REVIVAL OF THE COLLECTIVE MEMORY WITH THE HELP OF CARTOGRAPHIC MATERIALS AND GIS

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Abstract

One of the important field of research in urban historical analysis is the revival of collective memory in relation to the forgotten or lost urban heritages. Although it is known that in the 1910s, tramlines were used in Mersin and there were a number of piers used for various purposes, the route of the respective tramlines and the location of the piers were roughly drawn in several studies based on the oral history studies. In this context, the aim of this study is to ascertained the route of the tramlines and location of the piers by using historical cartographic materials that are important sources of urban and regional historical analysis. Based on two specific historical maps of Mersin city, the route of the tramlines and location of the piers have been identified together with the historical buildings by using georeferencing tools available in Free and Open Source Software for GIS.

Keywords: Urban History, Historical Maps, Collective Memory, Free and Open Source Software for GIS

INTRODUCTION

Until the mid 19th century, Mersin was mainly known for its piers and docks rather than being a emerging center of settlement unit. In the memoirs of old people who were born in Mersin, piers occupy an important place mostly in the form of some sort of nostalgia. Nevertheless, they are also part of the collective memory built with the narratives of not only the old residents of the city but also those who even did not experience the social atmosphere of the city witnessing the existence of piers. In a recent news published in Haberci, a local newspaper in Mersin, there is a call for, at least, uncovering the traces of old piers in the city (Eroğlu, 2017). In the news titled “Piers of Mersin should be brought to light! (Mersin’in iskeleleri gün ışığına çıksın)”, it is mentioned that there is a recommendation for uncovering and demonstration of the traces of old piers in order to inform both the residents of the city and visitors about the importance and exact location of the piers concerned by placing information boards. Nevertheless, the exact locations of the respective piers are not known, albeit there are some descriptions about their locations in oral history studies conducted by several researchers. Unfortunately, historical cartographic materials have also not been properly used for such a task by using scientific methods of analysis. Thus, a systematic and scientific analysis of the old maps concerned with the help of geographic information systems may help for the revival of the collective memory.

Another important element of the collective memory in Mersin is the fact that there were tramlines in the city during the 1910s. There are some speculations about their routes and functions based on the oral history studies. Some argues that they were mainly used for passenger traffic not for solely carrying goods. Some other argues that they were mostly used for the transportation of the goods. The routes of the tramlines can easily be redrawn by using the anecdotal evidences from oral history studies. Nevertheless, it is not possible to specify the exact routes of the tramlines concerned without detailed historical cartographical materials. Thus, the exact routes of the tramlines are also an important part of the discussions in relation to the collective memory in the city. Within this context, a number of maps has been obtained from the Ottoman Archives of the Prime Minister's Office (Başbakanlık Osmanlı Arşivi (BOA)). For the specific purposes of the study, particularly two maps obtained from the Archives are important. The maps concerned have no map projection and they do not have any indications of latitude or longitude.

The first one titled “Plan de la ligne du Tramway de Mersine” (Map of Mersin Tramline) dates back to 1889 and shows the route of the tramline that would be constructed in Mersin. The map was available in four parts (HRT. h. 2530: 1, HRT. h. 2530: 2, HRT. h. 2530: 3, HRT. h. 2530: 4) in jpeg format as raster images (300 dpi) and it was prepared at 1/500 scale. The parts of the map were first combined by using the image processing tools available in GIMP. On the respective map,
names of the buildings located along the route of the tramline are also given. The second map titled “Mersin Sahilindeki Iskeleri İrae eden Harita” (Map of the Piers Located along the Coast of Mersin City) dates back to 1894 and shows the location of the existing and proposed piers at the time in Mersin. The map was available in one part (BEO.505/37812:3-2) again in jpeg format as a raster image (300 dpi). The respective map prepared at 1/4000 scale was horizontally flipped in order to make it ready for georeferencing task as somehow the obtained map was actually a mirror image of the original map. Information about the name and condition of the piers are given in the map by using a coding scheme. Accordingly, each pier is marked with a letter explained in a detailed context on the upper part of the map. Some of the important buildings in the city is also marked with numbers on the respective map. Regarding these numbers, on the left hand side of the map, there is a legend for the names of the buildings.

As many of the buildings were demolished over time, Mersin Urban Development Plan prepared by Prof. Hermann Janssen at 1/2000 scale in 1939 has been used as the reference map showing the location of important historical buildings in addition to satellite images of Mersin city. Cartographical accuracy of the respective plan is higher compared with the maps showing the location of the piers and tramlines, and obtained from the Ottoman Archives. Jansen prepared the urban development plan of Mersin by using the map prepared by Hikmet Serdengeçti, a well-known engineer in the city at the time (Yeni Mersin, 24 March 1936: 1). Unfortunately, the original land use map prepared by Serdengeçti could not be obtained. However, the traces of the existing roads and buildings that facilitated the georeferencing of the old maps obtained from the Ottoman Archives are partly visible behind the drawing of the urban plan prepared by Jansen. In addition to this map, the map titled “Mersin'de İnşaası Musammem olan Limanın Planı - Projet De Port, a construire a Mersina (Asia Minor)” (Port Project, to be built in Mersin) and prepared at 1/5000 scale for the construction of a port in Mersin is also used as a reference map. The map concerned dates back to 1894 and it was available in three parts (PLK. p. 2950:1, PLK, p. 2950: 1, PLK, p. 2950: 3) in jpeg format as raster images (300 dpi). Only the last two parts of the map showing the urban fabric were combined in order to make it ready for georeferencing process. It was georeferenced by using the already georeferenced map of Mersin Urban Development Plan and satellite images. Thus, two basic maps used in this study have been georeferenced by using satellite images, Mersin Urban Development Plan prepared in 1939, and the port plan prepared in 1894.

In the elaboration of the the spatial and historical development of the piers and the routes of the tramlines, this study have made use of not only the cartographic materials obtained from the Ottoman Archives, but also the formal correspondences between the central state and local administrators again get from the Ottoman Archives together with some other resources such as the Ottoman Yearbooks (Sâlnâme), and the reports and Journals published during the period between the end of the 19th century and beginning of the 20th century. Overall, in this study the spatial development of the piers and the routes of the tramlines in Mersin have been elaborated within a critical and historical perspective for the period between 1830s and 1920s. Within this context, in the subsequent section, firstly there is a theoretical discussion regarding the georeferencing and georectification issues that occupy an important place in the specification of the location of the piers and the route of the tramlines. In the third section, the development of Mersin as a break-of-bulk point is discussed with particular reference to the chrono-spatial development of the piers in the city parallel to the economic development of the city and the construction of railway. This discussion is followed in the forth section by the elaboration of the construction of the tramlines in the city as linkages inside the break-of-bulk point. The last section of the paper draws on some concluding remarks revealing the importance of the employment of GIS in general and georeferencing in particular in the urban and regional historical analysis.

GEOREFERENCING AND GEORECTIFICATION ISSUES

In order to georeference a historical map whose projection is unknown (or it may not have a map projection), the map concerned should be properly georectified by using appropriate methods of transformation available for rectification. Once the coordinate system of the map is known, actually the information necessary for georeferencing is only to define the coordinate system the map is in so that the software can understand and transform it. If such information is not available, we need to find the earth-based coordinates (e.g. UTM) of some points on the historical map that will be first georectified. These points used for georectification of the image are usually called ‘ground control points’ (GCPs) that are map elements that can be recognized in both reference map whose projection is known and the historical map. In essence, in georectification operation a one-to-one correspondence is established between two set of GCPs lying on two different plane surfaces in order to rectify the historical map with the reference map. It is recommended that if possible GCPs should be equally distributed through the whole raster image of the historical map and they should be represented by the objects that are well-identifiable (such as road intersections or sacred objects that have remained unchanged).

In order to georeference the historical maps used in this study, Quantum GIS (QGIS), a Free and Open Source Software (FOSS) for GIS, is employed. In QGIS, there are several methods for the georectification of a map. These methods are linear, helmert, polynomial 1, polynomial 2, polynomial 3, thin plate spline and projective. An overview of the georectification methods frequently used for georeferencing historical maps can be found in Boutoura and Livieratos (2006). Actually, the methods used for georeferencing a map can be grouped into two general categories (Balletti 2006;
Bitelli, Cremonini, Gatta, 2009; Cajthaml, 2011; Brovelli & Minghini, 2012); (1) those having global & non exact algorithms (such as linear, helmert and polynomial algorithms) that employ all GCPs in order to obtain a transformation to be applied on the whole raster image, and (2) those having local & exact algorithms (such as ‘rubber-sheeting’ method, ‘thin plate spline’ and ‘inverse distance weighted’ methods) that use different sets of GCPs for different portions of the raster image. Although exact algorithms make the georectified positions of GCPs lying on the historical map coincident with those having earth-based coordinates and marked on the reference map, in principle non exact algorithms do not force the exact fitting of GCPs locations on the historical map with those marked on the reference map as they optimizes global accuracy to the detriment of local accuracy.

The number of GCPs changes according to the georectification method used because the number of the parameters involved in each method is different (Bitelli, Cremonini, Gatta, 2009: 224). For example, for a linear transformation including a shifting, a global rotation and scale changes, 3 or 4 GCPs are enough. If the cartographic material has a proper map projection or high degree of metric accuracy, linear and low degree polynomials can be safely used for the transformation. For the transformation of older maps, higher order polynomial algorithms can be used provided that high number of GCPs are available. Nevertheless, it is well documented in the literature that among the methods thin plate spline or rubber sheeting has the most appropriate algorithm for the georectification of the historical cartographical materials having no map projection and/or low degree of metric accuracy (Podobnikar & Šinkovec, 2004: 4-5). Yet, the problem with this method is that it requires high number of GCPs because unpredictable distortions may appear on the areas that are not covered with GCPs (Podobnikar & Šinkovec, 2004; Brovelli & Minghini, 2012: 104). In other words, parts of the raster image located outside the coverage of GCPs are not as accurate as those within the coverage of GCPs and they can be highly distorted, albeit the GCPs after transformation fit precisely because the location of the GCPs is conserved.

Another problem associated with the georeferencing of less-precise historical maps not based on geodetic network by using thin plate spline or rubber sheeting-type transformations is the fact that the raster image obtained after georectification can be entirely illegible if the basic topological conditions regarding the locations of objects in space are not met in the historical map (Affek, 2013: 386). For example, a hamlet projected on the old map to the north of another hamlet can be in reality located to the south of the hamlet considered. In these kinds of cases, a global & non exact algorithm can be chosen in order to georeference the hisotrical map. Georectification methods based on global & non exact algorithms can also preferred in order to georeference an old map if the map concerned is an accurate historical map having errors that are globally filtered, and no local effect (Brovelli & Minghini, 2012: 104). Another option for the georectification of a historical map is based on the joint application of global and local transformation. Dai Prà and Mastronunzio (2014: 119) argue that “the best results can be obtained by applying both procedures, using first a global and subsequently a local trasformation”. On the one hand, application of a global transformation significantly increases the geometric correction of the old map throughout the whole raster image; on the other hand, subsequent application of a local transformation actually aims at the “local refinement” of the map that is already globally corrected (Dai Prà & Mastronunzio, 2014; Guerra, 2000).

Since the historical maps used in this study are not based on geodetic network (i.e. they have neither a map projection nor indications of latitude or longitude), but they meet the basic topological conditions; thin plate spline is selected as the main method of georectification for the transformation of the maps concerned. However, in local algorithms precise coincidence of GCPs on the old map and reference map does not mean that two maps are matched perfectly (Affek, 2013: 385). Thus, for a pure cartographic interest (such as analysis of transformation precision), old maps georeferenced by using local transformation methods can also be georeferenced by using global transformation methods that allow for the calculation of important parameters because local transformation methods do not calculate these parameters and they are not suitable for generating inferences about the deformations characterising the maps (Bitelli, Cremonini & Gatta, 2009; Cajthaml, 2011). For example, residuals that can be taken as a measure of the transformation precision can be used in order to produce intuitive and qualitative visualizations of map deformation (such as displacement vectors) (Brovelli & Minghini, 2012: 101). Within this context, the maps used in this study have also been georectified by using first degree polynomial transformation, and the screenshots showing the vectors of displacement for GCPs have been presented in order to generate some insight about the extent of the deformations to which the old maps were subject.

After specification of the methods of georectification that will be employed in the study, a set of GCPs have been identified in both old maps and reference maps already georeferenced in UTM WGS84 and available in scales between 1/500 and 1/5000. In order to increase the accuracy of the geoferencing and rectification process, as long as possible well-identified points such as the corner of the buildings or streets have been designated as GCPs. As we have the detailed spatial information about the buildings and streets in different maps used as reference materials, lots of GCPs have been able to be identified thanks to the descriptive information available in the respective maps. After the identification of GCPs, the olds maps have been first georectified and georeferenced by using thin plate spline as the method of transformation (Figure 1 and Figure 2). In order to get some intuition regarding the deformations
characterising the old maps, the maps concerned have also been georectified by using first degree polynomial transformation and the screenshots of the vectors of displacement have been taken (Figure 3 and Figure 4).

Figure 1. Georeferenced Map of the Piers in Mersin according to thin plate spline transformation.

Figure 2. Georeferenced Map of Mersin Tramline according to thin plate spline transformation.

Figure 3. Vectors of displacement for Map of the Piers in Mersin according to 1st degree polynomial transformation.
In QGIS, list of residue values for individual GCPs can also be exported as a table. In this respect, residue values calculated for the first order polynomial transformation have been further processed to calculate Root Mean Square Error (RMSE) values for each historic map used in this study. RMSE, the square root of the mean of the squared residuals for the individual control points, is one of the most important global statistics used to measure the deformations characterising the old maps (Table 1). Accordingly, RMSE values (in meters) for “Map of Mesrin Tramline” and “Map of the Piers in Mersin” are calculated as 8.896 and 10.836, respectively. RMSE values for the other old maps used either as an additional reference map for georeferencing purposes or as a control map to ascertain the names of the piers mentioned in the archive records and to confirm the route of the tramlines are also given Table 1. Compared with the other maps, as expected, Mersin Urban Development Plan prepared by Prof. Hermann Jansen in 1939 has the highest cartographic accuracy. Overall, RMSE values for the old maps georeferenced in this study are close to the ones computed in other studies for the maps prepared approximately during the same period (1890s) and produced at the scales close to each other (ranging between 1/500-1/1000 or 1/2000-1/4000) (Brovelli & Minghini, 2012: 106).

Table 1. The number GCPs identified and RMSE measured for the old maps of Mersin city.

<table>
<thead>
<tr>
<th>Map Name</th>
<th>Scale</th>
<th>Year</th>
<th>Number of GCPs</th>
<th>RMSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Map of Mersin Tramline</td>
<td>1/500</td>
<td>1889</td>
<td>94</td>
<td>8.896</td>
</tr>
<tr>
<td>Map of the Piers in Mersin</td>
<td>1/4000</td>
<td>1894</td>
<td>150</td>
<td>10.836</td>
</tr>
<tr>
<td>Mersin Port Project</td>
<td>1/5000</td>
<td>1894</td>
<td>97</td>
<td>10.235</td>
</tr>
<tr>
<td>Mersin Urban Development Plan</td>
<td>1/2000</td>
<td>1939</td>
<td>68</td>
<td>4.917</td>
</tr>
</tbody>
</table>

Based on these georeferenced maps, in the next two sections; firstly the development of Mersin as a node of intersection of different modes of transportation will be properly depicted with particular reference to the chrono-spatial development of the piers in the city; secondly the installation of the tramlines will be elaborated with reference to their function as linkages inside the break-of-bulk point.

**EVOLUTION OF MERSIN AS A BREAK-OF-BULK POINT: DEVELOPMENT OF PIERS**

Break-of-bulk points such as ports where freight and commodities were transferred from one mode of transportation onto another have the highest potential for the development of new cities (Kaplan, Wheeler and Holloway, 2009: 143). Parallel to this, it is observed that two critical factors in the economic development of Mersin were the presence of a well functioning port and the transportation services connecting the port to the other cities in inland (Beyhan and Uğuz, 2001). The increasing importance of Mersin as a break-of-bulk point owes to certain historical and geographical factors. Although firstly Kazanlı gained importance as a port because of the fact that Rhegma Lake allowing Tarsus to function as a port city got filled up and turned into a swamp (Barker, 1853: 15), Mersin had also increased in importance as a port for the transportation of particularly cotton and timber since 1817 (Akkaya, 2004: 335). The first historical record regarding the piers in Mersin belongs to 1832 (TSS No: 285 Belge No. 40-41). In the respective record that has been found in the Tarsus Court Records (Tarsus Şer’iyye Sicilleri), it is mentioned that Mersin pier was important as much as Kazanlı pier. In another record dated to 1837, it is stated that there were some repaired depots around Mersin pier (TSS No: 289 Belge No. 5). The depiction of the economic activities in the emerging settlement of Mersin with reference to the pier continued in the subsequent decade (TSS No: 289 Belge No. 441). After the mid 19th century, it is observed that although there was almost no record for Kazanlı pier, the number of records mentioning about Mersin pier tremendously increased. This reveals that the administrative and commercial significance of Mersin pier rose during the second half of the 19th century.
According to a record dated to 1852, a stone pier was constructed in the same year in addition to the existing wooden pier by the state itself owing to the increasing number of people and good departing from Damascus and Europe, and arriving at the pier facing Cyprus (BOA. İ.MVL 262/9894: 2). Parallel to these developments, it is observed that in a short time period the settlements in the region were started to be described with reference to Mersin pier whose location was previously defined in relation to the respective settlements. For example, although in 1852 ‘the location of Mersin pier was defined with reference to Yumuk hamlet’ (TSS No: 291 Sayfa No: 224), in 1856 the respective hamlet was described in relation to Mersin (TSS No: 295 Belge No. 344-345). There is no doubt that the increase in the commercial vividness of Mersin was in correlation with the increasing number of piers in the city. There was a need for the construction of new piers (BOA. A.MKT.NZD 194/49). Within this context, the repair of the existing wooden pier and the construction of 5 new stable piers (stone or wood) were decided in 1856. As a matter of fact, there was no proper pier in Mersin in the 1860s. During these early years, sailboats were anchored near the seashore and the loading-unloading of goods was carried out by the porters, who of necessity, worked in the water (Develi, 2001: 143). Nevertheless, compared with the coasts of İskenderun and Syria, Mersin was more suitable to anchor owing to the excellent roadstead (Barker, 1853: 115). In spite of lack of natural protection from the waves, it was also able to guide ships under heavy weather conditions thanks to its lighthouse constructed in 1865 (Dingeç, 1998).

In 1874, a new pier was constructed by French Messagerie Maritimes Company (BOA. İ.MMS 49/2098). As the import and export activities increased in Mersin, the road between Adana and Mersin could not meet the needs. Consequently, in order to develop the transportation facilities between Mersin and Adana, the construction of a 67-km-length railway between the port and the inland city was decided (Dingeç, 1998). The railway between Mersin and Adana was put into operation in 1886 (Dingeç, 1998; Develi, 2001). After the construction of the railroad between Mersin and Adana, the number of ship agents in Mersin noticeably increased. Subsequently, Mersin became an important center of trade and maritime transport in the region in the 1890s. Parallel to the increase in the export and import activities, the existing piers in the city could not meet the demand. Consequently, with the contribution of both public and private initiatives, new piers were constructed. By 1892, there was a total of 7 piers in the city according to the yearbook of Adana province for the same year (AVS H. 1309). Four of them were made of wood and two piers were made of stone one of which had a wooden extension. And one pier belonging to the railways had an iron frame. Although, in “Map of the Piers in Mersin” dated to 1894, there was a total of 7 piers, one of them was a proposal and it seems that it did not actually existed at the time (BOA. BEO 505/37812) (Figure 5). Indeed, in another record dated to 1895, it was stated that there were 6 piers in Mersin and they could not meet the demand of the merchants in the city (BOA. DH.MKT 364/40).

Thus, there is no doubt that a proper spatial analysis of the historical evolution of the piers in the city provides us with a more accurate historical account of the subject matter. Within this context, it became possible for this study to specify the exact location of the piers mentioned in the Ottoman registries noted above. Furthermore, based on the information available both on the map and the registries, a chronological and spatial order of the piers has also been produced in this study thanks to the georeferencing tools available in FOSS for GIS (Figure 5): The first pier originally made of wood was located in front of the Port House. The Ottoman registries reveal that it had been there since 1830s (TSS No.285 Belge No. 40-41). The second pier constructed in 1852 was most probably the one located in front of the store of Dimitri and Şatur. The third pier was constructed in 1874 (BOA. İ.MMS 49/2098: 1). Since it was constructed by Messagerie
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Maritime Company, it is considered that it should have been the pier closest to the building of the respective company. The forth pier was first visible on a map prepared in 1883 for the construction of the railway line between Mersin and Adana. According to the main map showing the existing and proposed piers in Mersin, it was shown in front of the houses and stores of the local merchants Mavromati, Consulate of Spain, and his son-in-law, Christman, Consulate of Austria. The fifth and sixth piers are visible both on the main map prepared particularly for piers and the one prepared in 1894 for the construction of a port in Mersin. The fifth pier having a wooden frame was built temporarily in front of the Customs House. What is evident from “Plan de la ligne du Tramway de Mersine” is that the respective pier was constructed at the beginning of the 1890s together with the sixth one connected to the railroad. The existence of the sixth pier serving for the railway connection can be traced back to 1892 according the yearbook of Adana published for the same year.

LINKAGES INSIDE THE BREAK-OF-BULK POINT: THE STORY OF TRAM-LINES

The first news about the construction of a tramline in Mersin appeared on a weekly commercial and financial journal titled “The Money Market Review”. In the respective news, it is stated that Mersin Municipality obtained the right to construct a tramway from the Custom House to the railway station. According to the news, tramway would shortly become an accomplished fact (Money Market Review, 1885: 1261). Nevertheless, what is evident from the correspondences occurring between the state and local government bodies and obtained from the Ottoman Archives is that the construction of the tramway was delayed due to the problems experienced firstly in the approval of and permission for the project by the State, and the subsequently in the start of the construction by Mersin Municipality.

Indeed, what is evident from the correspondences between the Governorship of Adana and the Ministry of Public Works (Nâfi’a Nezâreti) in 1888 is that just after the construction of the railway between Mersin and Adana, the municipalities of Mersin, Tarsus and Adana requested the permission of the state for the construction of tramlines in their cities (BOA. ŞD. 1188/10:2). It is important to note that only the request of Mersin municipality was taken into account by the state considering the necessity of the connection between Mersin railway station and the piers in the city provided that Mersin Municipality strictly complied with the rules of the license prepared for the construction of the tramway. Upon this, Mersin Municipality sent the plan and project prepared for the construction of the tramway to the Governorship of Adana by accepting to comply with the rules of the license and to complete the project within two years after the approval of the tramway plan as specified in the license. And, subsequently, the Governor of Adana requested the approval of the tramway plan and project, and the permission for the construction of the tramway from the Ministry of Public Works by arguing that the respective project was important for the development of not only Mersin city but also the country (BOA. ŞD. 1188/10:1). Within this context, in the Archive records, information about the route of the tramway and the cost of the construction is also given. Accordingly, it was stated that the tramway line having a length of 1350 meters would be installed between the railway station and French Messagerie Maritimes Company, and it was calculated that it would cost 3150 liras (BOA. ŞD. 1188/10:1). In the respective record, we are further informed that the segment (1050 meters) of the tramline between French Messagerie Maritimes Company and Frenk Church would be constructed with sidewalks, and the remaining part between the Church and the station would be constructed as a solid carriageway.

The correspondences reveal that the permission awaited for the construction of the project was not yet granted by the State even though approximately 3 months passed after the request of the Governship (BOA. ŞD. 1188/10:2). In a record dating back to 29 September 1888, we are informed that the permission was still pending and the Governship sent another letter to the Ministry of Public Works in order to start the construction of the project by arguing that it was important for the development of the trade in the city (BOA.İ.MMS 102/4320:1). Fortunately, the permission for the construction of the project was granted to the Municipality with an imperial edict (Ferman) on 25 December 1888 (BOA. ŞD. 1201/9:1). However, in the same record revealing this information, we are informed that in 1894 Mersin Municipality somehow did not yet start the construction of the tramway, and unfortunately two years’ time period specified in the License was terminated after granting the permission. By arguing that there was an ongoing development in Mersin and this also contributed to the development of the country, the Governor of Adana requested from the State for the prolongation of the time period predefined in the License. As a result of these correspondences, the State prolonged the time period for another two years starting from 30 March 1894 (BOA. ŞD. 1201/9:5). Since no correspondence between the State and the local governments could be found on this subject matter after 1894, the exact date of the start and end of the construction is unknown. Another factor retarding the construction of tramway was most probably the construction of a railroad pier (6th Pier) near railway station already by 1892. As the goods were started to be transferred via this pier, the need to connect the Customs Pier with the railroad via a tramline for the transportation of the goods should have decreased.

Develi (2001) argues that the tramline was put into operation in 1912. Yet, in his book, Develi (2001: 220) also provides us with a photo dated to 1910 and showing the fact that a tramcar was passing through the Customs Square in front of Hotel Europe. In another source published in 1916, it was mentioned that on the customs pier there existed “a light tramroad running to a store” in the Custom Square (The Hydrographic Office, 1916: 552). Thus, it is evident that in the 1910s tramlines were used in Mersin. The route along which tramlines would be installed according to the project
permitted in 1888 and the buildings located along the route can be seen in Figure 6. Although in the original project the route is between the railway station and Messagerie Maritimes Company, according to Develi (2001: 82) the tramline was actually installed between the Customs Square and Müftü Mosque located at the western part of Mersin inhabited by the rich residents of the city. In fact, this is also in line with our explanation given above. In a map titled “Port of Mersin - Project presented for the construction of the port”, there was also a proposal by Tahincioğlu Atnaş Efendi and David dö Toledano together with their partners in 1897 for the extension of the tramline to the west of the city till in front of the Arab Orthodox Church (BCA 230-0-0-0/19-74-1). When France occupied the region, the tramline mentioned by Develi was dismantled and it was re-installed between the railway station and the Customs House, but this time only for the transportation of goods (Develi, 2001: 82). Thus, in the early years before the French occupation of the region, it seems that the tram was mainly employed for transportation of people, not goods. After the French occupation between 1919 and 1922, this tramline was not used and rails of the tramline were dismantled in 1932 (Develi, 2001: 65).

![Figure 6. Route of the tramway in the project permitted in 1888 and proposal for its extension in 1897.](image)

Overall, the availability of historical cartographical materials and proper analysis of the respective materials provides us with a more accurate chrono-spatial account of the city and enriches our understanding of the historical narratives of the individuals witnessing the developments in the city during the era concerned. Furthermore, the exact location of the historical buildings demolished overtime due to the physical transformations in the city can also be properly identified if the required descriptions are available in the respective historical cartographical materials. Within this context, the names of the buildings indicated on the map in Figure 6 are given in Table 12.

**Table 12. The name of the buildings located along the tramlines.**

<table>
<thead>
<tr>
<th>No</th>
<th>Name of Building</th>
<th>No</th>
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</tr>
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<tbody>
<tr>
<td>1</td>
<td>Messagerie Maritimes Company</td>
<td>10</td>
<td>School of Dr. Metheny</td>
<td>19</td>
<td>Şatır Khan</td>
</tr>
<tr>
<td>2</td>
<td>Store of Mavromati and Christman</td>
<td>11</td>
<td>Courthouse</td>
<td>20</td>
<td>Sursok Estate</td>
</tr>
<tr>
<td>3</td>
<td>Customs House</td>
<td>12</td>
<td>Greek Consulate</td>
<td>21</td>
<td>Şatır Properties</td>
</tr>
<tr>
<td>4</td>
<td>Municipal Hall</td>
<td>13</td>
<td>Bakery</td>
<td>22</td>
<td>English Consulate</td>
</tr>
<tr>
<td>5</td>
<td>Governor’s Office</td>
<td>14</td>
<td>Port Authority</td>
<td>23</td>
<td>Nader Properties</td>
</tr>
<tr>
<td>6</td>
<td>Post and Telegram Office</td>
<td>15</td>
<td>Ziya Paşa Properties</td>
<td>24</td>
<td>Mısıri Zade Estate</td>
</tr>
<tr>
<td>7</td>
<td>Regie Administration</td>
<td>16</td>
<td>Beyleroğlu</td>
<td>25</td>
<td>Maronite Church</td>
</tr>
<tr>
<td>8</td>
<td>Ottoman Public Debt Administration</td>
<td>17</td>
<td>Sursok Khan</td>
<td>26</td>
<td>American Consulate</td>
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<tr>
<td>9</td>
<td>Regie Inspector’s Office</td>
<td>18</td>
<td>Cami-i Serif</td>
<td>27</td>
<td>Taşhan</td>
</tr>
</tbody>
</table>
CONCLUDING REMARKS

As it is evident from this study, a systematic and scientific analysis of the old maps with the assistance of GIS helps for the revival of the collective memory. In this respect, one of the most important tools in GIS is georeferencing. The georeferencing methods based on local & exact algorithms such as rubbersheeting and thin plate spline type transformations particularly increase the cartometric value of less-precise maps that are not based on geodetic network. As the main cartographical materials used in this study are not based on geodetic network, they have been georeferenced by using thin plate spline as the method of georectification in QGIS. As a result of the georeferencing operation realized in this study, the exact location and chronological order of the piers in Mersin from 1830s to the mid 1910s have been successfully specified. The route of the tramlines and the location of the historical buildings demolished overtime have also been properly revealed by georeferencing the old maps obtained from the Ottoman Archives. RMSE values for the old maps georeferenced in this study are close to the ones calculated in other studies for the maps prepared approximately during the same period (1890s) and produced at the scales close to each other.

Those old maps georeferenced can be vectorized in order to produce statistical data on distances and other spatial attributes of the objects such as areas and shapes of objects. Cartographic visualization of historical evolution of the urban fabric can also be made accessible to public in web environment by using FOSS for GIS specifically developed for this purpose such as GeoServer (for OWS Services) and OpenLayers (for web mapping) in combination with PostGIS, an open source object-relational database system. All these constitute future areas of research trying to understand and share the evolution of socio-spatial configuration of the urban fabric. The spatial changes experienced in Mersin city during and after the 1920s will be particularly addressed in another study focusing on the development of the piers till the construction of the first proper port in the city in 1960s.

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