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A morphological approach in defining the causes of tourist-local conflicts in tourist-historic cities

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Abstract

In Central Europe the two major urban tourism destinations are Vienna and Prague, similar in size and offer of cultural tourism. Congestion, overcrowding and mono-functional usage of the centre is evident and well published in the case of Prague, while considerably fewer are the known cases of conflict in Vienna. The main differences between these urban destinations are of morphological and historical nature. Prague's topography and the preserved medieval street layout forces visitors to use less public spaces while moving between attractions, and the fast liberalisation after the fall of the Iron Curtain helped tourism related services to push out local uses from these spaces. Data obtained from geographically referenced photography of the two cities uploaded to image sharing web sites were used to build graphs of spatial distribution of tourist attractions and routes, giving numerical evidence of these differences in the two spatial systems. With conscious urban planning and tourism management the tourist carrying capacity of these systems can be elevated, relieving some of the conflicts between visitors and locals.

Keywords

urban tourism, urban morphology, impact of tourism, geotagging, Vienna, Prague

1 Introduction

Vienna and Prague are two popular tourist destinations in Central Europe, registering similar numbers of tourist arrivals. While the size, cultural activity and historical richness is similar in their centres, the impact of tourism on spatial and social levels is quite different. The question is how the same amount of tourists causes well known and published socio-economical tensions in Prague, while Vienna seems only to profit from tourism, being one of the most liveable cities according to different indicators. This paper collects historical, political, economic and social differences in the two cities already revealed by previous studies, and suggests considering a new factor, the morphological differences in tourist space usage. It is assumed that in urban areas of similar size the geographical layout of tourist attractions, services and connecting public spaces can differ substantially, and that these are more complexly interconnected in the case of Vienna than in Prague. In a more interconnected

spatial network there are better chances for local-tourist functional mixes, as more space is available for the crowd to disperse, more chances for visitors to explore.

Tourists in cities consume a series of experiences ranging from sights, monuments, museums or cultural events to shopping, dining and interaction with other people. Cities compete on the global market for tourists by developing their attractions and their urban surroundings. However in tourist-historical cities (Ashworth & Turnbridge, 1990) like Vienna and Prague, the majority of attractions and their urban settings are monuments in historical urban layouts with an evolved and protected morphology, used also by the local community with their own infrastructures, businesses and cultural uses. These cities made their tourist offer richer in the past decade by improving the pedestrian access in their city centres, and by developing their cultural tourism services, commercial and retail offers, along with the necessary refurbishment of streets and historical buildings. These developments had an effect on the socio-economic structure of the urban areas involved. In some cases a fast gentrification has happened, while in worst cases tourism became the only working function, leading to the “museumification” of historical urban cores. Among these cities the most commonly cited are Venice and Salzburg (Borg, Costa, & Gotti, 1996), but inner Prague is also considered to be on this way. On the other hand there are few examples when heritage protection, destination branding and tourist-friendly investments lead to an even better local usage. Vienna seems to be such a case.

It is interesting how the tourist carrying capacity of these similar cities is different. This concept has been studied since O'Reilly (1986), with some attempts to define it as a quantitative indicator, like in the case of Venice, Italy (Canestrelli & Costa, 1991). Researches show how a certain crowd of tourists affects the local socio-economic structures of a city (Deichmann, 2002; Gilbert & Clark, 1997), and how it affects tourists themselves (Popp, 2012; Riganti & Nijkamp, 2008; Simpson, 1999) . As there are equal numbers of tourists in Vienna and Prague, The tourist carrying capacity has to be in connection with the size and structure of the urban spaces where tourists most often move, not with the overall indicators of the cities.

This paper focuses on the major differences in tourist space usage between the two cities, and will review the published cases of social and spatial tensions caused by urban tourism. Using a comparable model of urban tourist space usage, this paper attempts to give some additional explanations on why the same number of visitors in Prague is causing more problems than in Vienna.

2 Impacts of the tourism industry in Vienna and in Prague

2.1 Differences in the development of the tourism industries of the two cities

With 6,077,285 tourist arrivals and 13,119,077 bednights registered in Vienna and 5,394,283 arrivals and 13,601,964 bednights registered in Prague (TourMIS, 2012) these cities are the 6th and 7th most popular destinations in the EU after Paris, Berlin, Rome, Barcelona and Madrid. Both register increasing tourist numbers each year, but the rate of growth was quite different in the near history of the two (Figure 1).

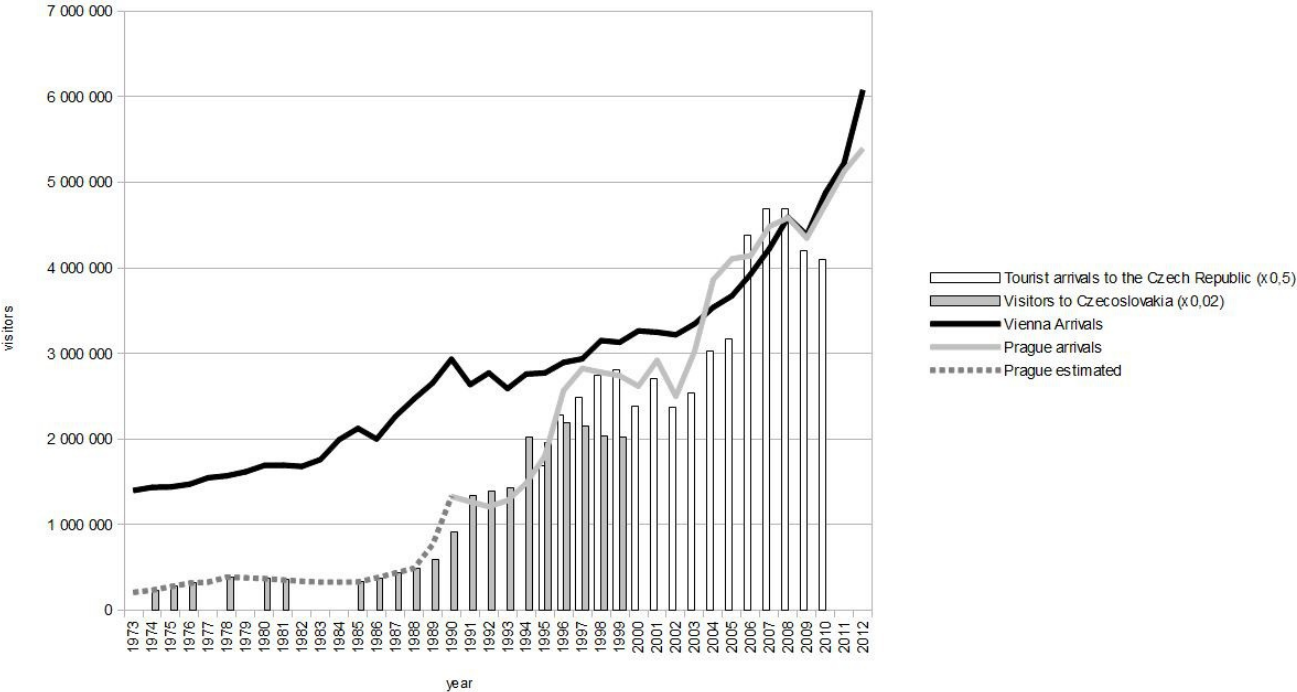


Figure 1: Tourist arrivals to Prague and Vienna between 1973 and 2011. (source: Franke, 1984; Hoffman & Musil, 2009; Maxwell, 1995; Medlik, 1990; TourMIS, 2012)

Both capital cities attract the same type of tourists, being popular week-end destinations, cultural destinations, with similar historical atmospheres of “Mittel-Europa”. Both were important capitals of the Holy Roman Empire, even if not in the same era. Prague flourished under Charles IV in the 14th century, and later under Rudolf II in the 16th century, while Vienna had a first period of prosperity in the 15th century, while it boomed as the capital of the Habsburg Empire, and later of the Austro-Hungarian Empire in the 18th and 19th centuries. Both cities built an early tourism industry between the two World Wars, but Following WWII the Iron Curtain effectively closed Prague to the booming expansion of tourism in the western countries.

Vienna kept its identity as centre of classical music and guardian of the Habsburg traditions after the war, building its tourism markets following a well-conceived strategy. In 1955 Austria regained full independence as a neutral country; in that same year the Vienna Tourist Board (originally Vienna Tourist Association) was founded under the special Vienna Tourism Law. This established the independent professional management and regulation of Vienna’s tourism industry and also the efficient tax collection and redistribution of earnings from the hotel industry. The city had 1,6 million bednights registered in 1955 and this number grew in steady pace: it reached 3 million in 1964, 4 million in 1975, 6 million in the 1980's, increasing to around 7 million in the 1990's and booming to a 13,1 million in 2012 (TourMIS, 2012). Vienna was visited five times more tourists than Prague was before the fall of the Iron Curtain. The Austrian capital city lost many visitors with the opening of the borders, mainly visitors from eastern countries, coming to Austria before the end of the communist regimes to shop goods not accessible behind the Iron Curtain. The new capitalist system made these visits obsolete, but it also imposed a period of economic recession to the post-socialist countries in the early 1990's, setting back tourism as well. Tourism management and urban planning in Vienna responded to these trends by diversifying and further developing its tourist branding and its cultural offer. The new museum complex Museumsquartier (MQ) opened in 2001, the Albertina museum was renewed and reopened in 2008, and many other smaller interventions were made (Frantz, 2005). As a result, the Vienna Tourist Board could fulfil its goal for the year 2010, registering more than 10 million bednights, achieving considerable growth levels since the early 2000's

Prague as part of the Eastern Bloc experienced a different development. Following a Soviet model all hotels and services were nationalized after the Czechoslovak coup d'état in 1948. Borders of Czechoslovakia were closed towards western countries, but travel was restricted even between countries of the Eastern Bloc. In the 1960's the government realized the benefits of western tourists spending their hard currency in the country, and started to modernize tourism infrastructures and ease to issuing of visas. The number of foreign tourists coming to Czechoslovakia did rise from below 5 million in the 1960's to almost 19 million in 1986; still more than 90% of all those visitors entering were from Eastern Bloc countries (Maxwell, 1995). After the Velvet Revolution in 1989 the country opened up its borders, and westerners were more than welcome. But at the same time visitors from post-socialist countries almost disappeared, resulting in stagnating arrival numbers until 1993. After 1993 this post-communist jewellery box attracted a steeply increasing number of tourists; in 1997 Prague overtook Vienna in the number of registered bednights for the first time. The heady rush of visitors started to settle down as the initial excitement from western tourists for formerly closed destinations began to wear off. However the appearance of cheap flights over Europe and some major investment in the historical centre of Prague and in hotel industries resulted in a second boom after the reconstructions following the flood of 2002. Statistics show the beginning of a new period of stagnation for the Czech capital: the arrival numbers of the two cities were head to head between 2008 and 2010, showing a remarkable advantage for Vienna today, catching up also in the registered bednight numbers. If this tendency will be lasting, that would prove how the planned tourism development model of Vienna is the more sustainable one, giving evidence to some negative impacts of tourism in Prague.

2.2 Conflicts and symbiosis between tourists and locals

While tourism is beneficial in an economical level to both cities, the same number of tourists makes different impact on the social and urban life of these. Tourism in general has a lot of evident benefits to a city's economy, but the balance between local and tourist uses is important to avoid conflicts of sociological nature. The healthy amount of local and visiting users can get the most out of the urban cores. Tourist spending contributes to a rich service

sector, where most of the functions are used by both groups. Restaurants and cafés, fashion and design shops, boutiques of local produces best prosper if also tourists uses them. The rich service sector attracts well educated and creative workforce, who by their sole presence contribute to the economic competitiveness of the city. With no tourists around, much of these services in inner cities could not survive, leading to a down-spiral of the socio-economic structure of the city. On the other hand tourist overcrowding can result in other problems of similar socio-economical nature. Tourist flows in urban cores can cause congestion, discomfort by noise or crowding, rising prices, disappearing local functions and services; as a result the socio-economic structure of neighbourhoods can change. Grocery stores and workshops turn into souvenir shops; local pubs into fancy restaurants, whole apartment buildings could be converted into hotels, as these are now more profitable services and businesses. Cooper & Morpeth (1998) described rather precisely this process in the case of Prague. The resulting exodus - when locals move out into suburbs or other parts of the city where parking, local services and tranquillity are more accessible - produces a mono-functional city centre that loses its urban character by a processes of 'museumification' or 'Disneyfication' (McNeil, 1999). At the end with local life also the unique character of a tourist destination can diminish. This way visitors seeking cultural tourism look for other destinations, as the culture of a city is most lively when rooted in and fed from the costumes and exigencies of those living there. Without locals multifunctional cities will turn into mono-functional museums, offering less excitement and discovery than any real city.

There is a remarkable difference in these processes between Vienna and Prague.

The Austrian capital resulted to be the most liveable city in the world fourth time in a row in 2012 by the international consulting firm Mercer. The Mercer's Quality of Living Survey takes into consideration several criteria in defining a liveable city, and Prague is only the 69th in this list. Vienna is second on the similar EIU's Global Liveability Report, where Prague is 60th. The impact of tourism is not extensive in these aspects, but as recreation and cultural offer is greatly affecting the liveability, it is worth noting how tourist use occupied exclusively the most beautiful and valuable parts of the Czech capital, pushing out locals from the nice medieval squares and from nearly all areas surrounding the main cultural attractions. This didn't happen in Vienna. There are some areas around monuments with exclusive tourist use,

like the sites that best portray the brands of 'Capital of Habsburgs' and 'Capital of Music', but between these attractions most public spaces of the centre offer a mixture of services for tourists and locals alike. The multifunctional use of an urban environment is hard to measure. A good indicator is the presence of shops and brands in the city centre used also by locals. One example is the disposition of popular international fashion stores present in both cities. In the very centre of Vienna the two most touristy shopping streets, the Kärntner Strasse and the Graben both host an *H&M* store, very popular brand for young people. The same brand has three stores in the centre of Prague, but all are outside the former city walls, in popular shopping streets and department stores out from the main tourist core. In Vienna the smart planning of new infrastructures for leisure and tourism has been a priority for the city. The extensions of the tourist network are always multifunctional environments, with plenty of services to locals. For instance MQ, the new museum district closing the main tourist axis of the Habsburg Hof is also a much visited gathering space for young local people, with movable urban furniture designed to potentiate the agora function, to allow sitting and lying. Another example is the development of the Danube Canal embankment, the area where the tourist city and the business district meet. It became a leisure district with new bars a river port and artificial beaches, used by locals and tourists alike (Hatz, 2008). The centre of Vienna is considered to be a premium environment for living, where carefully planned tourist uses did never affect the services of locals.

Prague faced drastic changes in the use of its historic core, leaving no time for comprehensive planning. After the fall of the Iron Curtain the beauties of the “City of a hundred spires” enchanted millions of tourists, and the new free economy served these visitors where they concentrated most, around the main sites of attraction. Small privatisation of shops and re-privatization of entire buildings in the centre accelerated the transformation of the once rich cultural, trading and living urban fabric into a mono-functional environment servicing visitors. This fast process led to socio-economical tensions in the centre described by many scholars (Cooper & Morpeth, 1998; Deichmann, 2002; Hoffman & Musil, 1999; Maxwell, 1995; Simpson, 1999). The most obvious result was the fast drop in the numbers of local population of the centre (Ourednicek & Temelová, 2009), most visible around the 'King's Way', a highly overcrowded succession of streets connecting all main monuments (Simpson,

1999). Strategic planning could have softened these processes, but in the early nineties the reputation of urban planning was the lowest, as considered something tied to the centralized governances, like during the communist era. A Strategic Plan for Prague had been implemented in 1996, but its tools were weak and its aims fuzzy, as the functional takeover of tourism in the centre was not treated properly (Cooper & Morpeth, 1998). The controversial takeover of tourists in Prague gained the attention of many scholars in tourism studies, resulting in the above mentioned bibliography of tourism related problems, something not existing in the case of Vienna.

3 Tourist space systems

3.1 Morphology and tourist space usage

The two cities have quite different morphological layouts as defined by their topography and historical development in urban design. Tourist use only portions of the urban spaces, they move between points of attraction in specific routes. These should be easy to follow, visually interesting, having street level services, and preferably pedestrian friendly. Most of these routes are marked on tourist maps or signposts, or are evident points of connections between attractions. The urban morphology of the city defines most of the times these connecting routes, and tourist only rarely divert from them, to explore streets that are not directly leading to any of the places of interest. Street morphology is the least of all changeable layer of cities, especially of protected tourist-historic cities. The development of pedestrian only zones, new services and the marking of new attractions can alter the flows of tourism; these are almost the only tools in the hands of urban planners in such urban cores.

The morphology of the two cities differs. The historical centre of Vienna was defined by the medieval city walls and the Danube Canal, this area lies on a flat terrain. The medieval town had earlier been built upon the ruins of a Roman military camp, Vindobona, which accounts now for the geometrical street layout of Vienna when compared with the more irregular street pattern that developed in the centre of the medieval city of Prague.

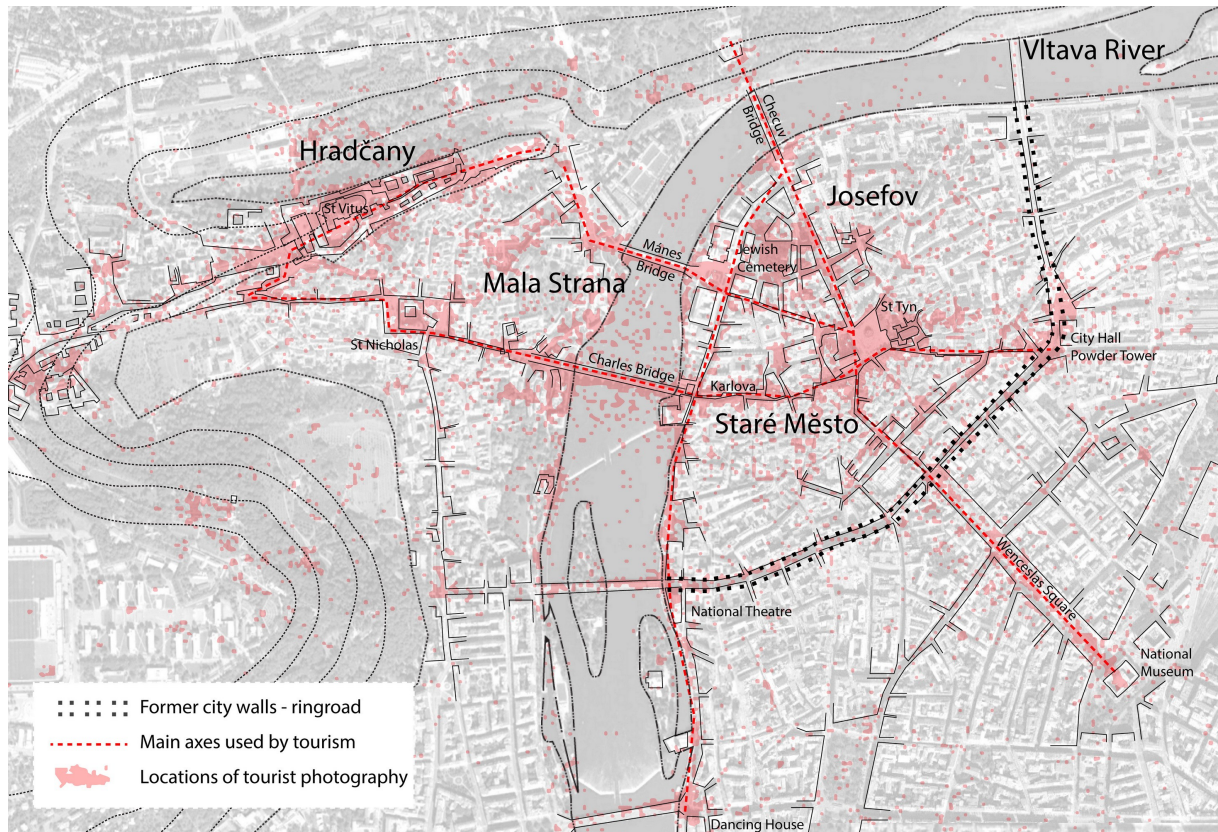


Figure 2: Main morphological and tourist elements in Prague (source: author's own)

The medieval street pattern was intentionally labyrinthine in the middle ages, to prevent enemy forces to easily penetrate the city. The rough topography of Prague made this goal even easier, only two are the access points to the Hradčany castle and obviously there was only one crossing through the river, the Charles Bridge. Urban development in the later eras made the system more accessible, new bridges were built and some large urban compositions connected the centre with peripheral developments – but the medieval core had never been touched, as in Prague preservationist movements (Club for old Prague) were strong since the early nineteenth century (Hoffman & Musil, 1999), while during the communist era the price and rent controls over land-use impeded new developments to occur in the centre (Cooper & Morpeth, 1998). Prague's core was originally comprised of four towns on the two banks of river Vltava. On the west side of the river the pattern of the streets were predominately determined by the hilly topography in the castle district, of Hradčany, and the Lesser Quarter, of Mala Strana. On the less hilly east side of the river Staré Město, the Old Town, and Josefov,

the Jewish Quarter was limited by city walls, replaced in 1871 by a semi-circular ring road. Despite having the National Theatre, Powder Tower and the City hall on it, as well as being the start of Wenceslas Square, the ring road in Prague is not equal to that of Vienna's when considering the movement and flow of tourist around the city (Figure 2). Instead there are three important historical axis used today by most visitors. The Karlova or King's Way is the oldest route of medieval origin linking the Old Town from the City Hall to the Lesser Town and the Hradčany castle. All important tourist sites of the western side are accessible from it: the Charles Bridge, the St Nicholas church, the buildings of the Royal Palace, the St Vitus Cathedral and the Gold Lane. From here some tourists return to the Old Town through the Mánes Bridge. The second axis consists of two urban compositions from the nineteenth century: the 750 meter long Wenceslas square finishing at the National Museum, and the Parizská avenue finishing in the Checov Bridge and the hill with a monumental park on the other side of the river. The river itself is the third axial element connecting the main points of interest. Conscious urban planning in the nineteenth and twentieth centuries placed some important institutions on the riverbank, where tourists look for reflected views of the city and visit the theatres, concert halls and museums on the embankments. Prague's attractions are all rowed on a series of historical routes in a well-defined portion of the centre, meaning that nearly all sites can be visited following one well beaten track.

In the more regular roman-medieval street grid of Vienna many of the streets were further regulated in the baroque era, creating important axis like the Kärntner Strasse or the Graben, both leading to St. Stephen's Cathedral, the most central and now touristy point of the city (Figure 3). The two most important urban compositions that regulate tourist flows today are the Ring and the axis of the Hofburg. Latter is the Habsburg emperors' ex residence, continued in the composition of two museums finishing in the Imperial Stalls, converted in 2001 to the new MQ museum district. The Ring is an urban ring-road organizing all major institutions of both civic and monarchical origin and connecting the old town with the dense urban areas developing around it. It was developed between 1860 and 1880 on the place of the demolished city walls, and today it is an important route and orientation way for tourism as well. Some routes carry tourists out from the Ring, like the one following the Naschmarkt market from Karlsplatz, or the axis of the Belvedere palace.

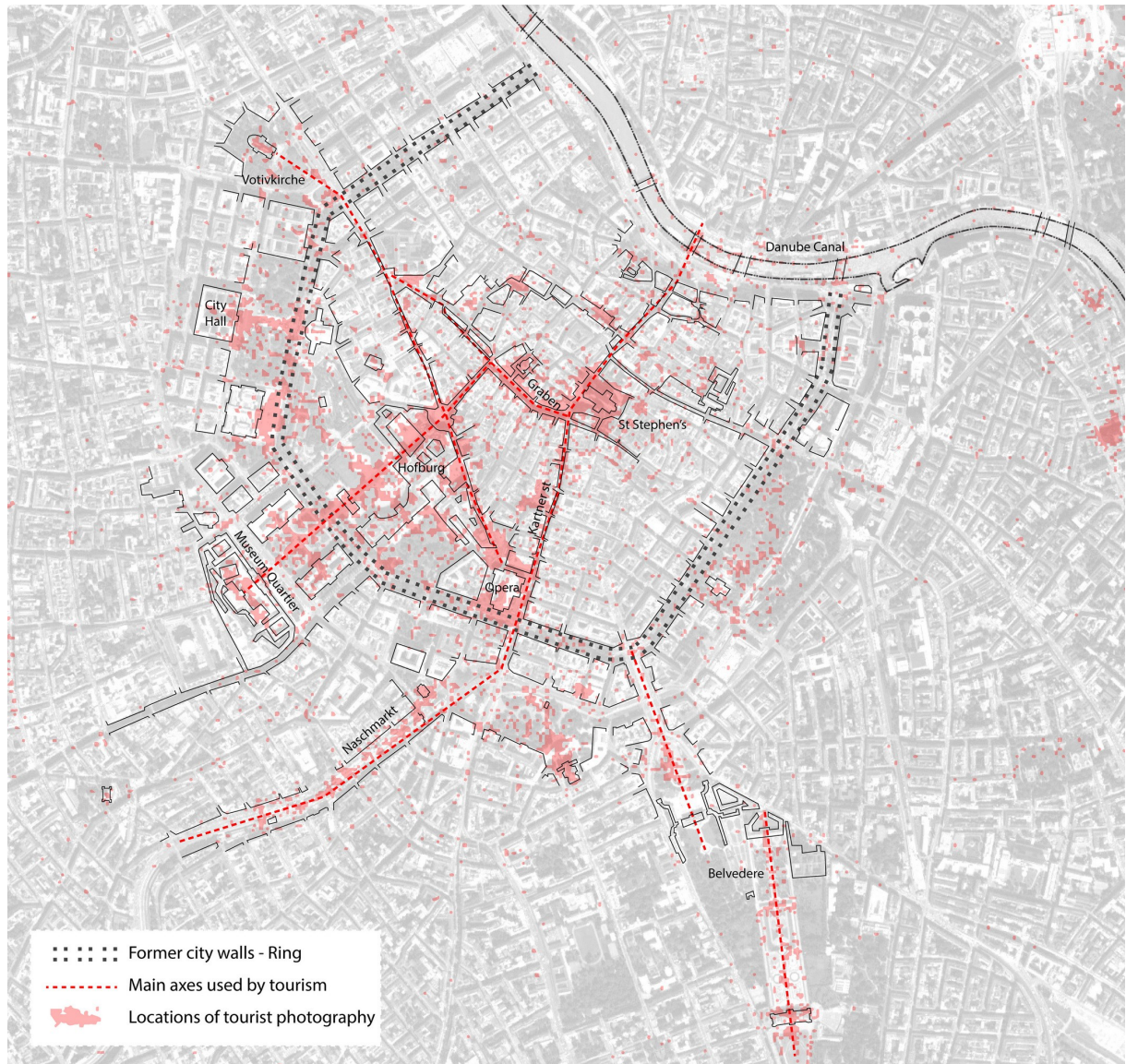


Figure 3: Main morphological and tourist elements in Vienna (source: author's own)

The attractions of Vienna are evenly distributed along the Ring and inside the historical centre, there is always a choice to get from a point to another following the Ring or some of the internal axis, therefore the city has a well networked tourist space system.

3.2 Measuring the space usage of tourists using geotagged photography

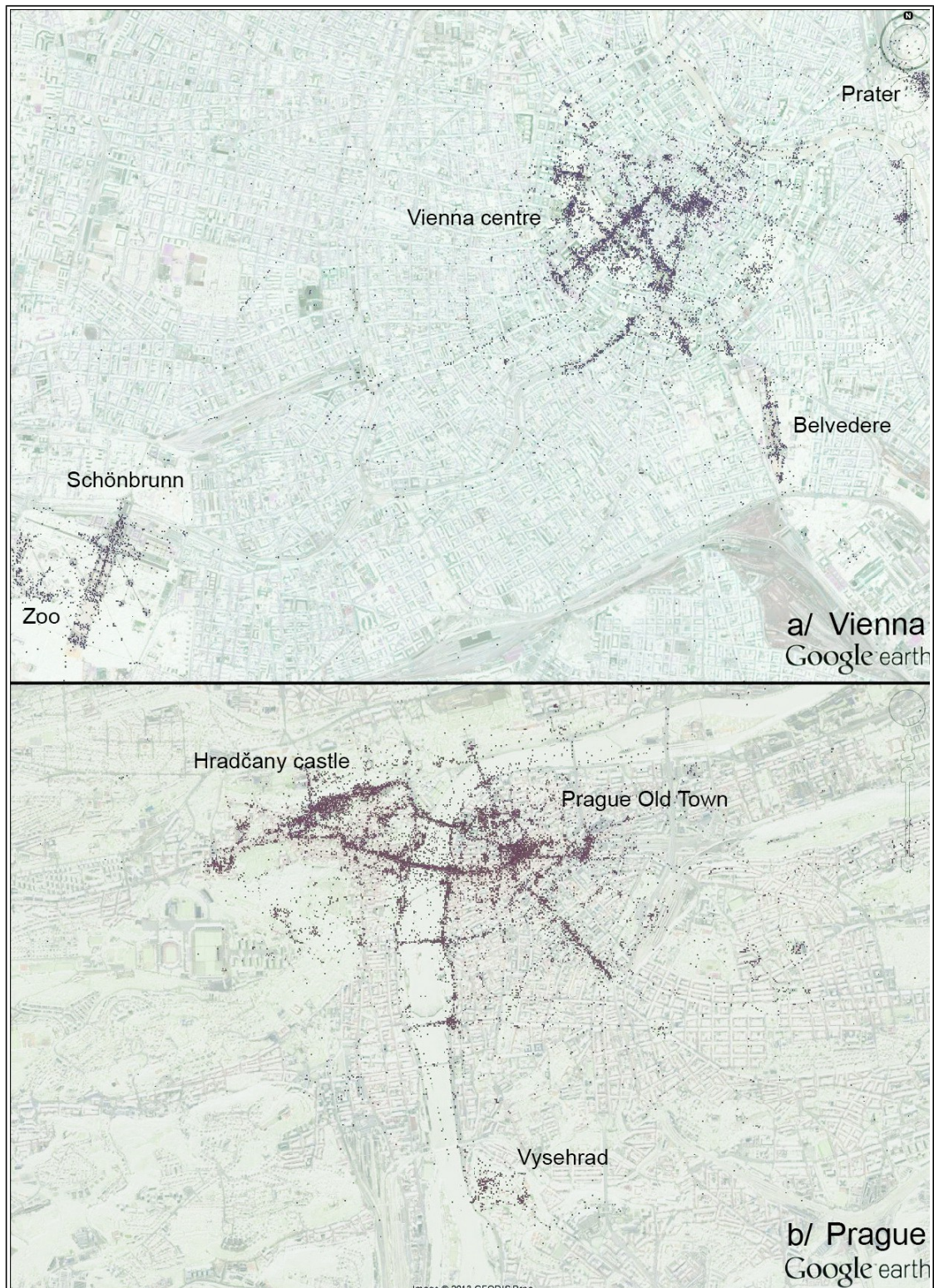
To draw conclusions regarding the differences of tourist space usage in the two cities a comparable model is needed which could give measurable evidence. To build such model reliable data would be needed to define where exactly do tourists move. Tourists use urban environments in similar ways all other users do, therefore it is hard to measure their movements and land use. Traditional forms of tourism statistics are either based on numbers registered in accommodation facilities or transport hubs, not giving much clue on the movement of tourists once they arrived. Attraction attendance statistics are based on the ticket selling and visitor counting of single sites, but most of the urban tourists only entering few of these venues but taking photographs of many while strolling around are not counted. Many scholars from the emerging field of urban tourism studies are working on different methods of tourist tracing, trying to refine the basic model of urban tourism set up by Ashworth & Turnbridge (1990) in *The tourist-historic city*.

The classic method of questionnaires, time-space diaries filled out by tourists brought data on visitors' gaze in urban space: Mckercher & Lau (2008) analysed the movement patterns of tourists finding 11 movement styles; Shoval & Raveh (2004) could categorize clusters of attractions in Jerusalem, visited by tourists with different characteristics; Hayllar & Griffin (2005) could define the most important themes in tourist experiences related to the physical environment and atmosphere of The Rocks district in Sydney. The use of Global Positioning Systems (GPS) or mobile phone cell-information in tracking tourists allowed a more precise measuring of tourists' movements, defining patterns in space and time (Shoval & Isaacson, 2010). (Modsching, Kramer, Hagen, & Gretzel (2008) used GPS tracking data to trace the activity areas of tourists, drawing the most visited hubs and paths in the German city of Görlitz. All above mentioned studies helped to understand how the individual tourist moves in an urban context, but none of them could provide quantitative data on tourists' space usage.

Some emerging studies rely on the data-mining of image hosting websites, where a large portion of the uploaded images are travel photographs. The motivation of tourists to record and share consumed personal experiences by their own photography meets well the

possibilities offered by these online services. The role of photography in tourism is well known since Urry (1990). Tourists photography is the final proof of travel experiences, and these are meant to be shared with friends, family, and with the whole world. A survey made among 1466 households of Hong Kong confirmed among others that the majority of tourists - 89% of those travelling overnight - do take photos during their trips (Lo, McKercher, Lo, Cheung, & Law, 2011). Out of this group 41.4% posted some of these pictures online, 16.5% did this on sites like Flickr.com. While the majority of all age-groups did take photographs, the study revealed a strong relationship between the age and education of tourists and their will to post their photos online. Nov & Ye (2010) did confirm that those posting travel photography to Flickr.com are 33 years old in average and come from the most educated parts of society. Even if the older generations are underrepresented, the large numbers of uploaded images can be useful to measure the space usage of tourism in urban centres. Tourists visiting attractions walking in a city show a similar age distributions: tourists tracked by Shoval and McKerchner were in majority between 26 and 55 (Mckercher, Shoval, Ng, & Birenboim, 2012; Shoval, McKercher, Ng, & Birenboim, 2011), and the same results are evident in other researches, like an extensive research of urban tourism made for many Australian cities (Edwards, Griffin, Hayllar, Dickson, & Schweinsberg, 2009). In fact elderly people often travel in organized tours relying on buses even between urban attractions.

Flickr.com (<http://www.flickr.com>) has more than 175 million geotagged images today, 400 thousand in the urban area of Vienna and 400 thousand in Prague. The API of Flickr.com was used by a limited number of studies for tourist space usage. The most promising maps came from data of the Province of Florence, Italy between 2005 and 2007 (Girardin, Fiore, Ratti, & Blat, 2008), and of Budapest (Gede, 2012). Gede generated diagrams from the numbers of photographs geotagged, making the points of interests visible on Google Earth. With his method it is possible to separate the photography of users living and uploading images in different time periods in the area analysed – locals – and users not having images uploaded outside a restricted time period from that city – tourists. These visualizations and databases developed by Gede are used in this research to retrieve data on the cities of Vienna (Figure 4a) and Prague (Figure 4b) from the years 2000 to 2011



*Figure 4: Position of geotagged photography in the centres of
a) Vienna and b) Prague (source: authors own with Gede, 2012)*

3.3 Creating comparable graphs of tourist space systems

The maps created from Flickr data give a new insight on where tourists were stopping during their visits. Overlaying the map of the main sites and street pattern of a city on this map the popularity of singular sites and their connections became more evident. It is possible to create a mathematical graph as a new layer of these maps, consisting of nodes and edges. Kádár (2012) created such graphs from the uploaded photographs taken in Vienna, Prague and Budapest, analysing the changes of tourist uses in the past 20 years. In this article such data is used to compare the systems of Vienna and Prague in the present. The nodes of these graphs are not necessarily individual attractions, but continuous public spaces where tourists can visit and photograph attractions without moving further. Nodes were defined where at least one attraction was photographed; the total number of photos was higher than 50 and the pictures were taken in a range of maximum 100 meters. The well identifiable points of interest overlap the most important attractions recommended by travel guides, while the edges are the main tourist routes between these attractions, usually pedestrian priority roads (Figure 5).

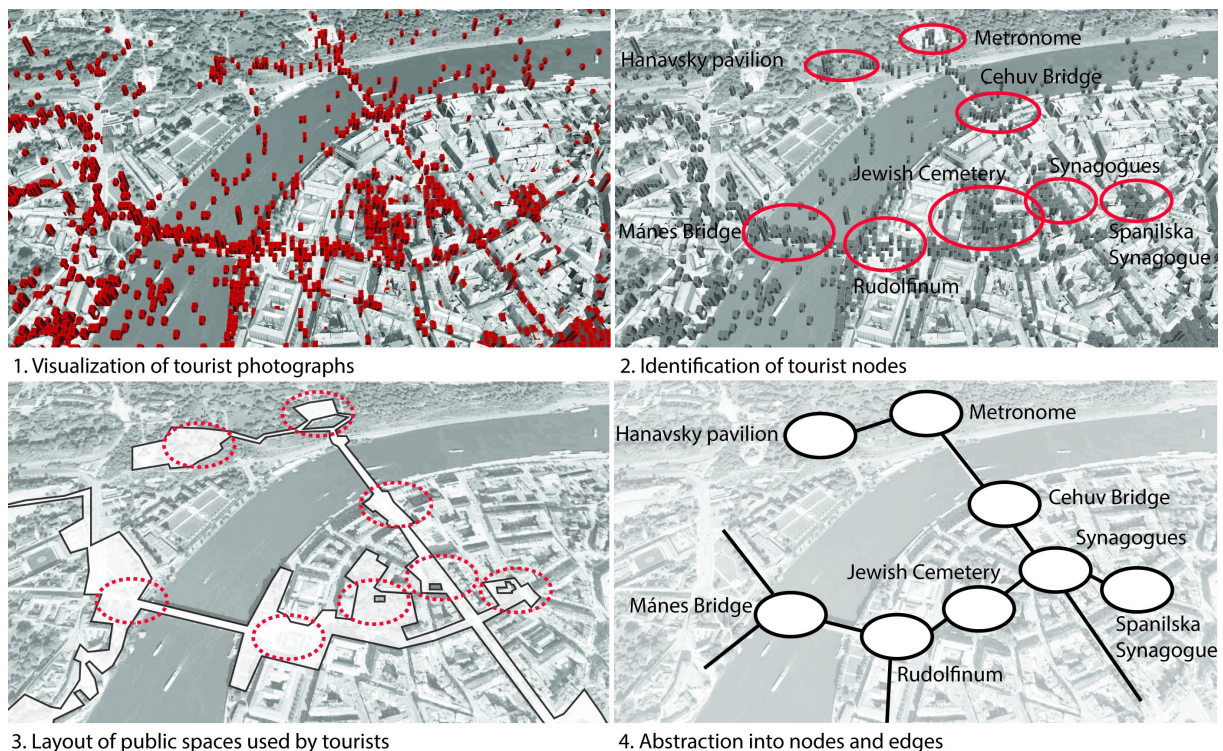


Figure 5: Creating mathematical graphs of tourist space usage from maps of geotagged photography.

The knowledge of given cities public space system is important in the construction of such graphs. Only routes accessible by pedestrians can be the edges connecting points of interest. The motorized transportation methods between tourist attractions are not taken into consideration, as during the use of public transport or hop on buses tourists are not present on the public spaces, not causing pedestrian congestion, not using other services present on the streets.

Using graphs to describe urban spaces is not a new method. Previous works describing human usage and perception of cities with network representations help verifying the validity of the comparative method chosen. Kevin Lynch in his famous work, *'The Image of the City'* defined five elements used by users of urban environments to describe their environments (Lynch, 1960). *Districts* are large sections of the city distinguished by some character, in the case of historical city centres tourists usually percept all as one tourist district, sometimes the districts of different historical age and character are distinguishable. More important are the *paths* and *edges*, defining human movement in cities, also defining the edges of the tourist space usage graphs. The *nodes* and *landmarks* are the important places, like all attractions and points of interest in tourism, therefore the nodes of tourist graphs. Lynch didn't analyse the mental maps as mathematical networks. It was Christopher Alexander (1965) who analysed the nature of urban spaces and functions with similar principles of networking in *'A City is Not a Tree'*. In fact Alexander notes the disadvantages of the tree structure of urban forms– when functions are arranged on after another with few branches and no alternative ways. He points out the semi-lattice structures of living cities, where spaces are arranged well networked with many intersecting branches. His work and the mathematical approach to urban structures have inspired many scholars, trying to describe the complex networks of cities. (Salingaros, 2004, 2005) summarizes some of the most important principles to break down the complexity of urban systems into graphs consisting of nodes and edges.

The description of the tourist space systems in cities with graphs uses these principles, and follows studies and methods already started in the field of recreational urban studies. The work of Gospodini (2001) defines the role of urban morphology in tourist satisfaction and touristic developments. Gospodini connects the principle of simultaneous and successive

arrangements described by Boerwinkel (1995) with the method of analysing syntactic space systems introduced by Hillier (1996). Boerwinkel distinguishes the spatial patterns of 'successive arrangement' and the 'simultaneous arrangement', stating that the latter is more attractive to tourists as it offers more choices of exploration, therefore more freedom, an essential value in leisure activities. Gospodini applies this principle to the urban environment, describing the two ways to connect attractions with a system of public spaces, and drawing a direct connection between the morphology of an urban space and tourists' experiences, highlighting the possibilities to develop the experience with methods of urban design.

Gospodini therefore proposes the space syntax analysis of tourism networks. It is easy to understand how the number of edges between a given numbers of nodes is a very important indicator if the same number of tourists visits the same number of attractions. The less edges – routes, public spaces used by tourists - connect the same number of attractions, the more crowded these will get. More edges mean more possibilities of interconnections, therefore less visitors using the same interconnection as there are many to choose from. Hillier's space syntax method is based on this abstraction of architectural and urban space into mathematical graphs, with an evolving field of studies using it today. Space syntax can make more complex calculations analysing the connectivity of attractions by integrating the basic depth calculations for the entire graph, resulting in the numerical expression of the syntactic depth of these graphs. The evaluation of the graphs of Vienna and Prague is based on calculations by Agraph software of space syntax in node mode (Manum, Rusten & Benze, AGRAPH, Software for Drawing and Calculating Space Syntax “Node-Graphs” and Space Syntax “Axial-Maps”). To compare the graphs the integration value (*i*) introduced in Agraph, calculated from the mean depth (*MD*) is used. The methods of calculation are the following (Manum, Rusten, & Benze, 2005):

$$i = 1 / RA$$

$$RA = 2 * (MD - 1) / (K - 2)$$

$$MD = TD / (K - 1)$$

RA is the relative asymmetry, *K* is the number of nodes and *TD* is the total depth for a node. The integration value (*i*) describes the level of integration of one node into the system. The mean integration value is the average of these values, and shows together with minimum and maximum values the overall connectedness of the system. This value gives much more

precise information than only the numbers of edges on how crowded can streets get in a tourist city. Integration values of nodes compared to each other carry only the relative information on which are the places most central, where a tourist will pass probably more times during a visit. The important indicator that telling how well all points are interconnected is the mean integration value of the system. This value takes into consideration all possible routes inside the system, unlike the simple number of edges. The higher the mean integration value is – and the higher is the lowest integration value in the system, the less are the nodes poorly interconnected with the rest of the system. This means fewer routes crowded by visitors forced to arrive from a part of the system to another on the same way.

3.4 Comparing the tourist space systems of Vienna and Prague

To make the graphs of the two capital cities comparable the first 40 interconnected points of interest were selected. This wasn't difficult due to the similarity of the tourist offer of these cities. It is important to omit attractions not in walking distance to the interconnected parts of the graph. Vienna has important tourist sites outside the centre like the Prater or the Schönbrunn palace, and the buildings of Hundertwasser also fall out of the system, as the 20 minute walking distance of it from the first central attraction is enough to make the use of mechanized transportation options more attractive to reach them. In Prague the Vysehrad castle and the Petrin lookout tower are the most visited sites outside the pedestrian system of the centre. The integral tourist networks follow the historically evolved morphological structures described before. The graphs of the two cities show some important differences.

In Prague (Figure 6) the three main axes described are well visible. Very few alternative connections exist between the well aligned attractions; therefore the graph consists of many nodes having only two (or one) connecting edges – points of interests on tourist routes with no options to leave that path. The most integrated points are on the Karlova, from the Charles Bridge to the Old Town square (6.50-7.05). In fact all tourists pass this section at least once. The minimum value is below 3, while 30% of all nodes have integration values below 4. The mean integration value is 4.75, a number interesting only if compared to other systems.

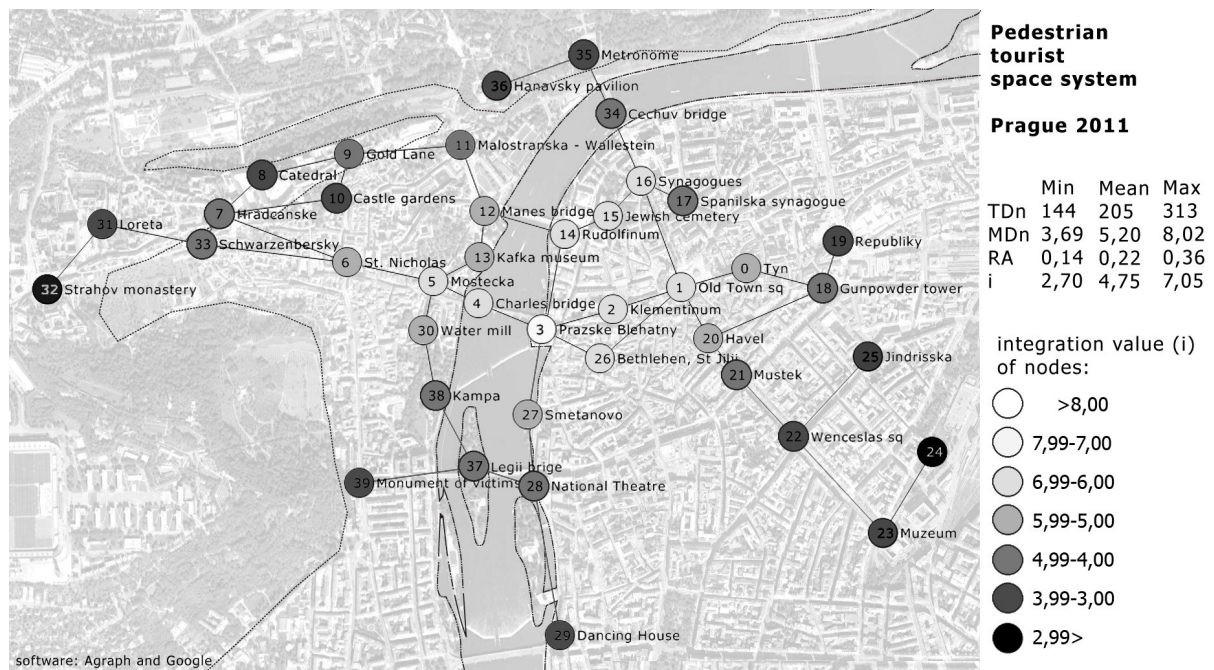


Figure 6: Pedestrian tourist space system of Prague (source: author's own with Agraph software)

Vienna (Figure 7) has a well interconnected central system held together by the edges and nodes on the Ring. The system reaches some attractions outside the ring, like the Museum Quartier, the Naschmarkt market and the Belvedere palace; these three are tree-like branches. The space syntax graph shows that the most integrated nodes in the network are around the Opera, which has an integration value of 9.62. Nodes around the centre all have values above 7.00, which is the maximum value in Prague. Minimum values are all above 4, except for the southern end of the Belvedere. The whole central tourist network of Vienna has a mean integration value of 6.16, which is remarkable if compared to Prague.

In fact the graph of Vienna shows a compact but complex network, where tourists have various options to gaze around the city centre between the attractions. The graph of Prague shows that this city has fewer options for tourists to discover new spaces than in Vienna, while the amount of attractions is the same. The reasons for such a low value are first of all the special morphology of the city with the topographical limitations on the west side of the

river, the river itself, the labyrinthine medieval street pattern of the Old Town with one main path marked, and the lack of a ring road on the eastern side of Prague to link the three tourist axis described before. Some recent developments in Prague did help making a more complex system for tourists. The Castle Stairs, Castle Gardens have been renovated in the past decades to give new routes to tourists visiting the castle. New attractions had been created on the riverbanks, like the Metronome on the north, or the Dancing House, the Memorial of the Victims of Communism and the Kampa museum on the South. But all European cities did similar developments extending their cultural offer, and Vienna was no exception. The MQ and developments by the Danube canal were the most important interventions extending the already dense tourist network (Kádár, 2012).

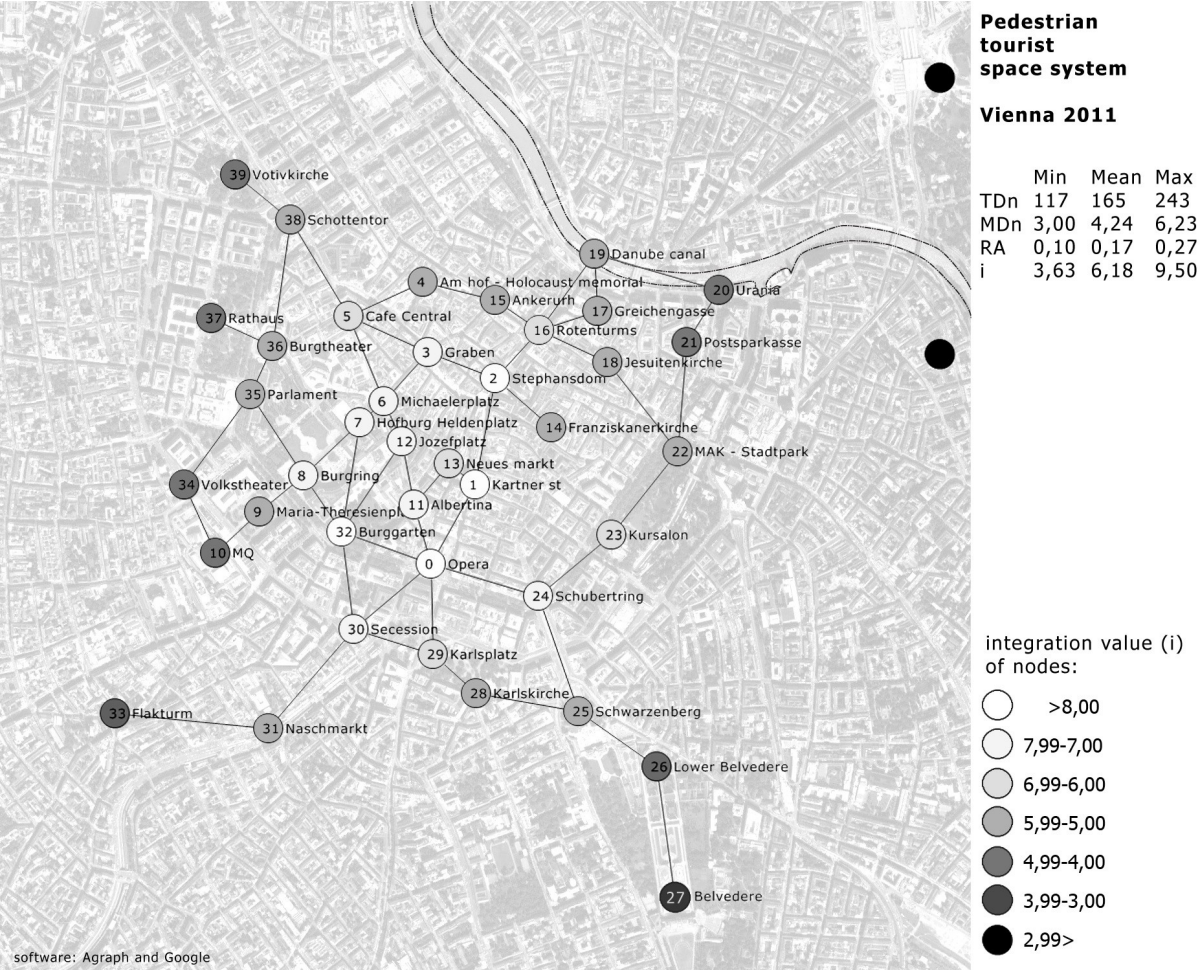


Figure 7: Pedestrian tourist space system of Vienna (source: author's own with Agraph software)

4 Conclusions

The negative effects of an overcrowded tourist space system are evident in the case of Prague, as reported by many scholars (Deichmann, 2002; Simpson, 1999; Cooper & Morpeth, 1998; Johnson, 1995). No such problems were published in the case of Vienna, where more public spaces welcome the same amount of visitors, therefore the tourists and services built upon them are more dispersed, leaving place for local uses and local users. In the spatial system of Prague the same numbers of tourists must pass through certain public spaces several times to visit all attractions. These differences are well visible on the graphs of tourist space usage, the integration numbers calculated from the depths of these graphs gave also numeric evidences.

These differences are mostly of a morphological nature. The attractions of Prague are mostly heritage sites from medieval and baroque ages, composed in a densely grown urban system that has not been altered since an era when defence was a priority. Vienna has an urban grid originating in the regular Roman camp, altered over the ages. The nineteenth century in Vienna was not the era of preservationism but of intense development and restructuring of the city. The Ring and all developments since made the city more accessible. Public spaces are well interconnected, attractions are well dispersed in this system. While in Prague tourists follow the few well known beaten tracks that lead through the medieval system, in Vienna they move from an attraction to another more freely, selecting from the branching possibilities of streets and public spaces. The correlation between the lowering numbers of residents and the intensity of tourist flows is evident in the centre of Prague. It is a question whether the concentration of tourist related services in the centre could have been avoided with a stronger urban planning in the early nineties. Vienna had more than 50 years of stable and conscious urban development; tourism management and urban planning were well seeded sectors of the governance. It is also important that the wealth of the population grew in pace with arrival numbers, allowing local inner city services to develop side by side – or together with those serving tourists. In Prague there was no possibility for such a balanced and planned growth. After the fall of the Iron Curtain the decentralization of state power and the liberalisation of all markets happened simultaneously with the sudden rise of tourist arrivals.

It is therefore possible to draw an important conclusion from these analyses: while a given urban morphological structure has a limit of tourist carrying capacity, urban planning and tourism management can alter these morphological constraints by extending the network of spaces used by tourists. Therefore it is worth analysing positive cases like that of Vienna to be able to make planning decisions that can bring some relief to urban areas where tourism causes evident conflicts, like in the centre of Prague.

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