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SPATIAL RELATIONSHIPS OF THE PREAJBA VALLEY LAKES EVOLUTION REFLECTED ON CARTOGRAPHIC DOCUMENTS

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Abstract

The Preajba-Făcăi lacustrine system is located in the southern part of Craiova municipality and it is distinguished by a high level of originality conferred by both its hydro-geomorphological and biological features. The construction of this series of lakes along the Preajba river began during the Communist times (in the 1970s) with the declared aim of serving as a recreational space for the inhabitants of this municipality. The river springs near Cârcea locality at an altitude of 192 metres and it flows into Craiova channel after 9.6 km, with a source-mouth level difference of 121.1 metres. Chronologically, the number of lakes situated along the Preajba river may vary, according to the analysed cartographic document, from 3 lakes (Military Topographic Maps) to 11 lakes (Topographic Map, 1:25,000). With the development of the area covered by water, the human pressure has increased as a consequence of the intensive development of the surrounding area. This phenomenon gradually led to an involution of the lake surface (25.34 ha in 2014, Google Earth PRO). The aim of this research is to highlight the relational dynamic appearance-evolution-involution suffered by the lakes situated along the Preajba Valley, in correlation with the processes that occurred at the level of the constructed surface and in terms of respecting the status of this protected area of aqua-faunistic interest (The Lacustrine System of Preajba-Făcăi).

Keywords: lakes, evolution, cartographic documents, GIS tools, Preajba Valley

1. INTRODUCTION

During the last decade, the regional development became a major research preoccupation for the scientific community and, at the same time, a debate topic for the local and central authorities. The human impacts at local

scale are of great diversity and they alter the balance and the metabolism of natural ecosystems.

Historians, geographers and media scholars have proposed theoretical approaches for studying the creation and the representation of geographic knowledge. Mapping is a cultural activity whereby social groups may record, represent and communicate spatial knowledge (Harley& Woodward, 1987).

The Romanian geographical researches on the environment dynamics use different multi-temporal data sources, such as cartographic documents and remote sensing (Rus et al., 2010; Huzui et al., 2011; Fodorean et al., 2013; Radu et al., 2013; Bilaşco et al., 2014).

At the same time, studies on the hydrographic features dynamics have been developed by Osaci-Costache&Achim, 2008 (*Changes of the environmental components within the Danube floodplain reflected in the cartographic documents from 19th – 20th centuries*), Curcan et al., 2009 (*Reconstitution of the morphohydrographic evolution of the Jiu – the Danube confluence area*), Cristea, 2009 (*Aspects in the evolution of the hydrographical network from the Lower Siret Plain reflected in cartographic materials*), Radu&Stoiculescu, 2010 (*Landscape changes in Colentina river basin reflected in cartographic documents, 1971-2000*).

Aspects of the lake surface dynamics were designed before in the international specialised literature for large lakes, such as: Huron, Yellowstone (*America* – Taylor, 2009; Youngs, 2011), Ciad and Manyara *(Africa* - History of the Lake Chad Basin, 1973-2007; Deus&Gloaguen 2013), Aral and Qinghai (*Asia* – Breckle&Geldyeva, 2011; Shen Fang &Kuang Dingbo, 2003).

1.1. Study area

The Preajba hydrographic basin is located in the South-East of Craiova municipality, between 44º15'25"-44º17'00" north latitude and 23º48'40"- 23º54'30" east longitude. The valley of the river has a length of 3 km and a width between 40 - 120 m (Ionuş et al., 2014).

Geomorphological, the study area is placed between the following micro-relief units: Teslui Plateau (with an altitude of 198 m in the area of its springs) and the meadow of Jiu river (with an altitude of 68,2 m where it joins Craiovița Sewer-Channel) (Fig.1). The lacustrine system of Preajba Valley was constructed during the Communist Times and, since 2000 it received the name of "Lacustrine System of Preajba-Făcăi", aqua-faunistic protected area. The natural protected area of national interest is declared

according to: the Law no. 5/2000 on country planning, section III, protected areas; the Government Decision no. 2151/2004 establishing the natural protected area regime for new areas; the Government Decision no. 1581/2005 establishing the natural protected area regime for new areas; the Government Decision no. 1143/2007 establishing new natural protected areas.

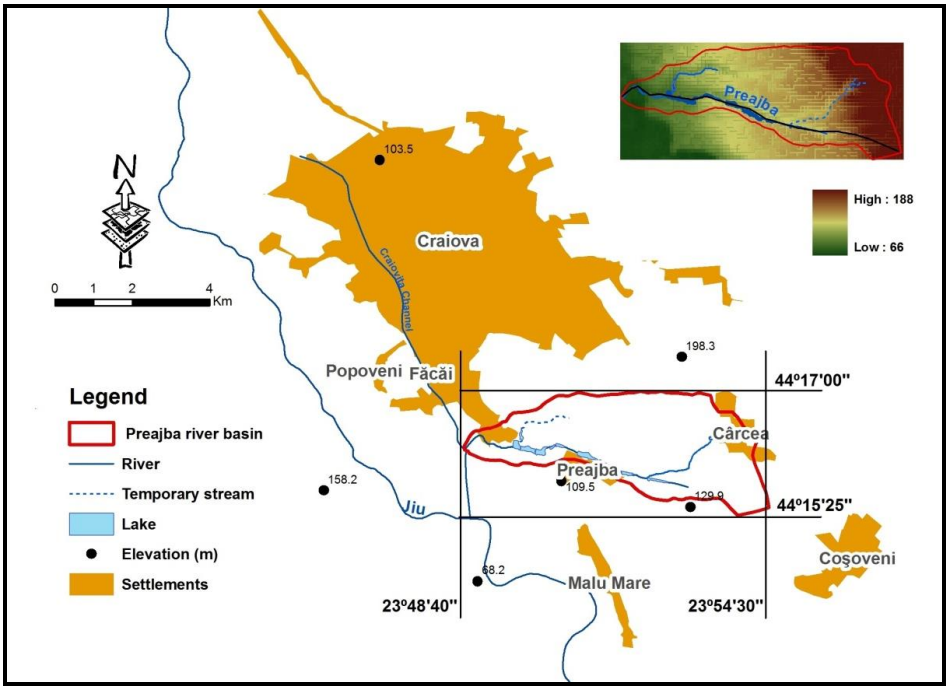


Figure 1. The study area and its features: location and hypsometry

The Convention on Biological Diversity defines the natural protected areas as being "terrestrial or marine areas specifically dedicated to the protection or the maintenance of biological diversity and of natural and cultural resources associated with them and administered by lawful means or other effective means". This status is one of the most frequently used means for preserving biological diversity.

Since both the lake biotope and its biohydrocoenosis make up a single whole, the lakes represent the most typical systems in nature (Gâştescu, 2009).

According to the project *The educational-ecological measures and dissemination of information about protected areas on the Preajba-Făcăi Lacustrine Complex*, the species for which it have been declared a Natural Protected Area are the following: *Ciconia ciconia* (White stork)*; Anas platyrhynchos* (Mallard)*; Aythya ferina* (Common pochard)*; Anser anser*

*(*Greylag goose)*; Fulica atra* (Eurasian coot); *Neomys anomalus* (Mediterranean water shrew); *Natrix tessellata* (Dice snake); *Lacerta viridis* (European green lizard); *Gobio kessleri* (Kessler's gudgeon); *Umbrat krameri* (European mudminnow).

In session 2/2010, the Minister for the Environment and Forests awarded the custody of the Natural Protected Area "The Lacustrine System of Preajba-Făcăi" to AVPS (Asociația Vânătorilor și Pescarilor Sportivi - The Association of Hunters and Fishermen) Diana Dolj, according to the custody convention no. 137/30.06.2010.

The current appearance of the Lacustrine System of Preajba-Făcăi is the result of both the human impact and the unusual behaviour of the lakes in lowlands, where the water sources are fewer, but characterised by a greater flow, being directly proportional to the infiltration caused by the sandy riverbed (Gâștescu, 1971).

In 2002, Cioboiu& Brezeanu remembered that the Preajba Valley Lakes may be used for both pisciculture and entertainment purposes. At the moment, *most of the lakes are invaded by paludous and aquatic macrophites, which is a feature of the eutrophic ecosystems* (Goga, 2009).

The aim of this article is that of highlighting the spatial-temporal evolution of the Lakes situated along the Preajba Valley, having regard to the cartographic documents from the 20th century. The symbiotic relationship between the natural and the man-made environment, between the habitat protection, the sustainable development and the area features is aimed to be analysed on the basis of recent ortophotoplans (2009) which are verified by field observations.

2. MATERIALS AND METHODS

In order to obtain the evolution results and the spatial reflection of the Preajba Valley Lakes, we used a series of cartographic documents (Tab.1): General Austrian Map of the Central Europe, Scale 1:200,000 (1910); Military Topographic Map, Scale 1:20,000 (1959); Soviet Military Topographic Map, Scale (1:50,000) (1970); Topographic Maps, Scale 1:25,000 (1975), Scale 1:50,000 (1991), Ortophotoplans (2009) and Google Earth PRO (2014).

Therefore, for the analysis of the fundamental landscape transformations within the Preajba Valley, a GIS database was realised concerning: the Preajba River, its tributaries, the temporary watercourse, the lakes and the settlements. The use of cartographic documents (online open

source) consisted in processing the raster format and digitising the vector data by using the Arc GIS 9.3 software.

Table 1. Maps and GIS database structure

Source name	Scale	Years	Details	Type	Structure	Attribute
General Austrian Map	1:200,000	1910	41-44 Vidin 42-44 Slatina	Raster	Grid	Surface
Military Topographic Maps	1:20,000	1959	3041, 3042, 3141	Raster	Grid	Surface
Soviet Topographic Map	1:50,000	1970	L-34-144-B	Raster	Grid	Surface
Topographic Map	1:25,000	1975	L-34-144-B-b L-34-144-B-a	Raster	Grid	Surface
Topographic Map	1:50,000	1991	L-34-144-B	Raster	Grid	Surface
Ortophotoplans	1:5,000	2009	40-30 40-31 41-30 41-31	Raster	Grid	Surface
Google Earth PRO	eye alt 25201ft/ 7681.3m	2014 (21.12)	-	Raster	Grid	Surface

The Austrian map presents the topographic elements with the help of some discrete colours whose nuances ensure an easy switching from the lowlands to the constructed perimeters. As regards the study area, we may notice the Preajba River which is rendered in blue and the existence of a traffic artery linking the urban environment and the surrounding rural areas.

The Military Topographic Map represents the landforms by using points and lines, contour lines and ground elevation, while the existing lakes are not rendered chromatically. They are rendered by hatchings and the entire hydrographic network (permanent and temporary watercourses) is highlighted and defined (Preajba River and Fântâniței Valley, Cârcea, Ciutura Popii and Bătrâna Valley).

As far as the Sovietic Topographic Map is concerned, the chromatic and specific complexity starts from the elements of land and hydrography to the constructed area and land use categories. The hydrographic network of the Preajba basin is rendered in a simplified way, but it comprises major

elements such as the area of the existing springs and the lacustrine basins at the time. The analysis of this cartographic material was hampered by the use of the Slavonic alphabet for designating specific toponyms.

The Topographic Maps are characterised in the analysed cartographic documents by rendering all the chromatic categories according to the existing natural and anthropological elements, facilitating the vectorisation of the hydrographic network in the Preajba basin. The novel element is the representation of dikes in a transversal manner and the representation of the barrier lakes situated along the Preajba river as results of the hydro-technical constructions in the period 1976 to 1979.

The ortophotoplans (1:5,000) represent the most recent cartographic material used, made available at national level by ANCPI (Agenția Națională de Cadastru și Publicitate Imobiliară - The National Agency for Cadastre and Land Registration). The representation of the important elements (including differences of chromatic nuance) facilitates the correlation of aquatic units with the human pressure in the study area (constructed area and agricultural lands). The working method consisted in overlapping the limit of the Preajba river basin (Map 1:25.000, 1970) in cartographic representations from 20th and 21s centuries.

3.RESULTS AND DISCUSSIONS

The use of the above-mentioned cartographic documents reveals differences at the level of the following categories: springs area, watercourses length and status (temporary and permanent) and number and surface of the lacustrine basins located in the Preajba hydrographic network. The establishment of the vector database began by using the Austrian map (1910) and drawing separately the watercourse of Preajba (Fig. 2).

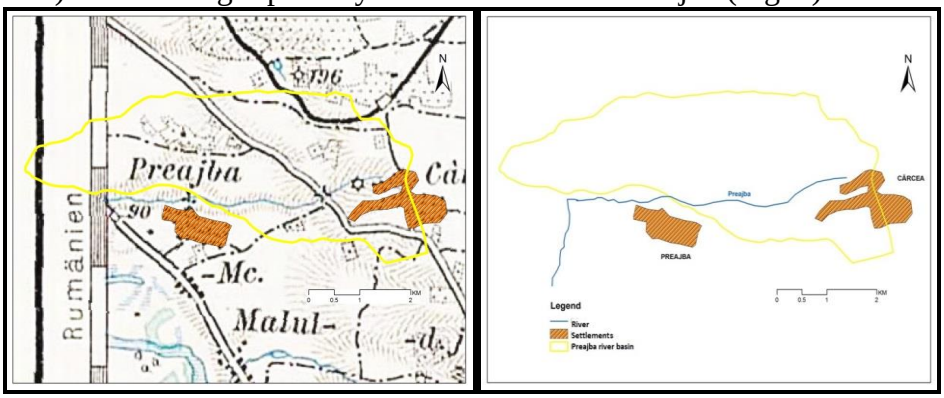


Figure 2. The Preajba hydrographic basin on General Austrian Map of the Central Europe (1:200,000 - 1910)

The separate drawing of the hydrographic network by using the Military Topographic Map highlights a greater density of the watercourses (including the mapping of the temporary watercourses) and their names (Fig. 3). The area of the Preajba river springs is identified due to the existence of Fântâniței Valley. At the same time, the permanent hydrographic network is supplemented by the two tributaries situated on the right side: Cârcea and Bătrâna Valleys.

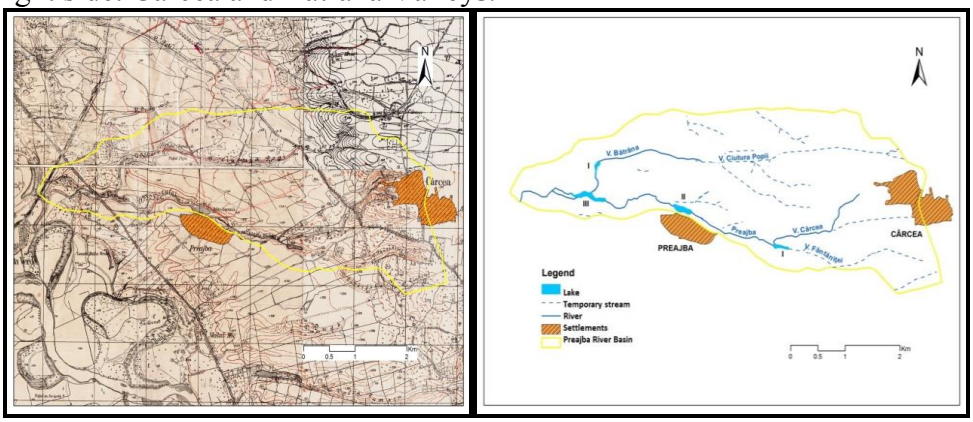


Figure 3. The Preajba hydrographic basin on Military Topographic Map (1:20,000 - 1959)

On the map from 1959 there were identified three lakes along the Preajba river with surfaces no smaller than 2.96 ha and no larger than 14.45 ha, and one single lake, namely Bătrâna Valley, along the Preajba tributaries, having a surface much smaller than 1.19 ha (Tab. 2).

Table 2. The lakes inventory on Military Topographic Map

The Preajba river	
Lake number	**Surface (ha)**
I	14.45
II	2.96
III	4.42
Tributary (Bătrâna Valley)	
I	1.19
Total: 23.02 ha	

On the Soviet Military Topographic Map the watercourses were mapped in only two nameless rivers with initially temporary character, while the number of the lacustrine basins located along the Preajba River

has risen (Fig. 4). The surface of the four lakes is rendered in table 3, with a maximum value of 6.34 ha. Compared to the previous cartographic document, we notice a westward disposition of the lakes, the first one being drawn in front of the Preajba locality. A particular feature is represented by the development of the existing constructed surfaces (for instance, north of Cârcea village) and the appearance of a new village, Făcăi.

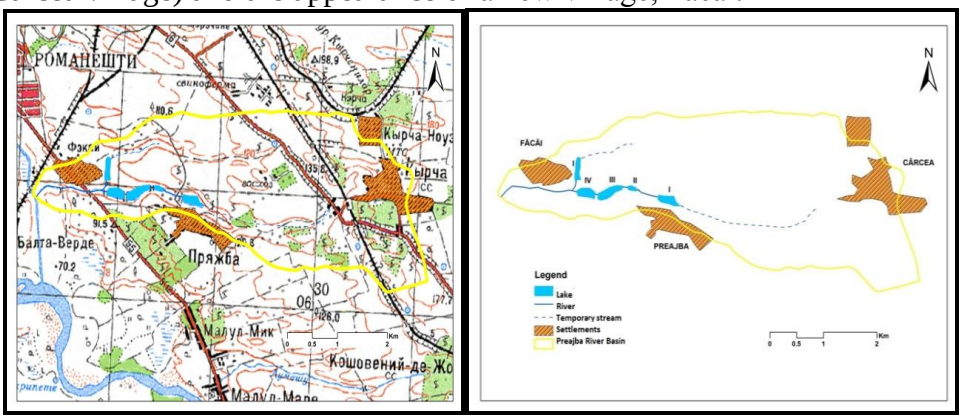


Figure 4. The Preajba hydrographic basin on Soviet Military Topographic Map (1:50,000 - 1970)

As regards the variations of the lacustrine surface, we notice, at the level of the hydrographic basin, an involution (20.22 ha), tendency which is also typical to the Preajba Valley, while, at tributary level, an observable extension of up to 3.50 ha is recorded (Tab. 3).

Table 3. The lakes inventory on Military Topographic Map

The Preajba river	
Lake number	**Surface (ha)**
I	4.70
II	1.19
III	6.34
IV	4.49
Tributary	
I	3.50
Total: 20.22 ha	

The identification of eleven lakes situated along the Preajba river and of two lakes located along its tributaries on the Topographic Map, 1:25,000, confirms the begining period of hydrotechnical constructions in Romania since the 1970s (Fig. 5). Another distinguishable situation is that

of the extension of the surface constructed inside the hydrographic basin (Făcăi and Cârcea settlements) as a social answer to the land acquisition and the promotion of the Preajba Valley from the touristic point of view. With the increasing number of lakes, their surface has also increased. Thus, the largest lake situated along the Preajba river has a surface of 5.87 ha (lake V), while the lake having the smallest surface, namely 0.76 ha, is the lake VIII (Tab. 4). At the level of the hydrographic network we may notice the reappearance of the springs areas of the Preajba river, Cârcea Valley and Buduroaia Valley (called before Valea Bătrână - The Old Valley).

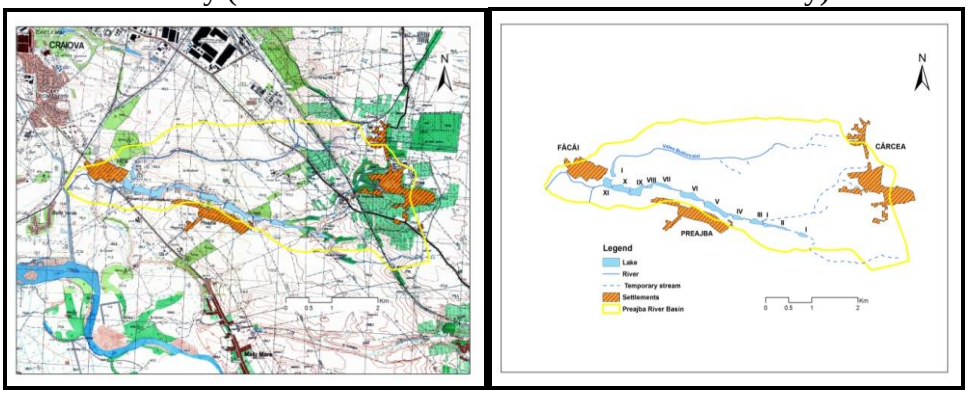


Figure 5. The Preajba hydrographic basin on Topographic Map (1:25,000 - 1975)

Table 4. The lakes inventory on Topographic Map, Scale 1:25,000

The Preajba river	
Lake number	**Surface (ha)**
I	1.16
II	2.20
III	2.14
IV	1.36
V	5.87
VI	4.69
VII	2.12
VIII	0.76
IX	4.36
X	4.32
XI	3.12
Tributary (Buduroaia Valley)	
I	1.83
Tributary	

I	0.31
Total: 34.24 ha	

According to the Topographic Map, 1:50,000, we notice the existence, in the Preajba hydrographic basin, of eleven lakes, two of which having a particular status (Fig. 6). The lake situated along the upstream tributary does not modify its position or surface (0,31 ha). A special attention must be paid to the lake X cartographically represented along both the river of Preajba and its tributary Buduroaia, fact which determines an extension of the aquatic surface up to 6.02 ha. Compared to the above-analysed maps, we must mention that this lacustrine basin actually corresponds to two different aquatic units. As regards the constructed surfaces, there is still a tendency of extension, fact which leads, in the case of Cârcea locality and the homonymous Valley, to a reduction of the springs area and its moving to the south-west.

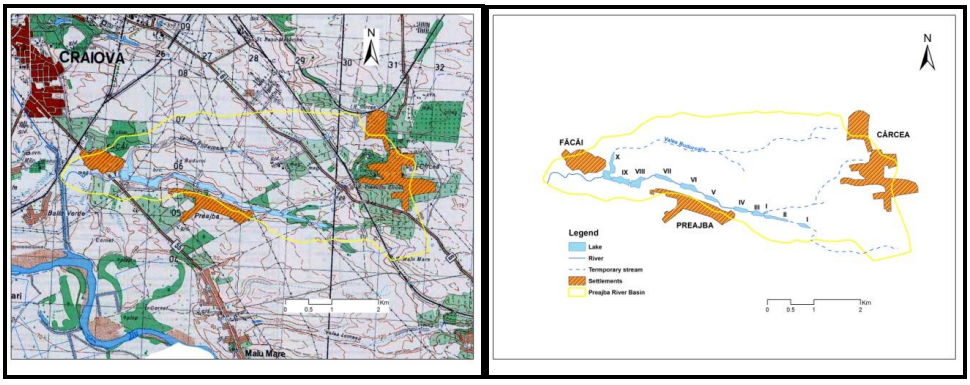


Figure 6. The Preajba hydrographic basin on Topographic Map (1:50,000 - 1991)

Individually analysed, the aquatic surfaces have increased by approximately 0.1 ha and by more than 3 ha in the case of four lakes (Lake VI – 3.56 ha; Lake VIII – 4.02 ha; Lake IX – 4.09; Lake X – 6.02) (Tab. 5).

Table 5. The lakes inventory on Topographic Map, Scale 1:50,000

The Preajba river	
Lake number	**Surface (ha)**
I	1.25
II	2.33
III	1.96
IV	2.17

V	1.81
VI	3.56
VII	2.56
VIII	4.02
IX	4.09
X	6.02
Tributary (Buduroaia Valley)	
I	0.31
Total: 30.08 ha	

After analysing the recent cartographic documents, we have noticed substantial modifications at the level of all the elements taken into consideration within the framework of this study (Fig. 7). Thus, the old Valley of Cârcea remains the only water source (springs and watercourses) for the lakes situated along the Preajba Valley. We notice as well the disappearance of Buduroaia Valley, the lake X being the only witness of its existence. Following the field observations, this lake has a limnocrene spring. This two aspects make possible the classification of the lake X as a unit of the Preajba Valley. There is a continuing observable tendency of extension regarding constructed surfaces, the limit between Preajba and Făcăi localities being extremely fragile.

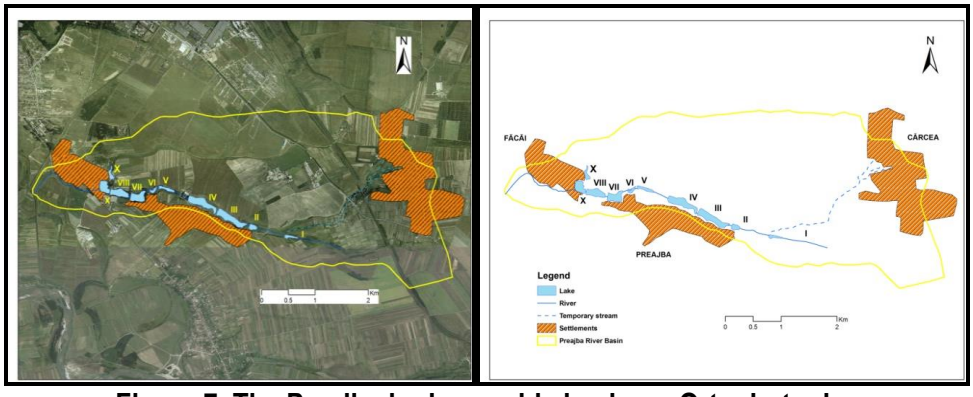


Figure 7. The Preajba hydrographic basin on Ortophotoplans (1:5,000 - 2009)

Compared to the previous cartographic document (Topographic Map – 1:50,000), we notice differences concerning the numbering of the lakes caused by the disappearance of two lacustrine basins (Lake I and Lake III on Topographic Map); consequently, Lake II becomes Lake I and Lake V

becomes Lake III. After the vectorisation on the ortophotoplans, the lake with the maximum extension is the lake number III with a surface of 6.09 ha, followed by the lake IV with a surface of 5.95 ha (Tab. 6).

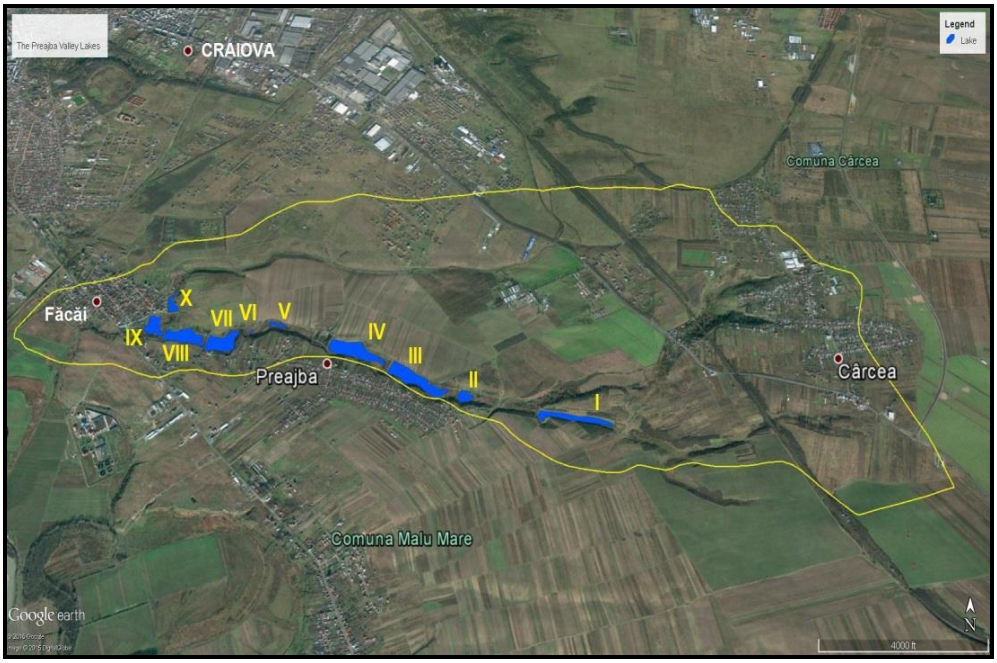
The smallest surfaces of the lakes situated along the Preajba Valley have 0.66 ha (Lake VI), 0.94 ha (Lake I) and 1.14 ha (Lake X).

At the same time, the existence of this lakes is being jeopardised by the development of the hygrophile vegetation and by the obstruction of the lake tail, which is noticeable in the chromatic nuances of ortophotoplans and verified by field observations.

Table 6. The lakes inventory on Ortophotoplans

The Preajba river	
Lake number	**Surface (ha)**
I	0.94
II	1.22
III	6.09
IV	5.95
V	1.39
VI	0.66
VII	3.78
VIII	3.76
IX	3.13
X	1.14
Total: 28.06 ha	

The use of the digital interactive map of Google Earth software (property of Google society), the professional version allowed us to visualize the recent study area by using aerial and satellite photos (imagery date – 21.12.2014; eye alt. 25201feet/7681.3 meters) (Fig.8). In this software we used the function "Polygon" for the delineation of the Preajba Valley lakes and measurements of perimeter and surface were carried out automatically.



a

b

c

Figure 8. The Preajba hydrographic basin – Google Earth PRO view (a); Lake VI (b, c)

As far as the lake surface is concerned (Tab. 7), we notice a significant increase from 1.16 ha (Ortophotoplans) to 2.95 ha in the case of the Lake I, as a result of its concession and redevelopment for the purpose of recreational fishing (inaugurated on 14 August 2010 and being called the Pond of Cârcea - http://www.gds.ro). The lakes having the largest surfaces remain the lake III (5.36 ha) and IV (4.82 ha). By contrast, we mention the lakes V (0.036 ha) and VI (0.38), each of them having a water surface smaller than 0.5 ha (Fig. 8).

Table 7. The lakes inventory on Google Earth PRO

The Preajba river	
Lake number	**Surface (ha)**
I	2.95
II	1.61
III	5.36
IV	4.82
V	0.38
VI	0.036
VII	3.63
VIII	3.58
IX	2.1
X	0.87
Total: 25.34 ha	

The above-mentioned situation is due to:

- the water source reduction which diminishes the springs number;
- the obstruction of the spillways with riverine inputs which causes a deficitary flow of the Preajba river between the lakes IV and V (Fig. 9), and the lakes VII and VIII;
- the altitude differences at the level of the lake dams which modifies the obstruction degree (poor oxygenation of water and vegetation development, Fig. 8); a big difference of altitude between the first lakes (Lake III and IV) favours the water source and flow, fact which determines the lacustrine surface increase. On the other hand, as regards the lakes V and VI, the surface is reduced as a consequence of the narrowed differences of altitude at the level of dams concerning the lakes IV and V within a distance of 290 meters (Fig. 10).

a b c

Figure 9. Spillway – Lake IV (a), Lake V (c); the Preajba River between the lake IV and V (b)

a

b

Figure 10. The Preajba river downstream lake IV (a) and water source Lake V (b)

The involution of the surface of the lakes situated along the Preajba Valley at temporal scale was graphically and statistically rendered by using GIS tools on the above-mentioned cartographic documents and it may be followed by comparing the surface values in table 8. For the analysed period, the largest extension of the lacustrine surface has 32.10 ha and it is due to the hydro-technical development of the Preajba Valley in the 1970s. Since then, the involution of the lacustrine surface is quite observable, currently having 25.34 ha.

Table 8 Lakes evolution (number and surface) according to the analysed cartographic documents

Cartographic data source	Number of lakes	Surface of the Preajba Valley Lakes (ha)
Military Topographic Map	Lakes on the Preajba river – 3 Lakes on tributary - 1	**21.83**
Soviet Military Topographic Map	Lakes on the Preajba river – 4 Lakes on tributary - 1	**16.72**
Topographic Map (1:25,000)	Lakes on the Preajba river - 11 Lakes on tributaries – 2	**32.10**
Topographic Map (1:50,000)	Lakes on the Preajba river - 10 Lakes on tributary - 1	**29.77**
Ortophotoplans	Lakes on the Preajba river - 10	**28.06**
Google Earth PRO	Lakes on the Preajba river - 10	**25.34**

On the basis of the results achieved, we have to provide the following elaborations concerning the use of the cartographic documents and the GIS tools in the study of the Preajba Valley lakes, methods which had both advantages and disadvantages, such as:

- effectiveness for an area assessment over an extended period of time;
- providing additional information to the observable evidence, by vectorisation and the generation of statistical date;
- possibility of free acquisition of the ancient cartographic documents which are already georeferenced with the help of open source sites;
- difficulties of vestorisation caused by projection, scale, representation which made the concerned elements subjective.

4.CONCLUSIONS

This article argues that historical maps are more than simple guideposts for exploration or testaments for surveying technology; they are valuable texts for exploring the historical, social and cultural processes in order to represent multiple and often conflicting sources of geographic data. The results of this research deepen the understanding of how social processes work to shape cartographic representation and provide a detailed cartographic history of an overlooked but important region of the South-Western Romania.

The study area shows an intensive dynamic. However, this evolution does not necessarily represent a progression, but rather a regression in the context of the disregard policy shown by local authorities. The achieved results anticipates an ecological threat for the Lacustrine System of Preajba-Făcăi and constitutes a warning for the regional decisional authorities.

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REFERENCES

Bilaşco, Ş., Lupoiu, I., Roşca, S., Vescan, I., Fodorean, I. 2014, Identification of suitable green areas for leisure and recreation planning, using Remote Sensing techniques and GIS spatial analysis. Case study: Zalău city, *Geographia Napocensis*, **VIII**(2), 23-33.

Breckle, S-W. & Geldyeva, G.V. 2011, Dynamics of the Aral Sea in Geological and Historical Times chapter in Aralkum - a Man-Made Desert, *Ecological Studies*, **218**, 13-35.

Cioboiu, O. & Brezeanu, Gh. 2002, Hydro-biological Particularities of some small Eutrophic Rezervoirs within the Hydrographical Basin of the Jiu, *Limnological Reports*, **34**, 275-287.

Cristea I.A. 2009, Aspects in the evolution of the hydrographical network from the Lower Siret Plain reflected in cartographic materials, *Georeview–Scientific Annals of Ştefan cel Mare University of Suceva, Geography Series*, 18:1, 45-60.

Curcan, Gh, Boengiu, S, Licurici, M. 2009, The Reconstitution of the Morphohydrographic Evolution of the Jiu – the Danube Confluence Area on the Basis of Cartographic Documents, pp. 246-256 in *The Third International Scientific, Conference – FMNS2009, Faculty of Mathematics and Natural Science, Blagoevgrad, Bulgaria, 3 – 7 iunie, 2009*, 441p.

Deus, D. & Gloaguen, R. 2013, Remote Sensing Analysis of Lake Dynamics in Semi-Arid Regions: Implication for Water Resource Management. Lake Manyara, East African Rift, Northern Tanzania, *Water*, **5**, 698-727.

Fodorean, F., Fodorean, I., Vescan, I., Bilaşco, S. 2013, Mapping archaeological sites using digital cartography. Roman settlements from Potaissa to Napoca, *Geographia Napocensis*, **VII**:2, 51-58.

Gâștescu P. 1971, *Lacurile din România. Limnologie Regională* [*The lakes of Romania. Regional limnology*], Edit. Academiei Române, Bucureşti, 360p. [in Romanian]

Gâștescu P. 2009, Limnology, lake basins, lake waters, *Lakes, reservoirs and ponds*, **3**:1, 7-12.

Goga, I.C. 2009, Basic data on the piscicultural communities from the hydrographic basin Preajba Valley, *Oltenia. Studies and Communication. Natural Sciences. Oltenia Museum*, **25**, 165-169.

Ionuș, O., Goga, C., Avram, M. 2014, Morphological and morphometric analysis of the Preajba Valley Lakes (Dolj county, Romania), *Lakes, reservoirs and ponds*, **8**:2, 68-81.

Harley, J.B. & Woodward, D. 1987, *The history of cartography*. Chicago, University of Chicago Press, 622p.

Huzui, A., Călin, I., Patru-Stupariu, I. 2011, Spatial pattern analyses of landscape using multi-temporal data sources, *Procedia Environmental Sciences*, **14**, 98-110.

Osaci-Costache, G. & Achim, F. 2008, Changes of the environmental components within the Danube floodplain (Mănăstirea-Călăraşi sector) reflected in the cartographic documents from 19^{th} – 20^{th} centuries, *Present Environment and Sustainable Development*, **2**, 301-309.

Radu, M. & Stoiculescu, R.C. 2010, Lanscape changes in Colentina river basin (between Bufte and the confluence with Dâmboviţa) reflected in cartographic documents (1971-2000), *Present Environment and Sustainable Development*, **4**, 299-301.

Radu, M., Gherasim, C., Huzui, A., Stoiculescu, R. 2013, The reflection of Orşova city's evolution in cartographic materials, *Present Environment and Sustainable Development*, **7**:2, 206-213.

Rus, I., Crăciunescu, V., Constantinescu, Şt., Ovejanu, I. 2010, Territorial development of Cluj-Napoca city (Romania) reflected in cartographic documents, *European Geosciences Union, Viena, 02-07 mai 2010*.

Shen, Fang, Kuang, Dingbo 2003, Remote Sensing Investigation and Survey of Qinghai Lake in the Past 25 Years, *Journal of Lake Sciences*, **15**:4, 289-296.

Taylor, D.R.F. 2009, A Cybercartographic Case Study of the Lake Huron Treaty Relationship Process, Geography and Environmental Studies, Carleton University.

Youngs, Y. 2011, Mapping an Enchanted Solitude: Cartographic Representations of Yellowstone National Park, *U.S.A. Conference Proceedings of the 25th International Cartographic Conference*.
*** Măsuri educativ-ecologice şi diseminarea informaţiilor despre ariile protejate privind complexul lacustru Preajba-Făcăi [The educational-ecological measures and dissemination of information about protected areas on the Preajba-Făcăi Lacustrine Complex. Measures to achieve a favourable conservation status], http://www.arealprotejat.ro/index.php. [in Romanian]
*** History of the Lake Chad Basin, Lake Chad Basin Commission, http://www.cblt.org/en/history-lake-chad-basin
***http://www.gds.ro/Actualitate/2010-08-16/Zona+de+agrement++la+Carcea/