



CONSIDERATIONS REGARDING THE INTEGRATED MANAGEMENT OF FRESHWATER LAKES IN TRANSYLVANIA PLAIN

Ioan FODOREAN

„Babeş-Bolyai” University
Cluj-Napoca, Romania
fioan@geografie.ubbcluj.ro

Abstract

Lakes appear under more forms and dimensions and include lots of features that constitute important advantages in defining them as a class of objects that need to be studied. They have very well defined limits and there are open systems that receive water, solar energy and chemical substances from outside the system. The foreign specialty literature provides special attention to the study of the lakes and the swampy fields of their neighbourhood, as well as to the numerous interactions that come out from the existence of these water units. In this purpose, proper paradigms of the study of aquatic systems have been drawn: the paradigm of lakes as microcosmos or integrated ecosystems, paradigm of lakes as experimental systems, paradigm of lakes as chronicles of natural history etc.

Keywords: Transylvanian Plain, sustainable development, SWOT analysis, lake basin

1. THE EVOLUTION OF THE NUMBER OF LAKES IN TRANSYLVANIA PLAIN, THE NECESSITY OF SUSTAINABLE MANAGEMENT, JUDICIAL FRAME

In which the lakes in Transylvania Plain are concerned, their statistical evolution closely reflects a certain manner of managing the lake areas, not necessarily the most proper one, having in mind the large extension of these surfaces in the past and the number of lakes at present.

The oldest cartographic document presenting details about the extension of the lakes in Transylvania Plain is the map of A. von Wenzely and F. A. Schraembl, which appeared in 1789 and was published by T. Morariu in 1958 and afterwards by Al. Săndulache. According to these authors and their writings, we may conclude that, on Fizeş Valley, starting with the springs' areas, a continuous lacustrine system is formed in

between Cămărașu de Câmpie and the confluence of Diviciori River with Fizeș River, down Sântioana on a distance of 35 km. On Luduș Valley there is an array of lakes on a distance of almost 50 km. On the main tributaries there are four lakes on Frăței Valley, five on Silivașului Valley and three on Lunga Valley. In Comlod Basin there are seven lakes, on Bolduțului Valley there are four lakes, five in Gădălinului Basin, and on Dipșa Valley there are eleven of them. And yet, the lake of Pogăcea Valley has not been signalled anywhere.

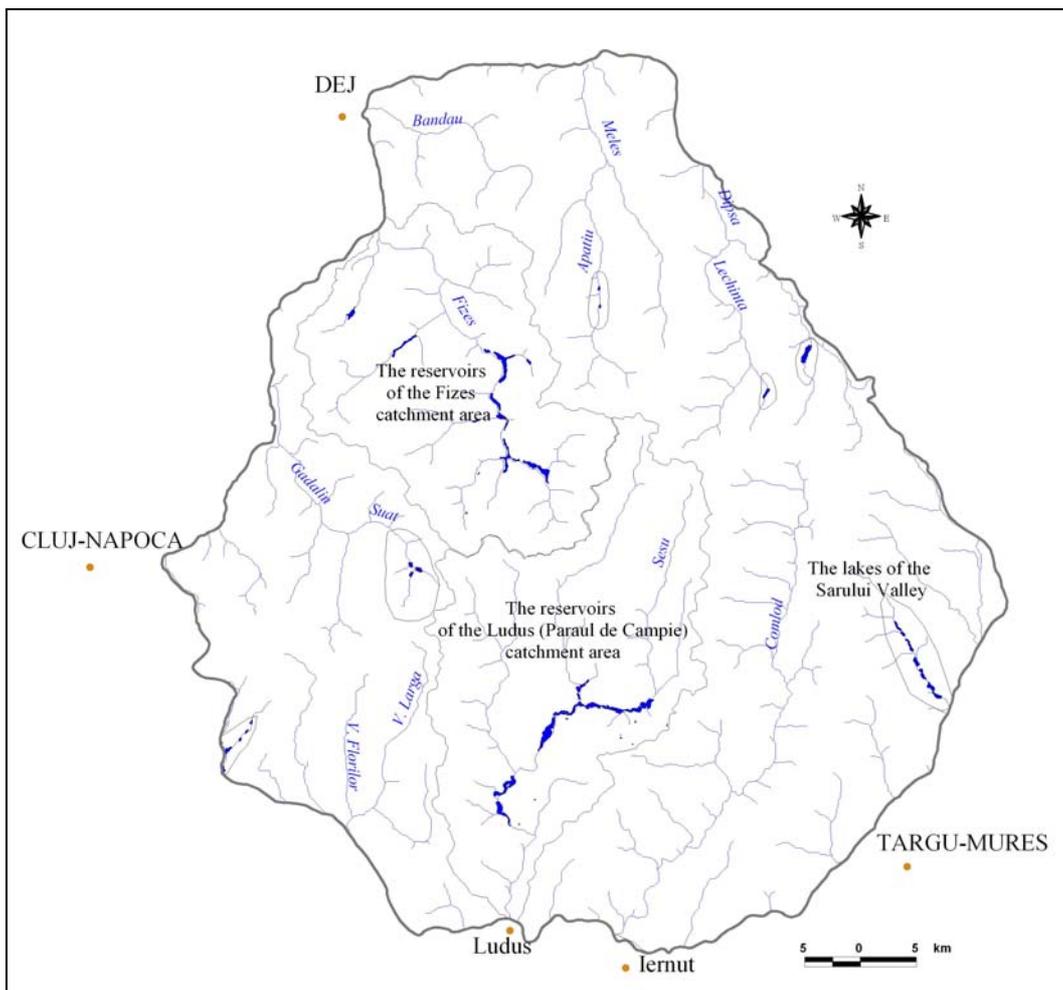


Fig. 1. The present distribution of the lakes in the Transylvanian Plain.

On another cartographic document from 1862, these lakes are very well displayed as defined units, even though their number is a lot smaller than on the previous map. In the North - Eastern part of the Plain, on Dipșa Valley, there is no lake anymore and the same happens to Meleşului Basin; moreover, Știucii Lake is not anymore represented, despite

the fact that it is one of the biggest and deepest lakes in this area. Over a period of 73 years, period in which these two graphical representations were made, it seems that some of the lakes were naturally or artificially drained, their traces still being visible nowadays. Later on, in 1908, Sztripszki's paper, dealing with fishing practices in Ardeal, was published. This document illustrates the history of the development of the lakes in Transylvania Plain. Based on the documents that he consulted, the author established that there were about 250 lakes in Transylvania Plain, out of which only 20 could still be visible in 1908. From this author's point of view, the main usage of the lakes was for milling, and, only secondary, for fishing. The author considers that the large number of lakes in the past may have been a result of the religious habit of the Catholics of having ember days, when they were allowed to eat fish, yet, since the spreading of reformed religion about 40 monasteries have been closed, and their almost 200 fishing lakes have disappeared, too. This explains why in 1908 the number of these lakes was a lot smaller.

Furthermore, in 1908 K. Erödi publishes a map that illustrates the territorial spreading of the lacustrine surfaces in Transylvania Plain, where the number of lakes is smaller than on the previous maps.

In Someşu Mic basin there is only one lake, at Suatu, in Fizeş basin there were only the lakes that have already been individualized and may be seen today, as well, and in Luduş basin the author only mentions the lakes of Miheş and Zau, and the author does not mention Tăureni Lake, anymore.

It seems that the author may have been right in which the repartition of lakes is concerned, if we judge by a map from the end of the 19th century, on which we may easily notice the relatively small number of lakes on Pârâul de Câmpie River.

Regarding the distribution of the lakes at present (fig. 1), it follows the information presented in the table below:

Table 1. The distribution of the lakes.

No.	Name	Position
1.	Ştiucii	Hosu V., left tributary of Fizeş River, nearby Săcălaia locality
2.	Pogăceaua	Interflow between Sărăturii V., right tributary of Comlodului and Bologa rivers
3.	Archiud	Close to homonym localities
4.	Dătăşeni	Close to Mureş river, between Luduş and Lechinţa
5.	Sântejude I	V. Sicu, left tributary of Fizeşului upstream Sântejude Vale locality
6.	Sântejude II	V. Sicu, left tributary of Fizeşului upstream Sântejude Vale locality
7.	Borzaş	V. Sicu, left tributary of Fizeşului upstream Sântejude Vale locality
8.	Ţaga Mică I	Fizeşului V., near Ţaga locality
9.	Ţaga Mare	Fizeşului V., between Ţaga and Sucutard
10.	Sucutard II	Fizeşului V.
11.	Sucutard I	Fizeşului V., downstream Lacu commune
12.	Geaca III	Fizeşului V.
13.	Geaca II	Fizeşului V.
14.	Geaca I	Fizeşului V., in SW of commune on Mociului V.
15.	Roşieni	Ciortuşului V., when interflows Mociu and Fizeş rivers
16.	Sf. Florian	Fizeşului V.

17.	Tăul Popii	Fizeşului V.
18.	Cătina	Fizeşului V., where Fizeş interflows Cătina
19.	Miheş II	Luduşului V.
20.	Răzoare	Luduşului, V. where Velcheriu interflows Părăul de Câmpie
21.	Miheş I	Luduşului V., where Şesului V. interflows Luduşului V.
22.	Miheş III	The confluence of Şesului V. (Bologa) with Luduşului V.
23.	Văleni	Şesului V. (Bologa), left tributary of Luduşului V.
24.	Şăulia I-IV	Şesului V. (Bologa), left tributary of Luduşului V.
25.	Bujor II	Luduşului V.
26.	Bujor I	Luduşului V.
27.	Zau de Câmpie	Luduşului V.
28.	Tăureni IV	Luduşului V., between the interflow with Morii V. and that with Corabia, both right tributaries
29.	Tăureni II	Luduşului V., between the interflow with Morii V. and that with Corabia, both right tributaries
30.	Tăureni III	Luduşului V., between the interflow with Morii V. and that with Corabia, both right tributaries
31.	Tăureni I	Luduşului V., between the interflow with Morii V. and that with Corabia, both right tributaries
32.	Sânger	Luduşului V., between the interflow with Morii V. and that with Corabia, both right tributaries
33.	Fărăgău	Şarului V., sit. at the interflow with Mureşul nearby Glodeni locality
34.	Ercea	Şarului V., sit. at the interflow with Mureşul nearby Glodeni locality
35.	Toldal	Şarului V., sit. at the interflow with Mureşul nearby Glodeni locality
36.	Păingeni II	Şarului V., sit. at the interflow with Mureşul nearby Glodeni locality
37.	Păingeni I	Şarului V., sit. at the interflow with Mureşul nearby Glodeni locality
38.	Glodeni II	Şarului V., sit. at the interflow with Mureşul nearby Glodeni locality
39.	Glodeni I	Şarului V., sit. at the interflow with Mureşul nearby Glodeni locality
40.	Tăul Ceanului	Caldă Mare V., downstream the interflow with Cheiţa
41.	Beclean	Caldă Mare V.
42.	Fâneţa Vacilor	Caldă Mare V., at the confluence of Caldă Mare V. with Vacilor V.
44.	Turda	Caldă Mare V.
45.	Mărtineşti	Racilor V.

It may be noticed that the number of lakes in Transylvania Plain is, even nowadays, rather large, the most important element being represented by the large extension of water surfaces, reason enough for the implementation of a new project for a sustainable management of these lakes.

During time, local authorities had many initiatives and preoccupations in this respect. The area that is insisted upon is Fizeş hydrographical basin, even if the aspects approached are not completely focused on the lacustrine surfaces, but also on the flora and fauna aspects. A remarkable thing here is the project for the above mentioned area controlled by the Environment Protection Inspectorate of Cluj-Napoca Municipality, which will be financed by the European Union with 450.000 Euro, and, much more, it could be the only one of this kind in Romania. This project refers to the establishing of a functional ecological network in the centre of Transylvania Plain and its main purposes will be the preservation of the most valuable flora and fauna species in Fizeş hydrographical basin, on

a 40.000 hectares surface. Up to the present time, some other zones in the area have been in the attention of researchers, and, as a result, they have become natural reservations, such as:

The Botanic Reservation of Suatu. It is situated at a 26 km distance from Cluj-Napoca Municipality, on a surface of 4 hectares, where we can find real botanic treasures that have been subjects of studies for researchers since 1911.

The Ştiucii Lake Reservation. The vegetation that surrounds the lake makes possible the existence of the necessary conditions for the development of a rich flora and fauna, at the same time offering a resting place for migratory birds.

The "Legii Lake and Valley" Ornithic Reservation. It is situated in the upper basin of Fizeş River, and it was declared a natural monument in 1967. Its 45 hectares surface adds in numerous marshlands covered with reed.

The Peony Reservation from Zau de Câmpie. Situated in the middle basin of Pârâul de Câmpie River, this reservation lays on a small surface of land, the steppe peony (*Paeonia tenuifolia*) being found here. This is the only place in Transylvania where this plant grows, at the Western limit of its spreading area.

So as to solve the numerous current problems in the management of the protected areas, it is absolutely necessary to apply the following protection actions:

- marking the field, by setting boundary stones, so as to delimit the protected areas;
- enclosing or fencing all the areas that represent botanic and zoological natural reservations;
- improving the security of these areas and of the scientific reservations, as well;
- posting some indicators to each and every protected objective, on which, the name and type of the objective and also the misbehaviours punishable by law through penal intercourse, to be written down;
- supporting, even financially, the periodical or permanent actions of supervising and checking made by the nongovernmental institutions.

The lacustrine areas, especially those nearby marshlands, have lately constituted areas of interest for the governments of numerous countries, which adopted and signed the Ramsar Convention on February, 2nd, 1971, amended later by the Paris Protocol in December, 3rd, 1982. Romania adhered to this convention and it was set the Law No 5 in January, 25th, 1991, referring to the Convention of the humid areas, of international importance, as a habitat for the aquatic birds.

Basically, this convention represents a first judicial measure having the character of a sustainable management of humid areas, which are recognized as being a resource of great economic, natural, scientific and recreational value, for which reason their disappearance would be disastrous.

Besides this, this convention considers the aquatic migratory birds as an international resource. At present, as far as we know, the only humid area in Romania

indicated by authorities when signing the convention (because it was compulsory to mention at least an area), would be the Danube Delta.

We consider it as a first proposal concerning the sustainable management of the lakes in Transylvania Plain to include the middle basin of Fizeş River into this humid protected area category, having the fact that, as we mentioned before, in this sector there are many reservations, most of them about flora and fauna.

2. THE EVOLUTION OF SOME IMPORTANT PARAMETERS OF FRESHWATER LAKES IN TRANSYLVANIA PLAIN AND PROPOSALS FOR SUSTAINABLE MANAGEMENT

Even from the beginning, there must be mentioned that, approaching the aspects of a sustainable management of the lakes as specific individualities, is very difficult even without referring to the aspects of the other physical-geographical and socio-economic elements. We consider that sustainable management has to take into consideration a few coordinates of great importance:

- the aspects of sedimentation (deposition of soil particles) of the lakes, including the issue of the presence of vegetation on the lake's surface;
- the process of eutrophication of the lakes;
- the sources of pollution of the lakes;
- the fish breeding practices.

The deposition process. When we discuss about the lakes in view, the problem of deposition maintains itself on a very special place, because the manner and duration of functioning and existence of lakes depend on it. Because the deposition of the lakes determines a decrease in their utility and capacity of attenuation and their period of functioning, as well, some studies and proper measures for reducing the intensity of this process are necessary.

The aim of researches with a view to the process of deposition of the freshwater lakes has, as main objectives, the setting up of some preventive measures for attenuating the deposition of these lakes, so that their period of functioning would last longer in the projected parameters and, in the worst case, for the cleaning out of deposits on the lake beds, which would be very expensive.

Fish farming is the main activity practiced on the lakes in Transylvania Plain for which reason we considered necessary to decide, on the basis of the existent data, if the perspective of using the lakes with the aim of fishing is a real and practical one. For this, we took into consideration the fish farming volume, the most important morphometric element, and the data about deposition, this characteristic volume, which are listed in the table 2.

Table 2. The annual average level and rhythm of deposition the fish farming volume of the main lakes in Transylvania Plain.

No.	Name of the lake	Period of analysis	The fish farming volume			
			The process of deposition		The Average Annual Rhythm	
			mil. m ³	(%)	mil. m ³	(%)
1.	Borzaş	1971-1999	0,016	16,42	0,0005	0,61
2.	Sântejude	1971-1999	0,053	16,06	0,002	0,59
3.	Sucutard II	1962-1997	0,444	73,03	0,013	2,09
4.	Sucutard I	1971-1997	0,286	95,33	0,011	3,67
5.	Geaca III	1971-1997	0,137	80,59	0,005	3,10
6.	Geaca II	1962-1997	0,137	85,63	0,004	2,45
7.	Geaca I	1962-1997	0,184	76,03	0,005	2,17
8.	Tăul Popii	1962-1997	0,089	30,69	0,003	0,88
9.	Cătina	1962-1997	0,322	46,67	0,009	1,33
10.	Miheş I	1971-1998	0,029	32,58	0,0011	1,21
11.	Miheş II	1971-1998	0,011	26,83	0,0004	0,99
12.	Miheş III	1971-1998	0,014	23,33	0,0005	0,86
13.	Bujor I	1962-1998	0,025	19,53	0,0007	0,54
14.	Bujor II	1962-1998	0,019	32,76	0,0005	0,91
15.	Zau de Câmpie	1962-1998	0,148	7,79	0,0041	0,22

And, in what the extension of the hygrophilous vegetation concerns, the most severe problems appear mainly on the same lakes, even if large percents of the vegetation that covers their surface appears on other lakes, as well, but disposing of a much larger surface (table 3).

Table 3. The extension of the hygrophilous vegetation of the lakes in the upper basin of Fizeş River (Sorocovschi, Şerban, Rus, 1998).

No.	Lake	The level of water when measuring (m)	Surface (ha)		
			Total	Invaded	(%)
1.	Cătina	293,40	56,0	1,95	3,48
2.	Tăul Popii	-	-	-	-
3.	Sf. Florian	291,30	9,4	1,825	19,41
4.	Roşieni	0	20,64	5,278	25,57
5.	Geaca I	291,15	26,15	2,137	8,17
6.	Geaca II	289,71	16,25	3,25	20,00
7.	Geaca III	288,77	10,409	0,67	6,44
8.	Sucutard I	287,27	25,85	3,9	15,09
9.	Sucutard II	286,0	41,3	0,5	1,21
10.	Țaga Mare	-	104,21	15,62	14,98

Even though the other lacustrine surfaces are not so much accumulated in, the simple fact of a certain current process of deposition would represent a passive attitude. The sustainable management presupposes the necessity of controlling and an active stepping into the action of this process. Its proportion and rhythm could be influenced by acting upon the main factors that contribute to the deposition of the lakes in the studied area. Thus, two types of measures are individualized here: the preventive and the curative ones, of which preferably would be the first ones, because it is a lot easier to act upon the causes and not upon the effects (Giurma, 1997).

The preventive measures deal with the causes and they may be established if someone takes into consideration the three stages of the deposition process:

- measures for the derivation place and their aim is to reduce the process of soil erosion in the entire reception basin, as for surface erosion, and also for in-depth erosion;
- measures for the transportation area, through works for protecting the lake beds, on the sides;
- measures for a depositing place, through maintaining a sufficient volume for deposition (if possible the retaining of the alluvia take place in other basins than the useful accumulation).

The curative measures look upon the effects and consist in taking off the deposits in the accumulations and these help clean out the lake beds, but usually they are difficult to be applied to, and some of them very expensive so that they come to overpay the price of a new accumulation.

The process of eutrophication. This process represents the damaging raising of the nutrients in the lakes and in our century this represents one of the major problems of the fresh water and one of the main objectives set by sustainable management of the lakes.

Among the typical symptoms, found especially on some lakes in Fizeş basin, include the continuously growing weed and organic microphyte, associated with issues like taste, smell and even toxicity, diminishing the oxygen in the in-depth layers of the lake and losing some of the fish and invertebrates species.

The causes of this process are multiple and not singular. Nevertheless, in many other studies abroad, this problem has still not been solved. There are many examples even in the specialty literature that explain this process of eutrophication, even though in many situations it is very carefully observed, it still affects the important lacustrine surfaces, for example the Great American Lakes or the lakes in Scandinavia (*The USA National Academy of Science, 1996*).

The density of the households around the lakes – an important source of water's impurity. Transylvania Plain is one of the largest areas considered as deprived areas in the North-West Region and not due to the lack of physical and geographical resources but due to some socio-economic aspects about the lack of the current water, sewerage system, the predominance of the rural population and others. These aspects also affect the lacustrine

systems, especially Fizeş basin, in which some of the lakes are directly affected by their closeness to the nearby households (figure 2), which involuntarily overflow a large quantity of organic substances into the water of the lakes.

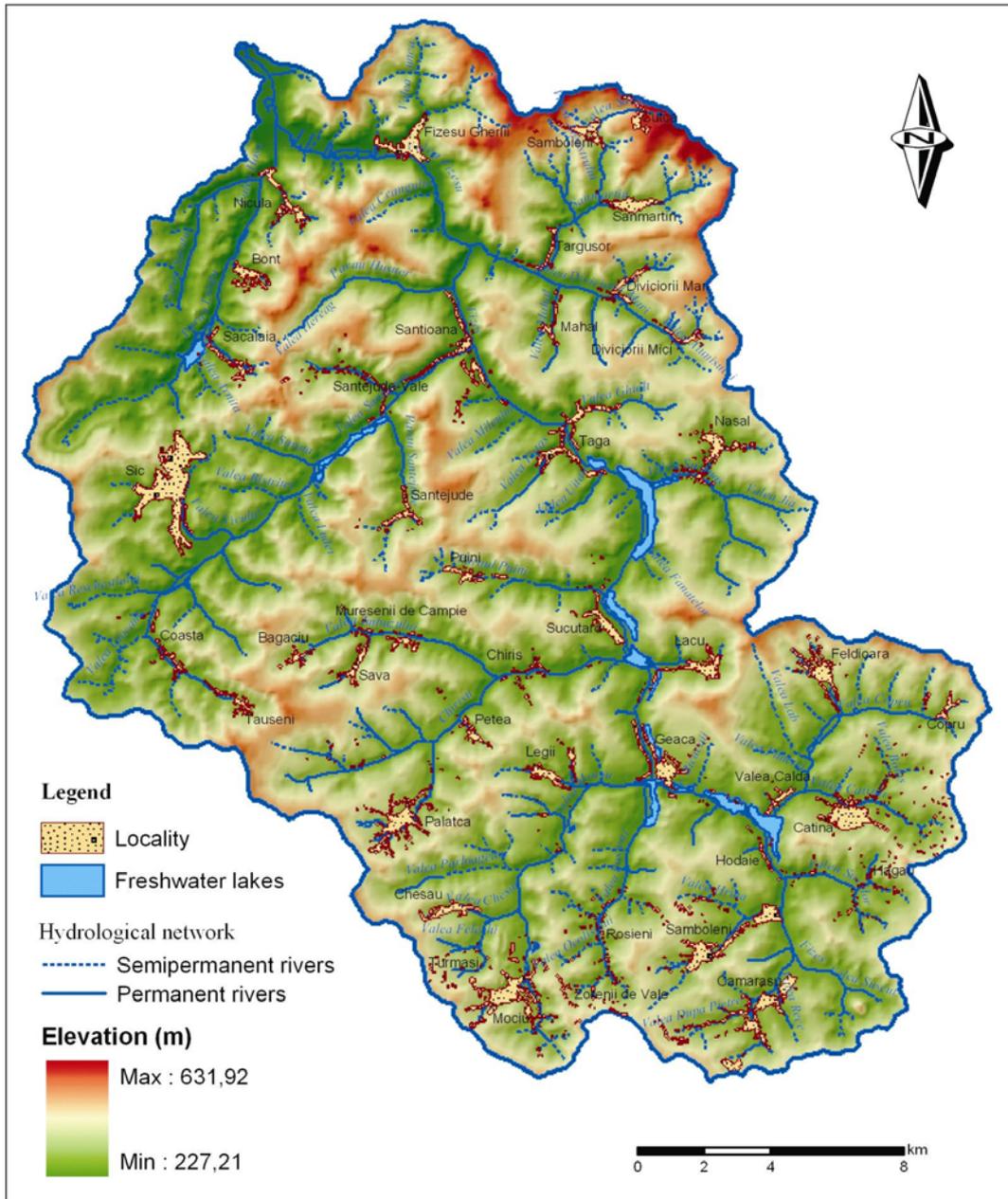


Fig. 2. Critical areas resulted from setting the population households in the immediate neighbourhood of the lakes in Fizeş basin.

In the middle basin of Fizeş River we may find the most serious problem that primarily affects Sucutard II, Geaca III, Geaca II and Geaca I lakes, situation in which the settlements are linearly shaped, alongside the lakes.

We also consider that, in such a case, some measures for eliminating these aspects would be necessary and that would also depend on many decisional factors.

However, this wrong management has immediate consequences on fish production and fishing process, fact which is emphasized by the decreasing number of fishermen in the Geaca I lake area and by choosing some sectors up the river to practice this sport.

Fishing and the organizational system of fish production. As for the aspect of the organized fish farming, it may be divided into four characteristic periods.

The first period corresponds the phase up to 1950, when the surface set up for fish farming was only 270, 2 ha large, where Zau de Câmpie, Bujor I, Tăureni, Țaga Mare lakes were added into. The years between 1951 and 1960 are supposed to form the second period of development of the fish farming in the plain, during these years being established a surface of 168, 2 ha, only for Cătina, Tău Popii, Geaca II și Sucutard II lakes.

The third period corresponds to the years between 1961 and 1970 when the fish farming surface grew with 335, 9, meanwhile Zau de Câmpie Lake was modernized and the lakes of Șăulia, Miheșu de Câmpie, Bujor II, and Tăureni were established. During the fourth period, which starts in 1971, the fish farming is affiliated to two major plain valleys of the rivers (Fizeş and Pârâul de Câmpie) by modernizing other lakes.

At the same time, fish farming practices shift towards other new hydrographical basins, like Iernut, Glodeni and Fărăgău lakes on Noroiașu Valley, Suatu and Aruncuta lakes on Gădălin Valley, Mărtinești and Turda lakes on Racilor Valley.

These improvements made to the lakes contributed to a fast growing of the surfaces set for fish farming, which worked out at over 1800 ha in 1984, more exactly at 1834 ha (Pop, 1986).

This fish farming surface was organized into specialized farms that managed the entire activity in fish farming, starting with providing the spawn for lakes, providing food for feeding the fishes, cropping, maintaining the lacustrine surfaces, and so on and so forth. Up to 1990, some farms functioned at Zau de Câmpie on Luduș Valley, at Tăureni on Șesului Valley, while the lakes were administrated by the Agricultural Cooperatives for Production Șăulia and party household Mureș (only Văleni Lake), besides Geaca and Țaga farms on Fizeșului Valley. Even from the start, fish farming characterized itself by growing some species of Romanian carp and then of some species of Chinese carp. Using the existing data, up to 1990, the annual fish production was usually of over 2 tones/ha, but obviously these data may not be the real ones, because we all know the way in which production "was declared" at that time.

Still, it remains clear the fact that, up to 1990, the aspects concerning fish farming were organized in a certain way, especially tending to valorise the area of Pârâului de Câmpie hydrographical basin.

After 1990, the same time the opinion about property changed, the situation changed, as well. Since then, these aquatic surfaces have changed their status to private properties and many of them have been degraded.

Nowadays, the lacustrine surfaces in Pârâul de Câmpie basin benefit of the best management, from all points of view (see also the aspects regarding deposition), and the lakes in Fizeş basin degraded year by year, excepting some of them (especially those from the upper and lower basins).

Some proposals for a sustainable management of the lakes in Transylvania Plain. Taking into consideration the aspects mentioned above, we consider that, no matter the use of accumulations is, the most important aspect related to the concept of sustainable management of a lake, is the one related to the process of deposition, which imposes the period in which the accumulation will function.

The friable substratum in Transylvania Plain, the low level of forestation, the excessive depasturage, the prevalence of agricultural fields, the lack of management in the functionality of the lakes, are only a few elements that dragged into a rather accentuated deposition of the lakes, especially for those in the middle course of Fizeş River.

We consider necessary to start an urgent programme for reducing the deposition in the system of the lakes from Geaca I and up to Sucutard II, due to the fact that, at this moment, this is the most damaged sector and, eventually, to think of a new way of using them. Thus, it would be recommended to include the settings from Geaca I and Roşieni into the category of protected areas, having the fact that another reservation, "Lacul și Valea Legii" Ornithic Reservation was established nearby, and, the fact that here, the marshlands and their specific vegetation extend on an important surface. This way this micro-region would shape into a humid zone used for protection of the migratory birds in the central - Northern part of Transylvania Plain (according to the Law no. 5/1991).

The area situated on the main course of Fizeş River and that comprises the settings from Geaca II, Geaca III, Sucutard I and Sucutard II could be included in the circuit for tourism, being located nearby the main county road that crosses over the plain and that wouldn't anyhow affect the settings down the river, if the measures for protection would be appropriate.

In this sector a large number of settlements are located, though very agglomerated and dense, where the rural tourism could be implemented and developed; in the context of the strategy of development, these areas are included in the National Territorial Administration Plan and the Regional Territorial and Administration Plan in the first phase of development. So that the ecosystems of Țaga Mare and Țaga Mică lakes shouldn't be affected, the first measure (and the cheapest one) to take, is for decreasing the level of deposition, for maintaining the optimum qualities of the water for the activities with a sportive character, and so on, would be to resize these lakes into smaller ones, by building a parallel channel with the right bank of accumulations (the area where the most important tributaries are crossing), and which, when floods, would conduct the transported alluvia on the most abrupt slope/versant.

Some attention should be paid to the lakes situated between the sliding waves, as those from Pogăceaua, Dătășeni and Archiud, which are, now, entirely neglected.

3. THE SWOT ANALYSIS OF THE FRESH WATER LAKES IN TRANSYLVANIA PLAIN

Instead of conclusions, the most appropriate way of ending the present study is to try to create a diagnostic analysis of the studied area, which would highlight the positive and negative aspects of the actual management and also the proposals for a sustainable management of the lakes. Underlining the particularities of the sustaining component, as those of the existent situation demographically, economically, socially, and environmentally speaking, it, therefore, allows distinguishing the functions and dysfunctions, the advantages and disadvantages of the territorial structure of the system. According to the principles of SWOT analysis, they group together the following aspects: strengths, weaknesses, opportunities and threats.

<p>Strengths:</p> <ul style="list-style-type: none"> - the presence of lakes, which determine a variation in the landscape of the Transylvanian Plateau - a benefic influence on neighbouring topoclimates and microclimates - a relatively uniform distribution on the two important rivers crossing the Plain - morphohydrological potential for future planning - important area for fishing - they lessen flood waves and regulate the transport of nutrients and/or polluting material - location potential in relation with the important urban centres of the region - high biodiversity potential, rendered concrete by the existence of protected areas and reserves - the interest of different ranked decision makers to preserve the natural heritage - the optimal continuation of two functional regions, along the main valleys 	<p>Opportunities:</p> <ul style="list-style-type: none"> - possibilities for capitalizing the potential of the landscape - the keeping or extension of lake surfaces - the access of numerous human communities to the capitalization of resources - the regional consolidation and future development - the perspective of the development of fishing and the implementation of projects concerning the development of fishing farms - the amelioration of perception regarding hydrochemical risks - potential for tourism capitalization - NGOs capable of providing services for managerial formation and assistance - the development and extension of the network of protected areas to preserve the biodiversity - the access to European finance programmes ISPA, SAPARD, PHARE
<p>Weaknesses:</p> <ul style="list-style-type: none"> - friable ground (preeminence of marls and clays) - the presence of steep slopes in the immediate neighbourhood of lakes - the tendency of the climate to become drier - the presence of a monotonous vegetal cover, with the preeminence of herbaceous species; low 	<p>Threats:</p> <ul style="list-style-type: none"> - the high erosional potential - the important transportation of eroded material directly into the lake basin - the reduction of the water reserves and the change in the chemical composition of the water - the exposure of land to erosional factors - the increase of the amounts of friable

<p>degree of afforestation</p> <ul style="list-style-type: none"> - the considerable extension of arable lands and the use of improper agrotechnical measures (ploughing along the slope) - the storage of organic waste of human and animal origin near the lake basins - the excessive use of chemical fertilizers on agricultural lands of the catchment area - the lack of a fishing management system, including the control of poaching - the location of the settlements in the neighbourhood of lakes - the weak ecological education and sense of duty 	<p>material liable to be moved towards the river beds and the lake basins</p> <ul style="list-style-type: none"> - biological and bacteriological pollution of the water of the lakes - higher epidemiological risks in the affected areas - the increase of the amount of nutrients in the water of the lakes and the acceleration of the eutrophication process - the exhaustion of the current ichthyofauna - high demographic pressure with the risk of pollution - the persistence of the indifferent behaviour concerning the issues of environmental protection.
---	---

References

- Angermeier, P. L., Karr, J. R. (1994), Biological Integrity versus Biological Diversity as Policy Directives, în revista *BioScience*, S.U.A.
- Brown, R. L. (1996), *Probleme globale ale omenirii. Starea lumii 1996*, Editura Tehnică, București.
- Gâștescu, P. (1961), *Tipuri de lacuri din R. P. R. după originea cuvetei lacustre*, Probl. de geogr., VIII, pag. 301-323, Editura Academiei R. S. R., București.
- Gâștescu, P., Parichi, M. (1963), Caracteristicile hidrochimice ale lacurilor din bazinul Fizeșului. Revista "*Natura*", Seria Geografie-Geologie, XV, nr. 5, pag. 30-36, București .
- Gâștescu, P. (1971), *Lacurile din România. Limnologie regională*, Editura Academiei RSR, București.
- Giurma, I. (1997), *Colmatarea lacurilor de acumulare*, H.G.A., 124 pg., București.
- Ianoș, I. (2000), *Sisteme teritoriale*, Editura Tehnică, București.
- Manoliu, M., Ionescu, Cristina (1998), *Dezvoltare durabilă și protecția mediului*, Editura H.G.A., București.
- Pop, Gr. P. (1986), Aspecte geografice ale pisciculturii din Câmpia Transilvaniei, în vol. *Probleme de Geografie Aplicată*, pag. 163-171, Cluj-Napoca.
- Sorocovschi, V., Șerban, Gh., Rus, I. (1998), Colmatarea iazurilor din bazinul superior al râului Fizeș, A III-a Conferință Internațională de Hidrologie "*Apa și protecția mediului hidric în bazinul mijlociu al Dunării*", vol. I, Universitatea " Babeș-Bolyai", Facultatea de Geografie, 24 – 26. IX., pag. 94-102, Cluj-Napoca.
- Sorocovschi, V., Șerban, Gh., Koloszvari, A. (2000), Iazurile de pe Valea Sicului – Câmpia Transilvaniei, A IV-a ediție a Conferinței Regionale de Geografie "*Cercetări Geografice în Spațiul Carpato-Danubian – Regionalism și Integrare: Cultură, Spațiu, Dezvoltare*", 12-14 mai, pag. 391-398, Timișoara.
- Sorocovschi, V., Șerban, Gh., Rus, I., Bătinaș, R. (1999), Aspecte privind colmatarea iazurilor de pe valea Ludușului între Miheșu de Câmpie și Zau de Câmpie, *Analele Universității Timișoara, Geografie*, 9 – 10, pag. 169-180, Timișoara.
- Șerban, Gh., Sorocovschi, V., Fodorean, I. (2004), Riscuri induse de amenajarea hidrotehnică a iazurilor de pe Valea Șesului (Câmpia Transilvaniei), în vol. „*Riscuri și catastrofe*”, nr. I, pag. 159-170, Casa Cărții de Știință, Cluj-Napoca.

- Vădineanu, A. (1998), *Dezvoltarea durabilă: teorie și practică (vol. I)*, Editura Universității din București.
- *** (1991), *Legea pentru aderarea României la Convenția asupra zonelor umede, de importanță internațională, în special ca habitat al păsărilor acvatice*, nr. 5 din 25 ianuarie 1991, publicată în Monitorul Oficial nr. 18/26.01.1991.
- *** (1992), *European Environment Agency – Dobris Assessment*.
- *** (1994), *Legea pentru ratificarea Convenției privind diversitatea biologică, semnată la Rio de Janeiro la 5 iunie 1992*, nr. 58 din 13 iulie 1994, publicată în Monitorul Oficial nr. 199/2.08.1994.
- *** (1996), *Legea Apelor* nr. 107 din 1996 publicată în Monitorul Oficial nr. 244/8.10.1996.
- *** (1996), *Contemporary Water Management: Role of Limnology*, în vol. *Freshwater Ecosystems: Revitalizing Educational Programs in Limnology*, pag. 65-106, The USA National Academy of Science.
- *** (2001), *Legea privind fondul piscicol, pescuitul și acvacultura* nr. 192 din 19 aprilie 2001, publicată în Monitorul Oficial nr. 200 din 20 aprilie 2001.