ortiz, Bennet & Pérez-Bustamante Yábar, 2016; Agarwal *et al.*, 2021; Minaei, 2022) worldwide (El Fallah Seghrouchni *et al.*, 2016; Song *et al.*, 2017; Mahmood, 2018; Bernardin & Jeannot,

2019; Haleboua, 2020) or by regions as in Australia (Yigitcanlar *et al.*, 2021) or Asia (Henriot *et al.*, 2018), specifically in India (Mani, 2016). A challenging question to be addressed is about ‘smart’ and ‘sustainable’ attributes of future urban agglomerations: Are they in competition or complementing each other? If so, is there any inter - conditionality? In other words, do *smart* make a city more *sustainable*? (Scarlat, 2022). However, the debate on this challenging issue requires further investigations.

METHODOLOGY

This investigation was conducted in order to explore the dynamic (tourist) transportation industry and relatively static hospitality industry (tourist accommodation) using geospatial technologies. Tourist accommodation is related to the main passenger traffic flows; from/to the main transport terminals. In Bucharest metropolitan area, there are two major transport terminals: Bucharest “Henri Coandă” International Airport (coded OTP) – BHCIA and Bucharest North Railway Station – BNRS. The main research objective is to identify if there is a specific preferred pattern for choosing the location of tourist accommodation facilities (hotels) in the studied area. In order to reach this objective, two research questions are developed:

The first research question: Does the traffic from the transit terminals influence the number of accommodation facilities available?

The second research question (strictly related to the first one): Does the position of the transit terminals influence the decisions on the location of accommodation facilities?

The investigation methodology consists of both secondary sources and primary research, respectively: national statistics as well as international databases as *Google Maps* and *OpenStreetMap*, extensively, using the geographic information system (GIS) database and

software tools (*QGIS 3.22* and *Google Earth Pro 7.3.4.8573*). Combining GIS software and databases adequately, map-based graphical representations of desired locations can be obtained; either in the dynamical or static format, current, past, or predicted accommodation locations (loaded with additional information such as hotel capacity, occupancy, *etc.*). Consequently, the remaining of the paper is structured as follows: an analysis of airport and train traffic for the Bucharest metropolitan area and an analysis of accommodation sites pattern and tendencies in the same area, followed by the resulting conclusions about the influence of transportation activity on hotels' location.

RESULTS

Airport and train traffic in Bucharest metropolitan area

For this study, the total number of passengers that travel either by plane or by train is essential. The data made available by Bucharest Airports National Company (BANC) reveals the evolution tendency for the number of passengers that arrived at or departed from Bucharest "Henry Coandă" International Airport (BANC, 2022), as depicted in Figure 1 and Figure 2. The usual pattern over twelve months is constant for every year (2015-2019) with a minimum low in February and a peak in August (BANC, 2022). From one year to another, the number of passengers increased by one million to one and a half million, until 2020, when it drastically dropped starting from March. The total number of passengers in 2020 was two-thirds less than the total number of passengers in 2019, a consequence of the restrictions imposed by the authorities in the attempt to contain the spread of the SARS-CoV-2 virus. In spite of an increase in the number of passengers in 2021, it was still less than half compared to 2019. After authorities in most European countries and other preferred destinations have decided to drop the travel restrictions, it is expected that the number of tourists transiting BHCIA to rise based on historical records in 2019. Data from the first quarter of 2022 shows that in March, for example, the number

of transiting tourists was four times greater than the same month in 2021, and very close to the number of tourists from March 2019 (Bucharest Airports National Company, 2022). In contrast, the total number of passengers transiting the Bucharest North Railway Station – BNRS followed a pattern that can be described as a linear, slow decrease between 2015 and 2019, followed by fluctuations in 2020 and 2021, and a rapid increase starting with the end of the first quarter, 2022.

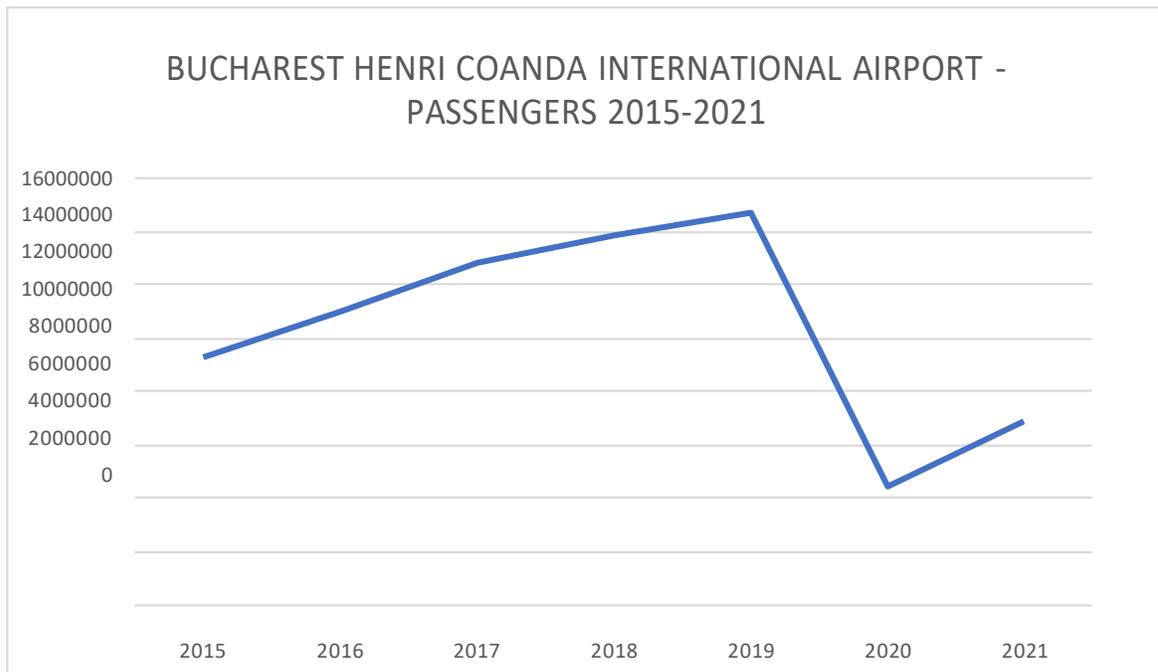


Figure 1. The total number of passengers transiting the Bucharest “Henri Coandă” International Airport from 2015 to 2021

(Source: BANC (2022))

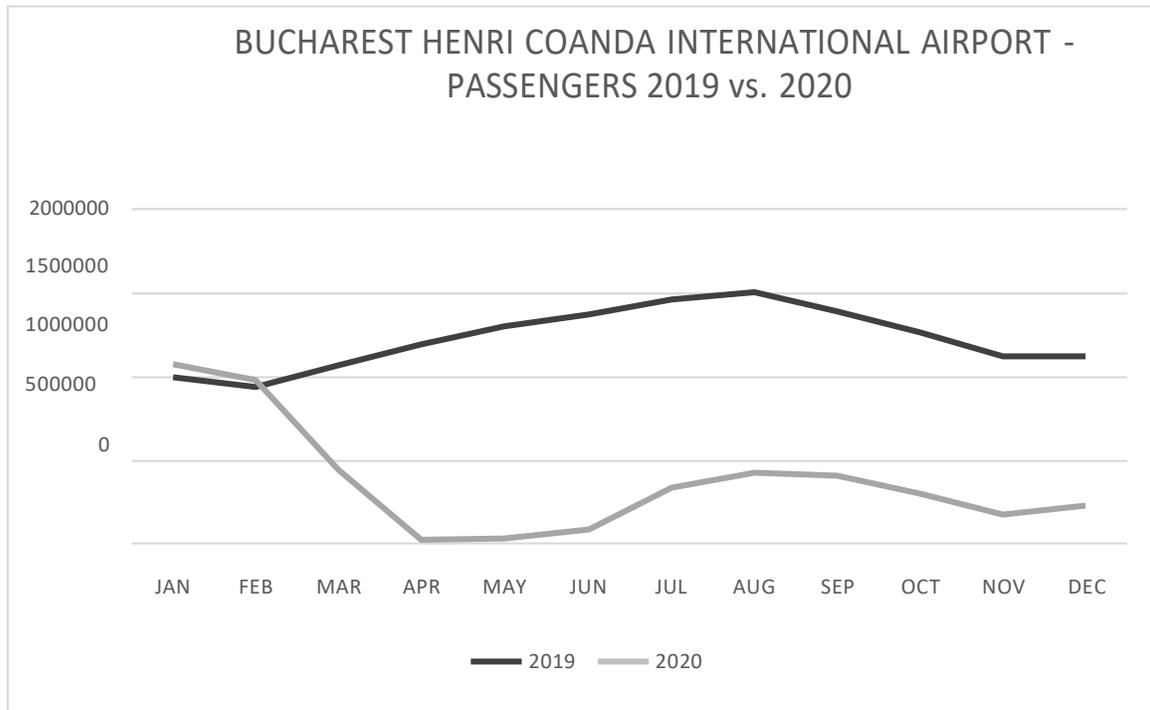


Figure 2. The total number of passengers transiting the Bucharest “Henri Coandă” International Airport by monthly comparison in 2020 vs. 2019 (b).

(Source: BANC (2022)).

Accommodation capacity layout in Bucharest metropolitan area and its trends

To study the layout of the hospitality business that offers accommodation in Bucharest and Otopeni, the authors have used the data provided by the Romanian Entrepreneurship and Tourism Ministry (ETM, 2022) updated for 15.04.2022 and included all the locations classified as *hotel*, *hostel*, *motel*, *touristic villa* (excluding the ones classified as *apartment-hotel*, *apartment to let*, *room to let*) as shown in Table 3.

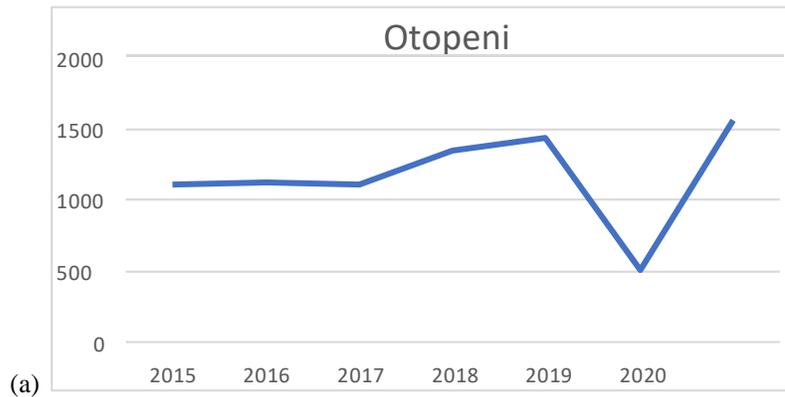
Table 3

Existing accommodation capacity (number of beds).

Year	2015	2016	2017	2018	2019	2020	2021
Bucharest	19,7 84	20,2 47	20,8 86	21,6 24	21,9 29	21,8 09	22,6 26
Otopeni	1,11 2	1,12 7	1,10 8	1,34 9	1,43 6	505	1,55 8
Country	328, 313	328, 888	343, 720	353, 835	356, 562	358, 119	n.a.

(Source: ETM (2022))

Similar results were obtained by querying *Google Maps* (Google, 2022) and *OpenStreetMap* (Open Street Map, 2022) databases for the same types of activity (*hotel, hostel, motel, touristic villa*). Additionally, data from the Regional Statistical Division of Bucharest Municipality (RSDBM) (2021) and the Romanian National Institute of Statistics (RNIS) (2022) were employed to develop the charts in Figure 3.



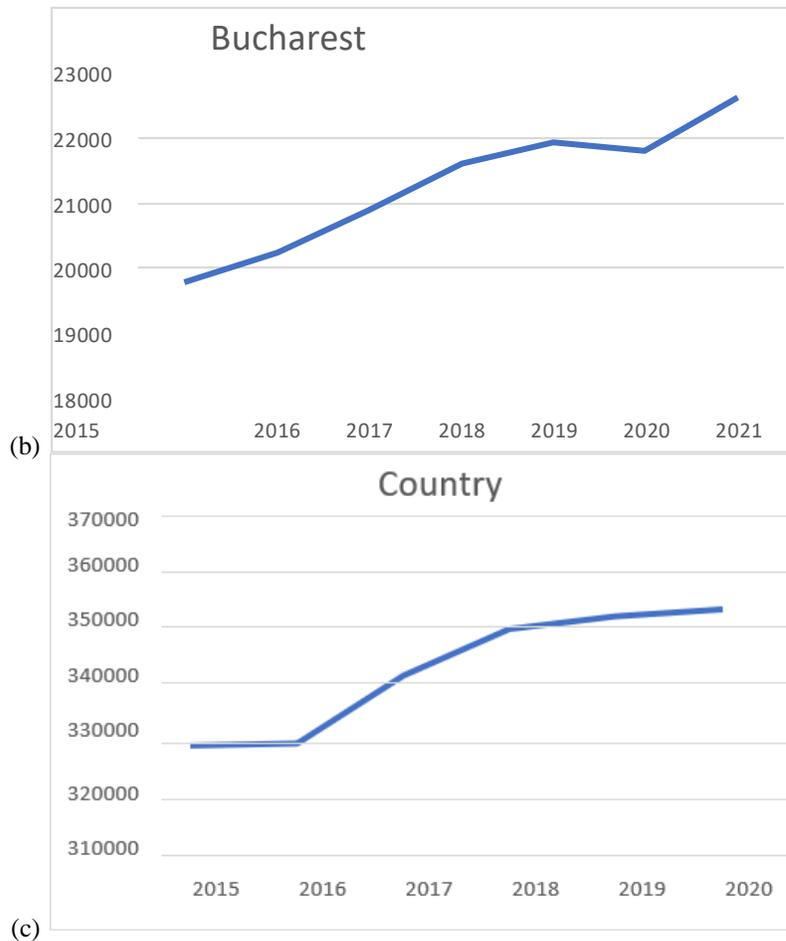


Figure 2. Existing accommodation capacity (number of beds) in Bucharest (a), Otopeni (b) and Romania (c)

(Source: RNIS (2022) and RSDBM (2021))

The evolution of the accommodation capacity can be described as a linear growth, with the exception of the year 2020, influenced by the Corona-virus disease (COVID-19). Comparing the data from *Figure 2 (a, b, c)*, it can be concluded that the most affected area in the year 2020 was Otopeni, having reduced the number of beds by approximately two-thirds compared with 2019, followed by a comeback in 2021, a pattern that follows the same evolution as the total number of passengers transiting the airport in the mentioned years. Comparing the charts that show the total number of passengers transiting BHCIA from *Figure 1* and the number of existing accommodation business in Otopeni from *Figure 2 (b)*, authors have noticed that they follow the

same pattern, and this led to the conclusion that the existing accommodation capacity in Otopeni is apparently dependent on the activity of BHCIA passenger terminal.

This answers the first research question that provides the data about the registered hospitality enterprises that offer accommodation in Excel Spreadsheets, providing text information about the type of activities (*hotel, hostel, motel, touristic villa, apartment-hotel, apartment to let, room to let*), name, address, etc. This data was geo-coded and analyzed using GIS tools (*QGIS 3.22 and Google Earth Pro 7.3.4.8573*). In order to better illustrate the data, the points indicating apartment-hotels, apartments for rent, and rooms for rent were filtered. It should be noted that the invisible points follow the same pattern as the visible ones as depicted in *Annex 1*. According to the map in *Annex 1*, Bucharest's center and the southern part of District I (which includes the North Railway Station) have an agglomeration of accommodation, while District VI also exhibits an apparent agglomeration of accommodation. The hospitality industry is concentrated in Otopeni, with the BHCIA in the north and Bucharest in the south.

The outcomes are comparable when using data from Google Maps or OpenStreetMap. The authors have obtained information from ETM on the registered lodging establishments for the area under study, updated for the following dates: 18.09.2018, 01.02.2019, 22.05.2020, 09.04.2021, and 15.04.2022. By comparing this data, the scientists came to the conclusion that Bucharest's central and northern regions showed minor differences in the pattern for agglomeration of structures for each set of data. When put in relation to tourist attraction sites queried from Google Maps, it was found that the two patterns are similar and the pattern for accommodation sites is mostly likely influenced by one of the tourist attraction sites as depicted in *Annex 2*. A series of differences was noticed when comparing the maps from *Annex 1* and *Annex 2*.

(iii) There are many accommodation facilities in District VI and the upper-central part of District I, but touristic attractions are scarce. This can be explained by the fact that these areas are crowded with business centers. Therefore, there is a good deal of people who travel for business purposes in that area.

(iv) In the northern part of District IV, the development of accommodation facilities is restricted as a consequence of the fact that the indicated area is a natural landscape with building restrictions.

(v) The accommodation facilities on the South from BHCIA and West from BNRS are not in close proximity to tourist attractions or business centers, indicating that the tourists are arriving at one of the transit terminals and are travelling to a different destination, suggesting that *positions of the transit terminals influence the decisions on the location of accommodation facilities.*

This answers the second research question that SARS-CoV-2 restrictions have had a huge impact on accommodation sites in Otopeni, suggesting that regions where the number of visitors is influenced by nearby transit terminals, have been the most affected. Most likely, recent events in Ukraine have influenced the number of accommodation sites in the area under study, influenced by the increased afflux of occupants, as Ukrainian citizens have left the conflict zones and transited or temporarily established a residence in Bucharest or Otopeni.

Implications and recommendations to main stakeholders

Entrepreneurs and business strategists working in the tourism and hospitality sectors, as well as other key stakeholders like managers of significant passenger terminals, airlines, and railroad administration, can all benefit from the findings of this pilot study. The localization technologies presented are powerful tools for both analysis and prediction, supporting both immediate judgments and longer-term planning. For example, consider how travelers' optimum

accommodation capacity may lead to higher-quality services (and for better profits on the business side). Finally, professional organizations from the tourist and hospitality sectors can better support their members and customers. Dynamic, real-time applications and platforms accessible to tourists can be developed based on localization technologies presented. Urban planners and city local administration can design better urban development plans in the process of digitally transforming urban agglomerations into sustainable, smart cities. Better coordination with smart infrastructures as energy smart grids is attainable.

In general, better informed and less risky strategic decisions can be made by simulating future scenarios, based on geo-spatial technologies and databases available. For both scholars and practitioners, it is challenging to conduct comparative studies related to different metropolitan areas (Ghiță, 2013), or more purposeful competition analyses focusing on restricted quarters of metropolitan area. In the second instance, it is challenging for an emerging business (either start-up or developing new sites) to discern between *attractiveness* of a certain business-specific, customer-rich area (Scarlat, 2018; 2020) and *perspective of failure* (because of the high competition) in the very same city area.

CONCLUSION

This study was focused on identifying whether there is a relationship between the dynamic (tourist) transportation industry and relatively static hospitality industry (tourist accommodation), with the help of geospatial technologies. The main objective of this study has been achieved and there is enough evidence to conclude that transit terminals passenger flow does influence the number of active accommodation facilities. This also answers the first research question. Moreover, it was found that there are identified patterns that show a higher density of accommodation sites in vicinity of transit terminals, which answers the second research question. Site selection is a vital

decision for the hospitality business that offers accommodation.

For Bucharest metropolitan area, some constants can be identified over the time, such as:

- Accommodation sites form clusters in central and central-northern part of Bucharest and in the southern part of Otopeni;
- Accommodation clusters follow the pattern of tourist attraction agglomeration.
- There has been a linear growth of number of accommodation units in Bucharest and Otopeni except for the year 2020;
- The number of accommodation units in Bucharest is proportionate to the number at the country level;
- The number of accommodation units in Otopeni follows (as proportion) the number of passengers transiting BHCIA, and it is greatly influenced by the airport activity.

Recent major events such as the COVID-19 pandemics and Ukraine conflict escalation have a great impact on tourism businesses. Patterns for accommodation sites clusters have been constant for the studied period (2015-2022), suggesting that sites in proximity of similar accommodation businesses have better chances to succeed than sites where this type of activity is considered as niche.

Limitations and further studies

This explorative investigation, as a pilot study for testing the use of the geo-spatial technologies and data bases, has inherent limitations as follows:

The consequences of the coronavirus epidemic and the crisis in Ukraine on the study regions should first be further examined. In-depth interviews with hotel managers could be conducted to

do localization research on the unique effects of the corona virus outbreak, the crisis in Ukraine, and the following migration of Ukrainians. The data provided by ETM has a drawback in that it only lists the accommodation facilities that are registered at a particular moment, independent of their real economic activity. This might result in themed maps that do not accurately depict the amount of accommodation available in a given location. Map-based graphical representations of desired locations can be obtained dynamically or statically using GIS software and databases, including current, past, or predicted accommodation locations (with additional information such as hotel capacity, occupancy, tourist profiles, preferences, intentions, and satisfaction).

Further studies could also consider features of accommodation units (such as price, occupancy, average score and number of reviews, *etc.*) that could be investigated using other digital technologies such as machine learning as well as models and algorithms based on artificial neural networks (Li, Liao & Gao, 2022). Therefore, analogue studies based on geospatial technologies could be carried out in such businesses as well, depending on the availability of industry-specific resources. The debate on the relationship between ‘smart’ *and* ‘sustainable’ attributes of future urban agglomerations (Scarlat, 2022) is also a matter of further studies. As studies of smart cities are one of the most dynamic inter-disciplinary areas, advanced methods for identifying the emerging topics need to be used. Thus, Lee (2022) finds that “the evolution of smart transportation and smart grids is likely to be the focus”. Therefore, further studies on accommodation units in Bucharest as well as other metropolitan areas (as comparative studies or independent) will probably be linked to the evolution of associated smart energy grids and smart transportation networks.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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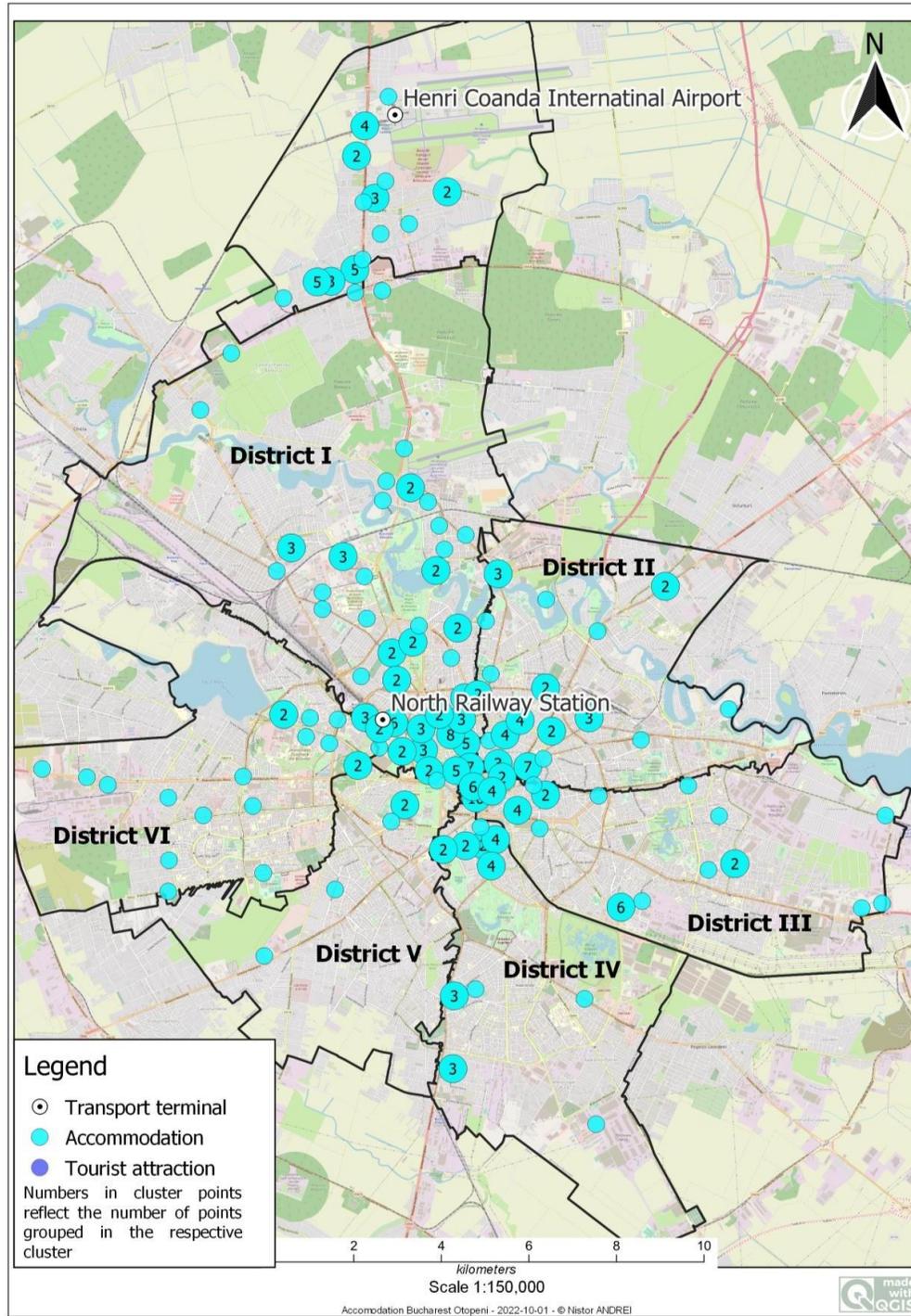
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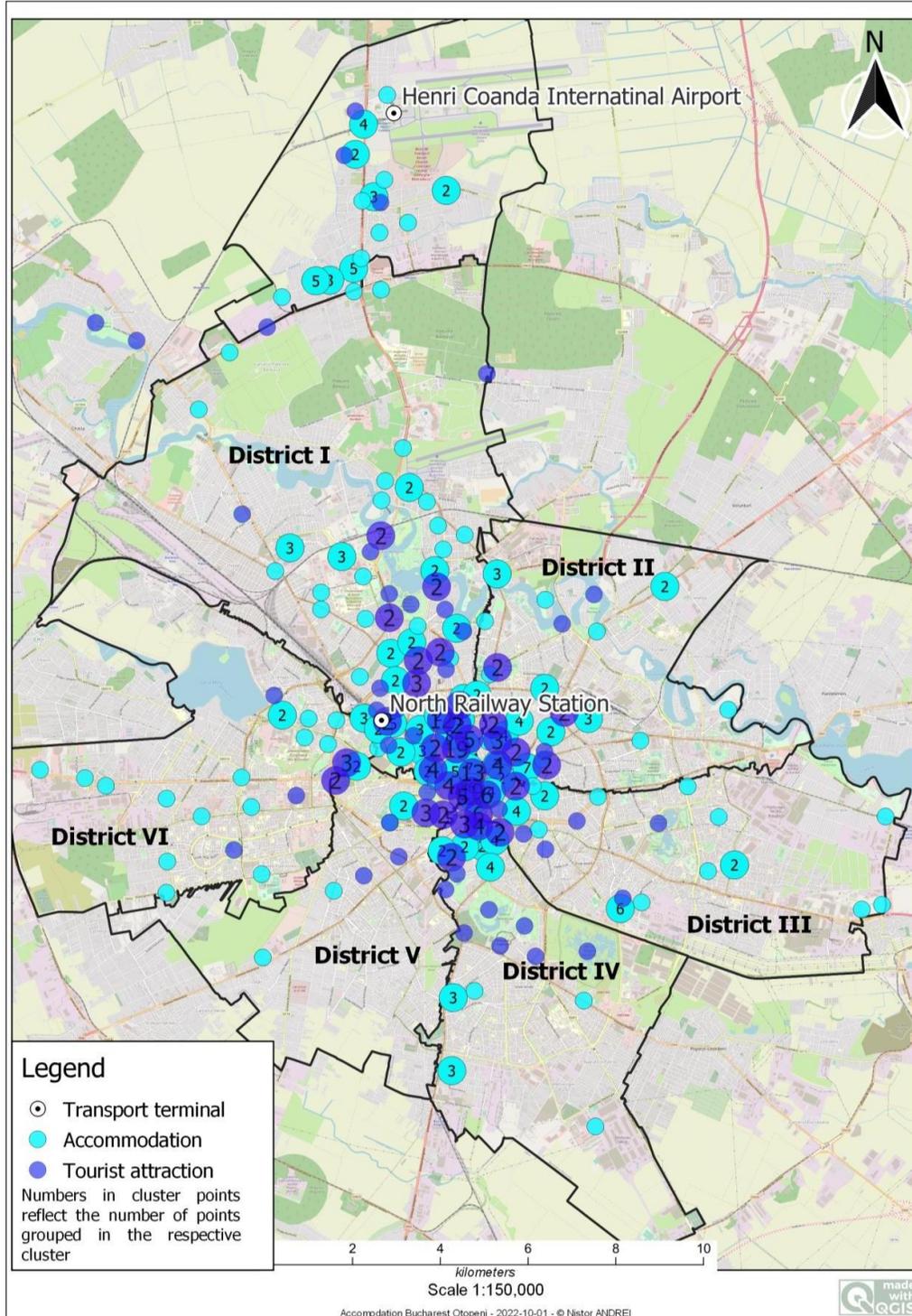
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Annex I. Registered hospitality enterprises that offer accommodation in Bucharest Metropolitan Area, (Source: ETM (15.04.2022))



Annex 2. Registered hospitality enterprises that offer accommodation in Bucharest Metropolitan Area in relation with tourist attractions in the region.

Source: (ETM (15.04.2022) and Google Maps (2022))