THE INVENTORY AND GIS MAPPING OF HERITAGE OBJECTIVES FROM TIMISOARA

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Abstract. *The city of Timisoara is the city that has registered in the last years an upward trend of development, from an economic and demographic point of view. The city of Timisoara has a long history that begins with ancient human settlements on the present hearth of the city and then with the appearance of the first fortified city, around the century. XII. Thus, Timisoara has a vast cultural heritage that, unfortunately, at the moment is not fully exploited, those interested (city dwellers or tourists) not having available easy mechanisms to obtain information on local heritage and access to these objectives.*
Timisoara is located at an altitude of approximately 90m in the south east of Banat Plain, which is part of the Panonia Plain due to the divergence between the Bega and Timiș rivers, which make this land a marshy and frequently flooded area. These rivers were a natural protection for the fortress of Timișoara for a long period of time, but they also contributed to the humid and unsanitary climate, to the spread of the diseases of that period having a relatively small number of citizens. During the time these rivers were drained and diverted, during the eighteenth century, so Timisoara was no longer on the river Timis but on the Bega Canal, due to the construction of the Bega Canal - 1728 and due to the complete drainage of the marshes in that area. The land of the city of Timisoara is located above a groundwater at a depth of only 0.5 - 5 m, a factor that prevents the construction of high objectives in safe conditions. However, due to these aspects, the soil in this region is of a higher quality so this region is considered a very fertile agricultural region. An important initiative to enhance the local cultural heritage was to obtain the status of European Cultural Capital 2021, one of the findings of this step being the need for a better correlation between the IT&C sector, which is in full swing in the last year of economic development of the city and the sector. cultural through the use of modern IT&C solutions, easy to promote the culture and the local cultural heritage at the level of the interested inhabitants and tourists. In this context, through this paper we propose the creation of digital maps in a GIS environment, through which any interested user can access information regarding the location and description of a total number of 118 monuments of local cultural heritage (type A and B, cf. Ord. 2314/2004 and 2385/2008). An important initiative to enhance the local cultural heritage was to obtain the status of European Cultural Capital 2021, one of the findings of this step being the need for a better correlation between the IT&C sector, which is in full swing in the last year of economic development of the city and the sector. cultural through the use of modern IT&C solutions, easy to promote the culture and the local cultural heritage at the level of the interested inhabitants and tourists. In this context, through this paper we propose the creation of digital maps in a GIS environment, through which any interested user can access information regarding the location and description of a total number of 118 monuments of local cultural heritage (type A and B, cf. Ord. 2314/2004 and 2385/2008).

Key words: GIS, Maps, Database, Digital

INTRODUCTION

Timișoara has a vast cultural heritage which, unfortunately, is not fully utilized at the moment, and so thus the inhabitants of the city or the tourists do not have accessible mechanisms to obtain information on the local heritage and access to these objectives.

By studying this paper, it emphasizes the importance and practical utility of these maps, namely:

- a better organization and a relatively short time for a tourist that goes site seeing in order to know the nearby historical monuments as well as to render a shorter route and a freer route to them
- increasing the awareness of citizens about the tourist objectives in the city
- is an easily accessible map and can be viewed even offline

In the list of monuments in the municipality of Timișoara, according to Order 2314/2004, modified by order 2385/2008, we are presented the most important historical monuments classified in two groups: group A and group B, in the first group we are shown 118 historical monuments. , and in the second group there are described the monuments classified between 2010-2012.

The map is a representation in plane (Nistor, 2011), conventional, reduced and generalized graphics of the Earth's surface. The reduction is made on the basis of a proportional scale and a map projection is used for drawing the map (Popescu et al., 2016). A map uses certain abbreviations or symbols that are explained in a legend (list of conventional signs) (Begov et al., 2016).

Maps are used in multiple fields and branches of science (Beogov et al, 2016). Basically the range of maps is very wide, which also shows the extent of the general cartography. In these conditions, the maps can be very different, thus being necessary for them to be ordered, in order to place them, in the areas in which they belong. The realization of such GIS maps of the historical monuments in the Municipality of Timișoara is of great importance both for increasing the knowledge of the citizens, for the tourists who are interested in visiting the historical monuments in detail and for easier navigation because if we access a GIS map we can observe more details such as: LMI code, name of monuments, type, address, dating, description, website and reproduction of angular coordinates, we must know the coordinates to be able to find out in which area we are

MATERIAL AND METHOD

In order to make these maps we used a database created in Microsoft EXCEL and the ESRI - ArcGIS for office module. A database stores and connects the details of the field with their attributes (Herbei, 2015), it is also a collection of records, made up of several fields, in Excel, any data table can be interpreted as a database and, ArcGIS is a system of geographical information for working with maps and geographical information (Herbei and Nemes, 2012). It is used for creating and using maps (Ienciu et al., 2013), compiling geographic data, analyzing mapped information, sharing and discovering geographic information, using maps and geographic information in a number of applications and managing geographic information in a database (Herbei and Sala, 2014).

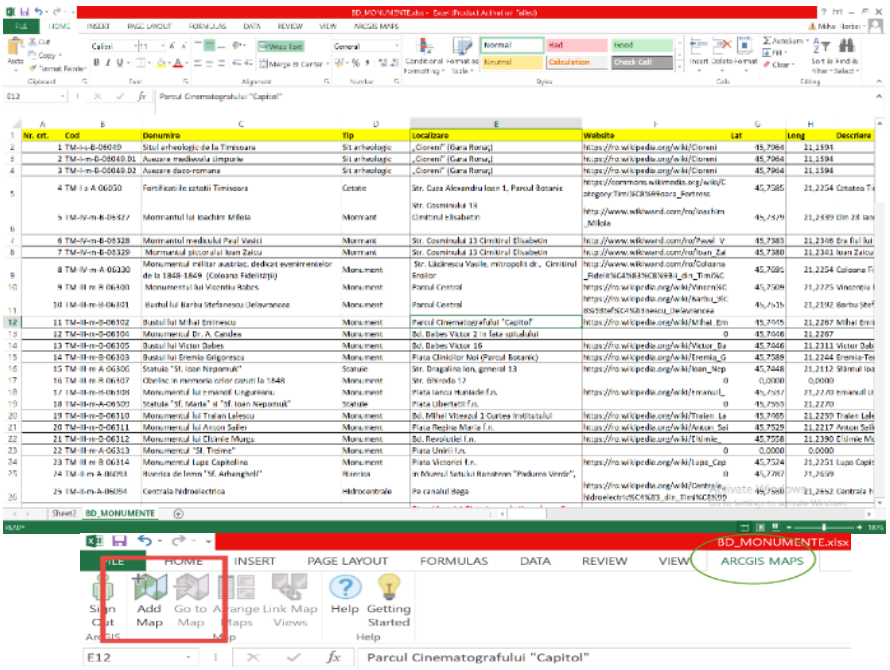

Figure 1. Database and ArcGIS for office

The spatial database represents a textual database which has the possibility to store and query all kind of GIS data, that represent objects defined in a geometric space (Herbei et al., 2016). Most databases allow the representation of objects through points, lines, polygons (Herbei 0. And Herbei M., 2010) or more complex structures: 3D objects, topology, linear networks.

The design and representation of spatial databases is carried out in several stages:

1. Identifying the data sources to be used and managed by the created GIS (Herbei and Sala, 2014).

2. Identifying key data based on the requirements of the desired GIS - Establish how each data set will be used for editing, modeling and analysis, representation and visualization.

3. The scale of representation of each thematic layer will be established. The data is compiled for use on a wide range of scales (Filip et al., 2015).

4. Decompose each representation into one or more geographical data sets. Discrete features are modeled as classes of points, lines, and polygons (Herbei and Sala, 2015).

5. Defining the database structure of the database and the behavior of the descriptive attributes. Fields containing attributes and column types will be identified. The tables also include attributes, relationships, and subdomains (Herbei, 2013).

6. Define the spatial reference and a series of integrity rules for the data sets used. This will be done using topologies, networks, 3D models (Herbei et al., 2015)

7. The actual design of the spatial database (Herbei et al., 2016).

8. Viewing (2D or 3D) digital maps created according to the user's needs (Oncia et al., 2013).

9. Assigning the maintenance and permanent addition of data.

10. Testing and correcting the database created to increase the accuracy of future data to be added

11. View the data with the help of thematic maps, diagrams, reports (Herbei et al., 2016).

The structure of the database from the project was realized with the help of Annex 5 - Order 2314/2004, modified by order 2385/2008 from the municipality of Timisoara, where we are presented to the 118 historical monuments from Timisoara from where we could collect information on each historical monument according to the current number of monuments that indicate their origin; LMI codes that have been associated with each historical monument; the name; what kind of monument is for example: archaeological site, monument, fortress, etc; location, website where we documented the description of the monuments, coordinates: latitude and longitude; historical data about each monument (description).

The database has the following structure:

1. Current number
2. Code
3. Type name
4. Type
5. Location
6. Website
7. Latitude
8. Longitude
9. Description

Each field has a special value because for the most efficient navigation we need all five columns presented in the table because we have clear information about each monument both for increasing the knowledge of citizens and for a better organization with regarding tourists who want to accurately locate a certain location with regard to a certain historical monument.

RESULTS AND DISCUSSIONS

GIS MAP CREATION USING MICROSOFT EXCEL AND ARCGIS FOR OFFICE PROGRAMS

In the first part we created an excel database (Smuleac et al., 2014) with all the details regarding each monument in order to obtain a GIS map that is as useful as possible for each person who will use it, as you can see in figure 2.

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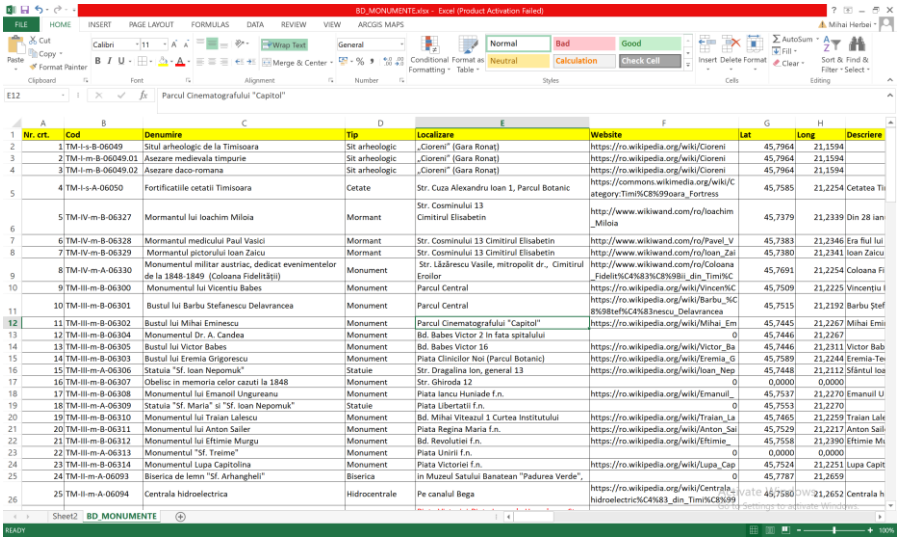

Nr. crt.	Cod	Denumire	Tip	Localizare	Website	Lat	Long	Descriere
1	TM-I-s-B-06049	Situl arheologic de la Timisoara	Sit arheologic	„Cioreni" (Gara Ronat)	https://ro.wikipedia.org/wiki/Cioreni	45,7964	21,1594	
2	TM-I-m-B-06049.01	Asezare medievala timpurie	Sit arheologic	„Cioreni" (Gara Ronat)	https://ro.wikipedia.org/wiki/Cioreni	45,7964	21,1594	
3	TM-I-m-B-06049.02	Asezare daco-romana	Sit arheologic	„Cioreni" (Gara Ronat)	https://ro.wikipedia.org/wiki/Cioreni	45,7964	21,1594	
4	TM-I-s-A-06050	Fortificatiile cetatii Timisoara	Cetate	Str. Cuza Alexandru Ioan 1, Parcul Botanic	https://commons.wikimedia.org/wiki/Category:Timi%C8%99oara_Fortress	45,7585	21,2254	Cetatea Ti
5	TM-IV-m-B-06327	Mormantul lui Ioachim Miloia	Mormant	Str. Cosminului 13 Cimitirul Elisabetin	http://www.wikiwand.com/ro/Ioachim_Miloia	45,7379	21,2339	Din 28 ian
6	TM-IV-m-B-06328	Mormantul medicului Paul Vasici	Mormant	Str. Cosminului 13 Cimitirul Elisabetin	http://www.wikiwand.com/ro/Pavel_V	45,7383	21,2346	Era fiul lui
7	TM-IV-m-B-06329	Mormantul pictorului Ioan Zaicu	Mormant	Str. Cosminului 13 Cimitirul Elisabetin	http://www.wikiwand.com/ro/Ioan_Zai	45,7380	21,2341	Ioan Zaicu
8	TM-IV-m-A-06330	Monumentul militar austriac, dedicat evenimentelor de la 1848-1849 (Coloana Fidelității)	Monument	Str. Lăzărescu Vasile, mitropolit dr., Cimitirul Eroilor	http://www.wikiwand.com/ro/Coloana_Fidelit%C4%83%C8%9Bii_din_Timi%C	45,7691	21,2254	Coloana Fi
9	TM-III-m-B-06300	Monumentul lui Vicentiu Babes	Monument	Parcul Central	https://ro.wikipedia.org/wiki/Vincen%C	45,7509	21,2225	Vincențiu I
10	TM-III-m-B-06301	Bustul lui Barbu Stefanescu Delavrancea	Monument	Parcul Central	https://ro.wikipedia.org/wiki/Barbu_%C8%98tef%C4%83nescu_Delavrancea	45,7515	21,2192	Barbu Ștef
11	TM-III-m-B-06302	Bustul lui Mihai Eminescu	Monument	Parcul Cinematografului "Capitol"	https://ro.wikipedia.org/wiki/Mihai_Em	45,7445	21,2267	Mihai Emi
12	TM-III-m-B-06304	Monumentul Dr. A. Candea	Monument	Bd. Babes Victor 2 In fata spitalului	0	45,7446	21,2267	
13	TM-III-m-B-06305	Bustul lui Victor Babes	Monument	Bd. Babes Victor 16	https://ro.wikipedia.org/wiki/Victor_Ba	45,7446	21,2311	Victor Bab
14	TM-III-m-B-06303	Bustul lui Eremia Grigorescu	Monument	Piata Clinicilor Noi (Parcul Botanic)	https://ro.wikipedia.org/wiki/Eremia_G	45,7589	21,2244	Eremia-Te
15	TM-III-m-A-06306	Statuia "Sf. Ioan Nepomuk"	Statuie	Str. Dragalina Ion, general 13	https://ro.wikipedia.org/wiki/Ioan_Nep	45,7448	21,2112	Sfântul Ioa
16	TM-III-m-B-06307	Obelisc in memoria celor cazuti la 1848	Monument	Str. Ghiroda 12	0	0,0000	0,0000	
17	TM-III-m-B-06308	Monumentul lui Emanoil Ungureanu	Monument	Piata Iancu Huniade f.n.	https://ro.wikipedia.org/wiki/Emanuil_	45,7537	21,2270	Emanuil U
18	TM-III-m-A-06309	Statuia "Sf. Maria" si "Sf. Ioan Nepomuk"	Statuie	Piata Libertatii f.n.	0	45,7553	21,2270	
19	TM-III-m-B-06310	Monumentul lui Traian Lalescu	Monument	Bd. Mihai Viteazul 1 Curtea Institutului	https://ro.wikipedia.org/wiki/Traian_La	45,7465	21,2259	Traian Lale
20	TM-III-m-B-06311	Monumentul lui Anton Sailer	Monument	Piata Regina Maria f.n.	https://ro.wikipedia.org/wiki/Anton_Sai	45,7529	21,2217	Anton Sail
21	TM-III-m-B-06312	Monumentul lui Eftimie Murgu	Monument	Bd. Revolutiei f.n.	https://ro.wikipedia.org/wiki/Eftimie_	45,7558	21,2390	Eftimie Mu
22	TM-III-m-A-06313	Monumentul "Sf. Treime"	Monument	Piata Unirii f.n.	0	0,0000	0,0000	
23	TM-III-m-B-06314	Monumentul Lupa Capitolina	Monument	Piata Victoriei f.n.	https://ro.wikipedia.org/wiki/Lupa_Cap	45,7524	21,2251	Lupa Capit
24	TM-II-m-A-06093	Biserica de lemn "Sf. Arhangheli"	Biserica	in Muzeul Satului Banatean "Padurea Verde",	0	45,7787	21,2659	
25	TM-II-m-A-06094	Centrala hidroelectrica	Hidrocentrale	Pe canalul Bega	https://ro.wikipedia.org/wiki/Centrala_hidroelectric%C4%83_din_Timi%C8%99	45,7580	21,2652	Centrala h

Figure 2 The Structure of the database

Row Labels	Count of Nr. crt.
Abator	1
Ansamblu urban	20
Biserica	11
Biserica de lemn	1
Biserica Sarbeasca	1
Camin	1
Cantina	1
Casa	21
Castel	1
Catedrala	2
Cazinou	1
Cetate	2
Cladire	5
Fabrica	2
Facultatea	1
Hala	1
Hidrocentrale	1
Liceu	1
Magazie	1
Monument	20
Mormant	3
Muzeu	1
Palat	4
Pod	1
Scoala	2
Sit arheologic	3
Situl urban	2
Spital	4
Statuie	2
Teatru	1
Grand Total	**118**

Figure 3 Historical Monument centralization

Figure 4 shows how to create a GIS map based on the data stored in the spatial database. The cells from the database containing the information to be represented will be selected, the fields containing the geocoding information (latitude and longitude) will be selected, and the field based on which the map elements will be differentiated will be selected (Type)

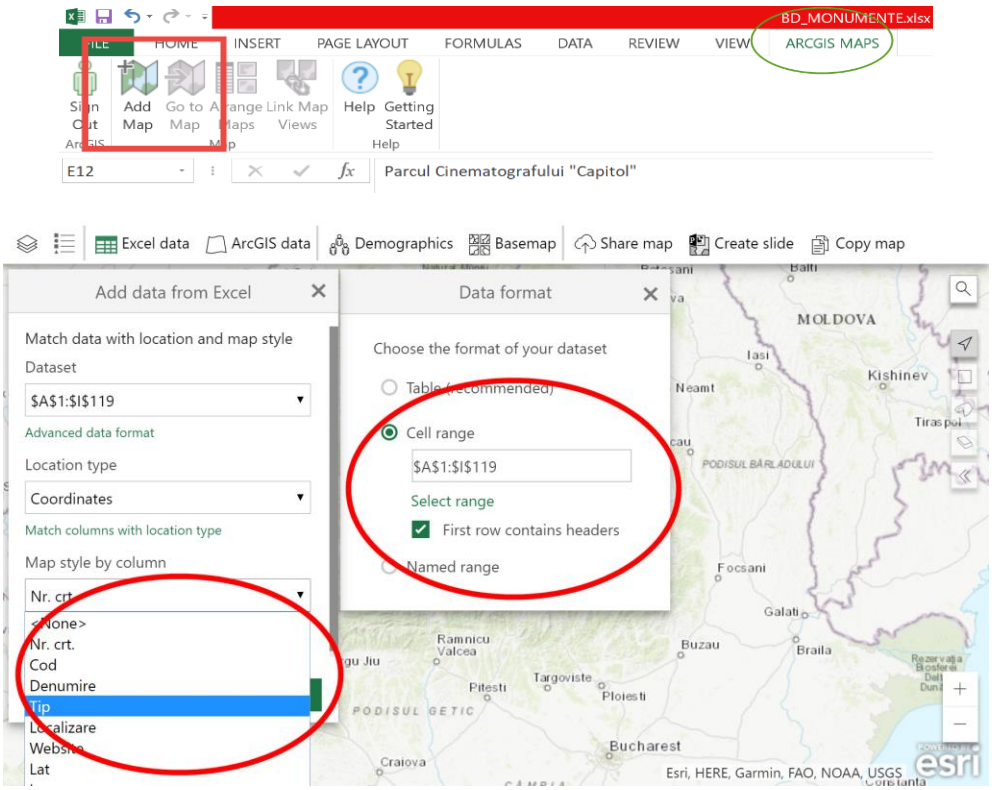

Figure 4 Selecting the data to be represented on the GIS map

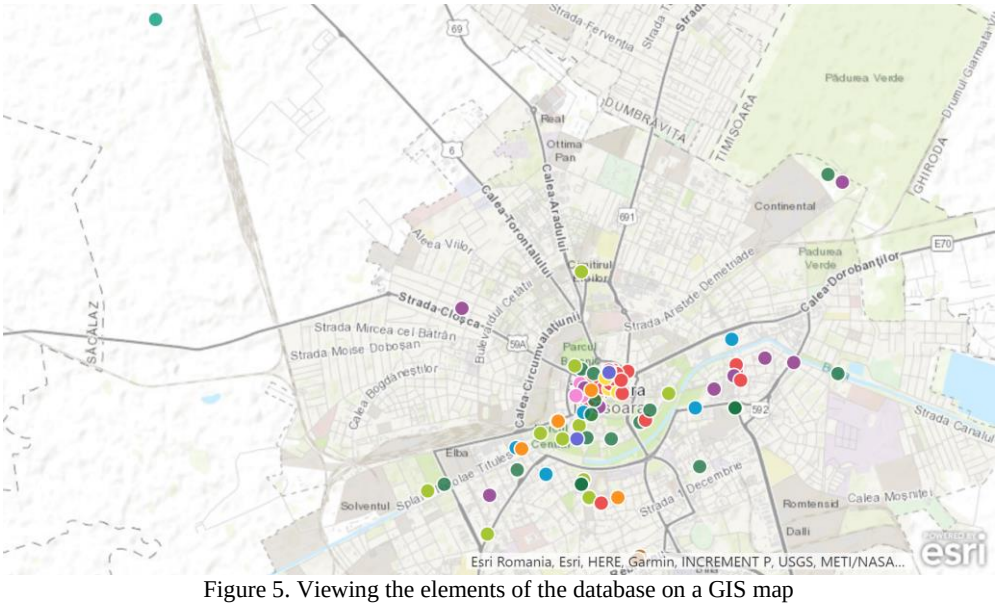

Figure 5. Viewing the elements of the database on a GIS map

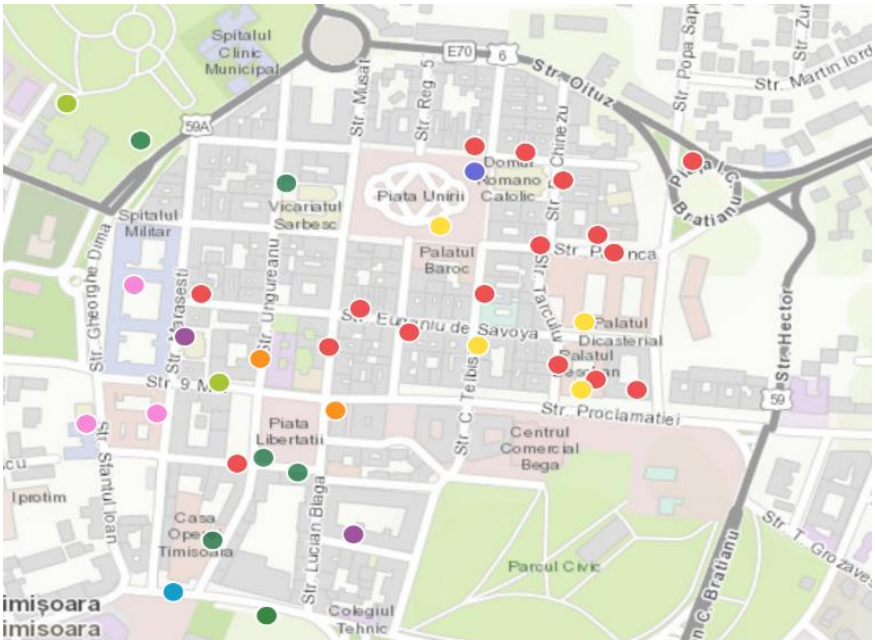

Figure 6. Timisoara City Center and existing monuments

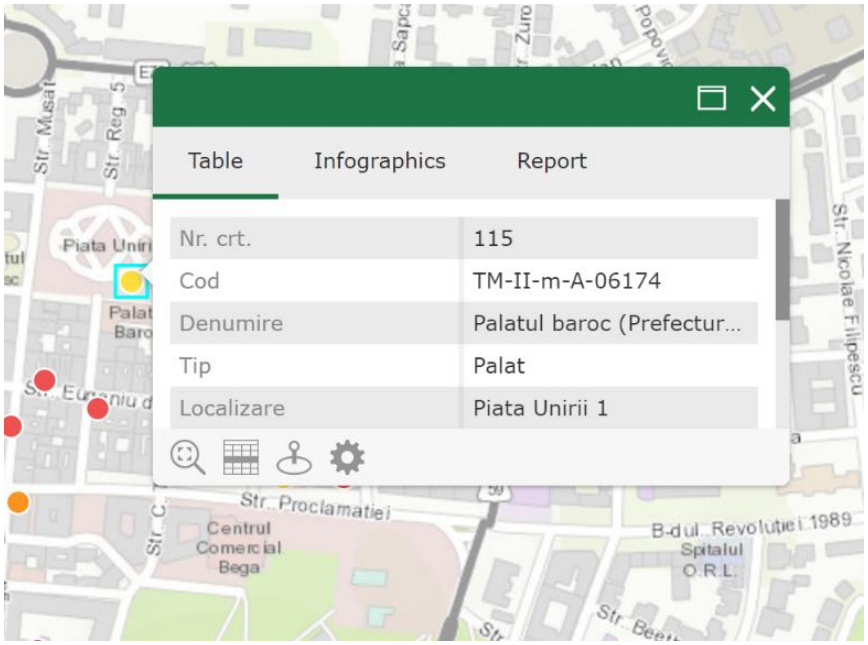

Figure 7. Visualizing the attributive elements

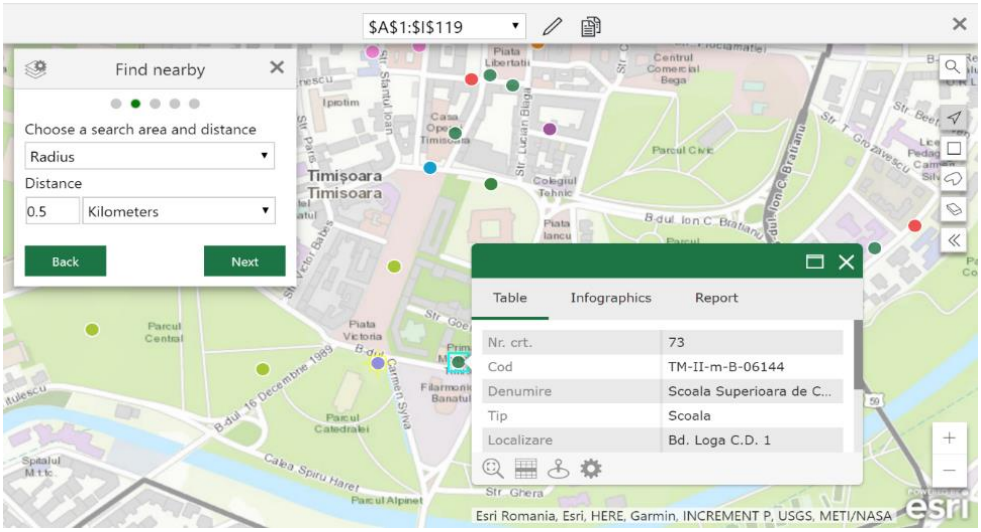

Figure 8. Carrying out spatial analysis

Any GIS product allows simple or complex spatial analysis, depending on the software solution used. The solution used in this work, namely Microsoft Excel and the ESRI ArcGIS for Office module, allows us to perform certain spatial analysis that will help users, for example, if we are interested in visiting only a certain area we can select the radius around certain main points, so that we can find out as quickly as possible the historical monuments of that area. In the example below, we present the 15 locations (historical monuments) that are within 500 meters of the Cathedral.

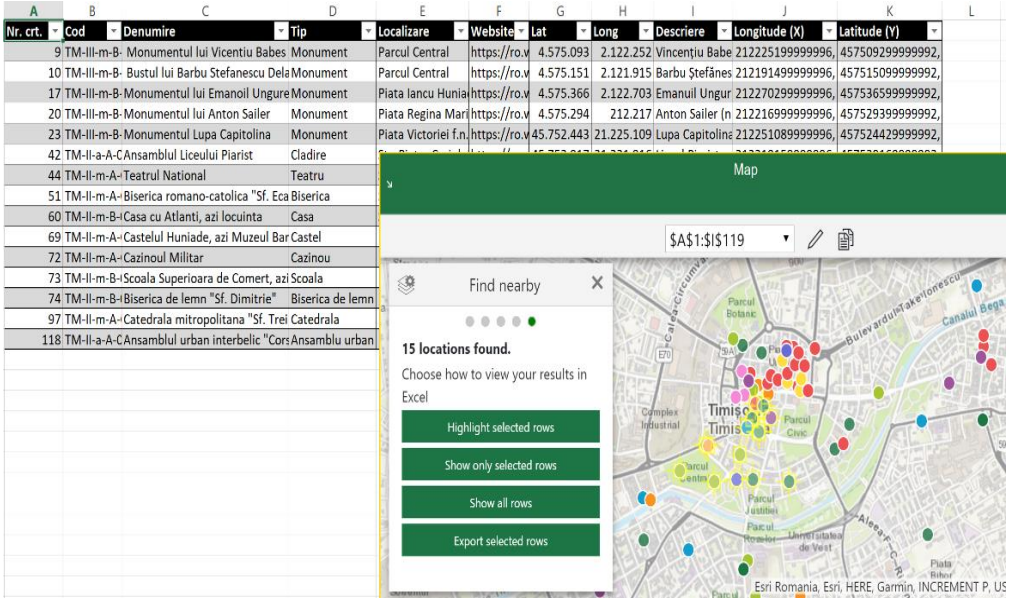

Figure 9. Spatial analysis - FIIND NEARBY 500 m from the Cathedral

CONCLUSIONS

Making such GIS maps represents both a great importance and practical utility for a better organization and a relatively short time for a tourist's hiking in order to know the nearby historical monuments, relay a shorter route and a freer access path as well increasing the knowledge of the citizens about the tourist objectives in the city.

GIS mapping is an important initiative to highlight the 118 historical monuments in the city of Timisoara as well as a more efficient way for all those interested.

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