The Appearance of Istanbul’s World Heritage Site in Terms of Accessibility and Embedding into the Urban Environment

Josef GSPURNING | Kerstin DOHR
University of Graz, Department of Geography and Regional Science

Abstract: The World Heritage Site of Istanbul covers four individual areas, which are all situated on the historic peninsula enclosing the district of Fatih. These consist of the Archaeological Park, the Süleymaniye Quarter, the Zeyrek Quarter and the ramparts. In these cultural heritage zones nearly all well-known historic sites are located, in particular the Topkapi Palace, the Sultanahmet Mosque, the Ayasofya Museum, the Hippodrome, the Süleymaniye Mosque or the Theodosian Land Wall, all of them cultural heritage objects of outstanding touristic significance. Considering that in many aspects there is a strong interdependency between (cultural) tourism and cultural heritage, it can be assumed that the “presentation” of cultural heritage objects influences the tourists and their movement patterns in the city. Therefore, the presented survey is focused on the domestic and the foreign sightseers as the appropriate target group, using selected aspects (such as activity range per time unit or the object’s visibility range) for the quantification of presence and appearance of architectural heritage.

Methodologically this is done by a geographic information system based network analysis. At first the visibility of the various objects was taken into consideration. An evaluation according to the following criteria was made: their visual perceptibility, their relationship to their neighbourhoods as well as their importance in the consciousness of the visitors. Afterwards the accessibility of the single heritage zones was examined by a quantification of the effort to arrive at. The analysis concentrated itself on three main information layers: the origins of the visitors (single entities as well as hotel hot spots), the destinations (cultural heritage site) and the means of transportation (public transport and footway network). The results demonstrate how cultural heritage is presented to tourists by its accessibility. Firstly the touristic areas, considering accommodation, as well as the most interesting cultural heritage zones were evaluated. Following the accessibility of each World Heritage Site zone was quantified using isochrones to delineate areas of equal travel time. The delineation furthermore outlined which zones were easily to access and which poorly and how they are integrated in the urban structure.

Keywords: Istanbul, World Heritage Site, public appearance, accommodation, public transport, accessibility, visibility.

Introduction
Visiting Istanbul the presence of history is undeniable. The peninsula enclosing the district of Fatih and the area around the Galata Tower are covered with numerous heritage sights, which give evidence of a historically and culturally significant and eventful past. The history of the city from Romans to Ottomans is reflected in the
monumental buildings and the impressive land wall system, which determined the urban development over centuries (EMBARQ 2013).

Several cultural heritage sites are also part of the cities UNESCO World Heritage Site. It covers four individual areas, which are all situated on the historic peninsula. To managed this significant heritage the Istanbul Site Management Directorate was established in 2005 (ISTANBUL SITE MANAGEMENT DIRECTORATE 2012).

Istanbul is one of the most frequently visited cities throughout the world, which implicates complex developments for urban planning and tourism. One of them is the challenging traffic situation, which has developed a kind of “tick-off tourism” (EMBARQ 2013, p. 8). ISTANBUL TECHNICAL UNIVERSITY (2015) proposes amongst other an enhancement of the transport connection of the single sights as well as the additional provision of parking lots and bus stops to antagonize the traffic situation in the touristic areas.

Another crucial factor considering mass tourism in historic areas is that “[…] heritage […] is used to attract tourism […]” (MARQUAT 2014, p. 8) and the World Heritage label is used to promote tourism in the protected areas, which also leads to transformation concerning the infrastructure in and close to these areas (MARQUAT 2014).

According to the introductory statements we argue that there is a strong interdependency between (cultural) tourism and cultural heritage. Concerning the fact that the single cultural heritage sites as well as the World Heritage Site zones of Istanbul are dispersed over the area of the historic peninsula and the area around the Galata Tower their accessibility as well as their presentation to the tourists are very important, because in the sightseer’s mind they help to create a topography of the city’s architectural legacy. Furthermore it can be assumed, that this “mindmap” of cultural heritage objects in general affects the spatial behavior of the tourists. Therefore the presented survey does not try to distinguish between domestic or foreign overnight sightseers as the appropriate target group; instead of this the authors use selected environmental aspects to assess the quality of the architectural heritage respectively its appearance. This is done in three ways covering different aspects of the problem:

- The first approach uses visible elements of the linguistic landscape (i.e. information signs, street signs, adverts, shop signs, ...) which provide orientation and help to navigate in little-known areas; in this context it is self-evident, that amount, density and location of these hints are highly correlating with quality of information given.

- The second approach is used to locate touristic centers in the historic areas of Istanbul. This is done by an evaluation of the concentration of heritage sights and / or accommodation facilities. Furthermore the patterns of the spatial distribution of heritage and accommodation give evidence whether the spatial structures are clustered or not and how the accommodation infrastructure spatially correlates with the heritage centers.

- The last approach is designed as an extension of the visibility method and is much more sophisticated. In this case the accessibility (of cultural heritage entities) is defined as real path length from the object itself to the nearest public transportation junction. This distance acts as a measure quantifying the disintegration of sites into the urban fabric according to the pattern: the longer the distance the higher the rate of disintegration.
The Conceptional Framework

Investigation Area and Istanbul’s World Heritage Site

The investigated study area covers the central part of Istanbul’s historic peninsula (Fig. 1), that is, administratively, equal to the districts of Fatih and Beyoğlu on the opposite side of the Golden Horn. Because of the huge amount of cultural heritage objects located there and the high density of accommodation facilities this area more than others show the intensive linkage between tourism and cultural heritage. In addition, this part of the town is well developed by a public transportation network consisting of the Istanbul Metro, different bus types/taxis and the ferry boat terminals situated on the left and right bank of the Halic as well as on the Marmara Sea coast and the Bosphorus shore. Traffic interchange points at Taksim Square, Sirkeçi, Aksaray, Kadıköy and Kabataş complete this system to a multi modal transportation network.
The World Heritage Site (Fig. 2) area under protection covers 6 780 000 sqm. It was inscribed into the UNESCO World Heritage list in 1985 encompassing the following areas protected by the corresponding regulations: the Archaeological Park (A), the Süleymaniye Quarter (B), the Zeyrek Quarter (C) and the ramparts (D) (UNESCO 2015).

In these World Heritage Site zones nearly all of the famous historic sites are located, in particular the Topkapı Palace, the Sultanahmet Mosque, the Ayasofya Museum, the Yerebatan Cistern, the Hippodrome, the Süleymaniye Mosque, the Pantocrator Church or the Theodosian Land Wall (UNESCO 2015; ISTANBUL SITE ALANLARI ALAN YÖNETIMI BAŞKANLIĞI 2015). These

"[…] include the key attributes that convey the Outstanding Universal Value of Istanbul […]" (UNESCO 2015).

Furthermore the UNESCO (2015) highlights the importance of the integration of the World Heritage into the urban structure; especially regarding restoration projects. To assure preservation several areas of city
planning have to be addressed. These include traffic and transportation, urban regeneration and tourism as well.

In addition other - maybe less known - historic cultural objects of outstanding touristic significance are situated in the investigation area. Therefor they have to be also included in this survey. To give some examples, other Ottoman monuments like the Nuru Osmaniye Mosque, the Fatih Mosque or the Yavuz Sultan Selim Mosque as well as the Mihrimah Mosque, which crown the city’s hills along the Golden Horn, are mentioned (EMBARQ 2013).

**Tourism**

According to the Istanbul Kültür ve Turizm İl Müdürlüğü 12,414,677 tourists visited Istanbul in 2015. The majority of the tourists came from Europe, the United States and the neighboring countries, like Iran, Iraq and Azerbaijan. On the top of the list of touristic arrivals you can find, of course, Germany. From April to October more than a million tourists visited the city each month (İSTANBUL KÜLTÜR VE TURIZM İL MÜDÜRLÜĞÜ 2015). This high amount of tourists visiting the city is reflected by the destinations-ranking of the German newspaper “Die Welt” from the 29th of January 2015. It specifies the 20 most frequently visited cities over the world. In this survey Istanbul is rated at the 11th place (DIE WELT 2015).

A survey of the touristic arrivals in the period from January to April of 2011 and the comparable periods of the following four years has shown an increase of 60.5 %, which is evidence enough for the meaning of cultural tourism in the city (İSTANBUL KÜLTÜR VE TURIZM İL MÜDÜRLÜĞÜ 2015).

Because of the fact that it is impossible to consider the real origins of each sightseeing trip the presented study is based on the assumption that the tourists usually start their excursions at their accommodation facility. Therefore, our research has been limited to these entities (most of them hotels) covering the central part of Istanbul (Fatih, Beyoğlu and parts of the surrounding districts); the acquisition of the hotel – relevant information has been done in the last quarter of 2015 by retrieval of internet based databases and generates a dataset consisting of about 1700 objects including further information like location, quality, accommodation capacity, price level and other attributes.

**Accessibility**

Although there is consensus about the strong relationship between touristic destinations the exact meaning of the term accessibility is still matter of discussion (BUHALIS and DARCY 2011). With reference to the local circumstances the authors follow SEN and MAYFIELD (2004), who were discussing the accessibility of historic buildings from the perspective of disabled persons and also TOTH and DAVID (2010), who - on a nationwide scale employed a log linear model to estimate the accessibility in Hungarian tourism regions. But in contrary to these in the Istanbul case the term accessibility refers to the walking respectively drive time the tourists need for the way from their origin (single entities as well as hotel hot spots) to the various destinations (cultural heritage sites) by the means of public transport as well as the footway network and was examined by a quantification of the effort to arrive at. The calculation of this parameter has been done based on an optimized (i.e. more realistic) transportation network dataset (GSPURNING 2014). The resulting isochrones outline the
zones which can easily be accessed and which poorly; moreover the results give evidence of how the World Heritage Site is integrated in the urban structure due to its accessibility.

Visibility
Visibility in this context is specified by the visual perceptibility of single entities of the World Heritage Site zones by the visitors. Following the assumption that navigation in space preferably is done with the aid of landmarks (KAMINSKE 2012) this part of the investigation tries to measure at which distance based on the location of a defined hotel hot spots distinct elements of the World Heritage Site can be seen - partly or as a whole – by the sightseers setting out for them.

Appearance
The two approaches described above indicate how cultural heritage is presented to the public. The appearance of cultural heritage is from outstanding significance for the investigation due to its importance in the consciousness of the visitors. It was observed how heritage is integrated in the landscape and urban structure surrounding it and how it is recognized by the tourists even from distance. The latter was verified investigating the existence and quality of way as well as information signs in the surrounding area of Istanbul’s World Heritage.

Data Processing
Data Acquisition and Integration
The data acquisition was very complex and required several independent steps, which were realised using ArcMap. At first the investigation area was defined and the relevant neighborhoods (Turkish: mahalle) were extracted from data provided by MB-RESEARCH 2010. For the creation of the network required for the network analysis a dataset was used which has already proved valuable in a prior investigation dealing with the accessibility of urban green spaces in the city centre of Istanbul (DOHR et al. 2014). With the help of OpenStreetMap data provided by Geofabrik and Metro Extract from January 2014 the public transport network, including railway, metro, tramway and metrobus lines and the corresponding stops, as well as the road network was built. Afterwards geometry and topology were validated and occurring errors - mainly resulting from poor working standards during the geometry acquisition process (i.e. digitizing, GPS tracking), from defiance of topological rulesets (i.e. usage of spaghetti data instead of smart geometries) and even caused by different data models (i.e. GIS data, CAD data or topological datasets) - were corrected. Furthermore the hotels as second information layer were extracted by using the platform trivago.at. Amongst the wide range of hotel procurement platforms in the internet, the choice for trivago.at was easily felt. The main reason was the integration of google maps, which provides a direct and quick view of the hotels locations and therefore an advantage for digitizing the single entities as point features. Furthermore trivago.at is a frequently used hotel procurement platforms with about three million visitors monthly. Due to the fact that the platform reverts to the data bases of several hotel search engines like hrs.de, booking.com, hotel.de, expedia.com, tiscover.com, it offers the user a huge hotel data base from about 150 000 registered hotels.
The establishment of an open source community guarantees up-to-date information. It is also the only procurement platform which presents a direct link to the hotel websites (HOTELLERIE SUISSE 2015).

<table>
<thead>
<tr>
<th>Layer</th>
<th>Use</th>
<th>Representation</th>
<th>Spatial Relationship</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural Heritage Sights</td>
<td>Analysis</td>
<td>Vector</td>
<td>Point</td>
<td>Extraction from Google Maps (Digitizing)</td>
</tr>
<tr>
<td>Hotels</td>
<td>Analysis</td>
<td>Vector</td>
<td>Point</td>
<td>Extraction from Trivago (Digitizing)</td>
</tr>
<tr>
<td>Road Network / Public Transport Network</td>
<td>Network Analysis</td>
<td>Vector</td>
<td>Line</td>
<td>OSM</td>
</tr>
<tr>
<td>Public Transport Stops</td>
<td>Network Analysis</td>
<td>Vector</td>
<td>Point</td>
<td>OSM</td>
</tr>
<tr>
<td>Hot Spots</td>
<td>Interpolation</td>
<td>Vector</td>
<td>Point</td>
<td>Hot Spot Analysis</td>
</tr>
<tr>
<td>Investigation Area</td>
<td>Orientation</td>
<td>Vector</td>
<td>Polygon</td>
<td>MB Research</td>
</tr>
<tr>
<td>Districts of Istanbul</td>
<td>Background</td>
<td>Vector</td>
<td>Polygon</td>
<td>MB Research</td>
</tr>
<tr>
<td>Satellite Image</td>
<td>Background</td>
<td>Raster</td>
<td>Cell</td>
<td>Prior Project</td>
</tr>
</tbody>
</table>

Fig. 3 – Parameters of the basic data model (Copyright: DOHR, GSPURNING)

Concluding the data collection the single entities situated in the four World Heritage Site zones and other cultural heritage sites in the investigation area were digitized using google maps as basemap, so that they were available for the later analysis as point layer. Figure 3 shows a compilation of the different reference data layers, their usage, geometric realization and their provenance.

**Analyses**

As already mentioned from the methodological point of view this study employs three different analysis approaches to assess the appearance of cultural heritage sites in the urban environment in terms of visibility, in relation to potential target group members (hot spots of accommodation sites) and in grades of integration into the fabric and their accessibility via the public transportation network.

**Visibility Study**

This approach describes the visibleness of cultural heritage sites in the urban fabric in terms of visibility. Due to the lack of appropriate high resolution data / Lidar data this part of the investigation had to be done empirically by observation of “the seeing again” instead of GIS-based calculations. Referring to the fact that in urban environments the intervisibility of landmark and observer - caused by obstacles (e.g. buildings or trees) - usually gets lost, this investigation supplementary tries to delineate the “area of no orientation”. This range can be understood as the distance between the signposts leading to the site and the according “point of seeing again”.
The objective was to evaluate at which distance the World Heritage Sites are visible for the tourists heading out for them. The data was collected during campaign in October 2015 and – because of the extensive fieldwork - was concentrated on the vicinity of World Heritage Site zones - in other words – on the Süleymaniye Quarter. The surrounding area was examined by groups of researchers which were centrifugally moving along the transportation network leading from/to the site and evaluating their visibility field permanently. Thereby the points of the last entire and the last fractional view of the Heritage Sites were from importance. The locations were recorded by GPS and entered manually in a GIS point layer. Furthermore the locations and the character of existing (way, traffic or information) signs were recorded in the same procedure. In addition pictures of the views mentioned above and the singular signs were made.

Hot Spot Analysis
The second approach investigates the relation between hotel locations (representing the “touristic centers”) and the locations of the cultural heritage sights. This part of the study uses the locations of the best known 1645 hotels (status: August 2015) and the very important historical buildings and monuments described in the “Reclams Städtführer Kunst und Architektur Istanbul”, which are mostly located in the historic areas of Istanbul.

At the beginning it was necessary to calculate the hotel hot spots as origin of the target group as well as the cultural heritage sight hot spots as potential destination. This was done by a hot spot analysis using the collected point features as basic layer. Significant hot spots with a high density of hotels within the investigation area were calculated and spatial clusters were thereby verified by using this method. After an interpolation of the gained hotel and sight hot spots, the results were visualized in three heat maps showing once more

“[…] the geographically clustering of a phenomenon”

(GIS LOUNGE, 2012).

Network Analysis
Based on the hotels (interpreted as origins of the target group) and the available cultural heritage sites (as destination of the target group), a network analysis (closest facility-/service area search) was conducted. Unfortunately, at the current stage of the investigation there exists not enough detailed information about the tourist mobility behaviour between the distinct hotel entities and their entry points into the public transportation system. Therefore assumptions had to be made (e.g. so that tourists always prefer the less exhausting route to the stations).

The pedestrian chooses, independently from its entry into the public transportation system, the simplest combination from an exit-station and the access to a cultural heritage site. Several equidistant accessibility zones were constructed and the distance was specified trough the real distance. Local inclination and its impact on the impedance/travel time have been considered. Moreover the average volume of traffic and the resultant attractiveness of the various routes were integrated in the analysis as well as influences of the passenger flow environments. The latter were recorded with the help of GPS and video technology in the course of prior field work (GSPURNING 2014).
Results

Visibility Study

The findings concerning the optical perceptibility of the Süleymaniye site can be seen in figure 4, showing the most important fact, that the “area of seeing again” around the mosque complex is relatively small. This - in connection with the low amount of optimal located signs - means, that visitors over a long distance have to navigate without any “official” aid.

As another result figure 4 clearly demonstrates the wide area between the red stars and the orange line which - except in the S and SE - approximately delineates the location where incoming visitors lose sight of the Mosque. Compared to other popular tourist destinations in Europe (e.g. Venice) this part of the tourist guidance system of Istanbul has to be qualified as suboptimal. These results may be caused supposable by the local urban structure and socioeconomic issues: Especially the peripheral part of the vicinity appears as non – touristic area; therefore the local authorities seem to keep their attention only on the important intersections of the main roads.
Hot Spot Analysis

The tools used were the Hot Spot Analysis as well as the Optimized Hot Spot Analysis. These kinds of analyses identify significant relevant hot spots (statistically significant spatial clusters of high values) and cold spots (statistically significant spatial clusters of low values) (ESRI 2015b). This means how the relevant entities (hotels and cultural heritage) are distributed over the investigation area. Clusters of high values show a concentration of the single features within a region. In opposite cold spots give evidence of a very small amount of the surveyed features within a spatial unit. The therefore relevant z- and p-scores show if the underlying null hypothesis is true or not (ESRI 2015a). From this, conclusions whether the distribution of the features is random, clustered or dispersed are possible.

Fig. 5 gives a quick overview of the distribution of accommodation facilities and sights in the investigation area. Furthermore we calculated, after several preprocessing steps, two hot spot analyses – one for the hotels and one for the cultural heritage sites. The results show two accommodation centers similar to figure 5. The first one is situated in the southern part of the historic peninsula around the Archeological Park Area including the Blue Mosque and the second one in the area around the Taksim Square, situated in the northern part of the investigation area. The hotel hot spots, for example, are represented in the figs. 7 and 8.

To analyze the spatial patterns more detailed, we used different interpolation methods on a raster cell basis based on the prior hot spot analyses. Interpolating vector point data the result will be a statistical cost surface representing specific values in each raster cell. For analyzing the distribution of the amount of the hotels in the investigation area we chose an algorithm which considers distance as the most important aspect. This means,
the smaller the distance between the singles objects is the more they are related. The result is similar to the previous map and gives evidence of the existence of a dense concentration of hotels in two areas (see figure 6). The first one is situated in the southern part of the historic peninsula, also home of a World Heritage Site Zone (Archeological Park Area) and the second one in the northern part of the investigation area around the Taksim Square.

Fig. 6 – Areas which indicate a high spatial Clustering of Hotels in the districts of Fatih and Beyoğlu (Copyright: DOHR, GSPURNING).

The same algorithm was used for the calculation of the concentration of cultural heritage sites in the different areas, which is presented in figure 7. Referring to that there is on the one hand a concentration of cultural heritage in the southern part of Fatih between the Süleymaniye and the Zeyrek Quarter as well as in the Archeological Park area on the top of the peninsula. On the other hand a clustering of cultural heritage sites was verified on the opposite side of the Golden Horn in the area around the Galata Tower. Additionally an interpolation of the World Heritage Sites (see figure below) was calculated and a supplementary binary weightening field, whether an object is part of a World Heritage zone or it is not, was included. The result shows a clustering of objects spatialized with the single World Heritage Site Zones in 3 areas. These are the Zone of the ramparts in the western part, the Süleymaniye and the Zeyrek Quarter in the middle, and the Archeological Park area on the top of the peninsula in the east. Using this algorithm another important aspect can be visualized, namely the unequal spatial distribution of cultural heritage sights inside a World Heritage Site Zone. The best example in this case is the zone of the ramparts – the famous historic land walls of Istanbul. Most of the cultural heritage sights of this zone are concentrated in the central and the southern part, especially around the Topkapı Gate and Yedikule Castle (orange areas).
According to our findings there is no correlation between the location of hotels, respectively hotel hot spots, and the location of cultural heritage sights. Only in the neighbourhoods of Sultanahmet and Sirkeçi a higher concentration of accommodation facilities and cultural heritage sights as well was found.
Network Analysis

Due to the rapidly ongoing development of the network of Istanbul (spatial and interval densification, increasing transport volume of the Metro trains and busses) more and more tourists use the means of public transportation to discover the city and its cultural heritage. This and the imminent gridlock make a case for the future importance of the nexus of public transport and the capitalisation of cultural heritage. Figure 9 symbolizes this cooperation in a spatial manner where yellow circles mark the locations of the sites.

![Accessibility of the Cultural Heritage sites by the means of public transport](image)

The radii of the symbols (in classes of 100 m) represent the shortest distance to the “nearest” stop (nearest in terms of “less exhausting to reach”) so that bigger circles indicate problematic zones while smallest circles designate so called top locations. The summary of the results shows the following facts: most of the sites have a high accessibility (usually within a range of 400 m around the nearest stop) and vice versa only few sites show very bad conditions (distance exceeds 800 m; max. 1400 m). Concerning the historical topography of the city most of the prominent sights of Istanbul can be reached easily by bus or metro, only few areas at the southern section of the Land Walls of Constantinople, NE of the Süleymaniye Mosque, nearby the Valens Aquaeduct and near Dolmabahçe Palace are harder to reach.
Conclusions
According to the research questions formulated for this study, the results of the different approaches used to analyze the appearance/embedment of cultural heritage in urban fabric and infrastructure can be subsumed in three crucial statements as follows:

The lower level investigations in the Süleymaniye Quarter show that at the present time in Istanbul the “signage” as a kind of spatial reference system is nearly negligible; quantity as well as density and placement of the existing orientation aids are definitely suboptimal for effective supporting the creation of a sight map in the tourist’s mind. In the investigation area a large gap can be verified between the signpost locations and the “points of seeing again”. Although similar investigations are missing the same results can be supposed throughout many parts of the city. Compared to international standards this is a clear shortfall.

Evaluating the spatial patterns of the distribution of cultural heritage and accommodation facilities the results show an intense cluster development of the entities of both information layers. But are there also areas with clusters of both entities? The analysis reflects no correlation between cultural heritage heat areas and hotel heat areas. The exception from the rule is the World Heritage Site Zone of the Archaeological Park. The unequal distribution of hotels and heritage is problematic taken into consideration the poor signage infrastructure in parts of the investigated area which makes it difficult to navigate from hotel to sight or vice versa.

The third analysis introduces the public transportation network as the backbone of the urban mosaic and also as an important factor to increase the intra urban mobility. Furthermore, it affects the range of coverage and the mobility patterns of the tourists and can increase the attractiveness of certain sights compared to others. Regarding the results of the visibility study the poor signage infrastructure might cause additional problems finding an effective route from the tram station to an interesting sight, which is equivalent to a reduced appearance. Apart from that in many cases (more than 60%) the accessibility of the sites from the public transportation network is good or very good (travel time about 5 minutes or less); but there are also some areas which are harder to reach (travel time between 10 and 20 minutes). Fortunately most of these sights are not important ones.

References


Imprint:
Vienna 2016
http://www.chnt.at/proceedings-chnt-20/
ISBN 978-3-200-04698-6
Editor/Publisher: Museen der Stadt Wien – Stadtarchäologie
Editorial Team: Wolfgang Börner, Susanne Uhlirz
The editor’s office is not responsible for the linguistic correctness of the manuscripts.
Authors are responsible for the contents and copyrights of the illustrations/photographs.