



## CONSIDERATIONS ON THE ANTHROPIC ROMANIAN LAKES AND THEIR IMPACT ON THE ENVIRONMENT

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### Abstract

In Romania there are over 2100 artificial lakes, which hold about 13 billions m<sup>3</sup> of water and cover about 1.9% of the surface of the country. This study refers to the most important of these lakes, whose volumes are over 1 billion m<sup>3</sup> and highlights their functionalities and their impact on the environment, at the level of the main relief units. Out of the 406 lakes analyzed, half are situated in the plain region, a quarter in the hill and plateau area and 17% in the Carpathian area. As far as their functionality is concerned, most of them (40%) have complex functions, these functions being followed by those of fishery (20%), and electrical energy production (17%). The analysis made revealed significant differences among the three major relief units, concerning the morphometric characteristics of the lakes (surface, volume) and their uses. At the same time, the impact of these arrangements on the elements of the geographic environment is different from one relief unit to the next, mainly according to their dimensions and their functionalities. So, in the plain region, the negative consequences of the dam-tanks, are less significant than the positive ones, so the quality of the impact is higher than the one of the alpine and hilly regions. In the mountains, where the socio-economic advantages are very important, there are many negative effects, essentially on the natural components of the geographic environment.

**Keywords:** anthropic lakes, functionalities, impact, major relief units.

In today's economic and social circumstances, at the end of the century and the millennium, the anthropic lakes have become a common place element of man's interference upon the geographical landscape. So far, in Romania over 1500 lakes have been set up, all contributing to meet the population's needs of water, as well as those of various economic branches, to ensure the necessary energy, to irrigate the agricultural

fields, to regularize the water flows, etc. In 2002 year, about 400 lakes (15 billion cubic meters) built on the major rivers (e.g. the Danube, Siret, Bistrița, Prut, Argeș, Olt and Someș) where in exploitation. The larger their dimensions are, the more powerful and complex the impact these lakes have on the environmental components, impact which differs from one land area to another.

The aim of this paper is to analyse comparatively at the level of major landscape zones the effects that the Romanian anthropic lakes have on the natural, social and economic environmental constituents of the country. The analysis includes only the large lakes which exceed a volume of 1 million cubic meters. These are in number of 400, comprise around 85% of the capacity of the anthropic lakes in Romania and cover around 0.76% of the country's area.

*The lakes of the plain region* represent half of the number of the lakes exceeding 1 million cubic metres. They are disposed mainly in the river meadows and are marked by reduced volumes. Although from the point of view of the area they cover they hold the highest percentage (60%), they contain a relatively small proportion of the total quantity of water belonging to the anthropic lakes (27%) (fig.1). Most of them fulfil complex functions, a quarter of them are used for pisciculture and one fifth of them is aimed at reducing the high floods and regularizing the flows. The smaller percentages belong to the lakes that are meant strictly for producing electric power (5%), for irrigation (2%) and recreation (3%) (fig. 1).

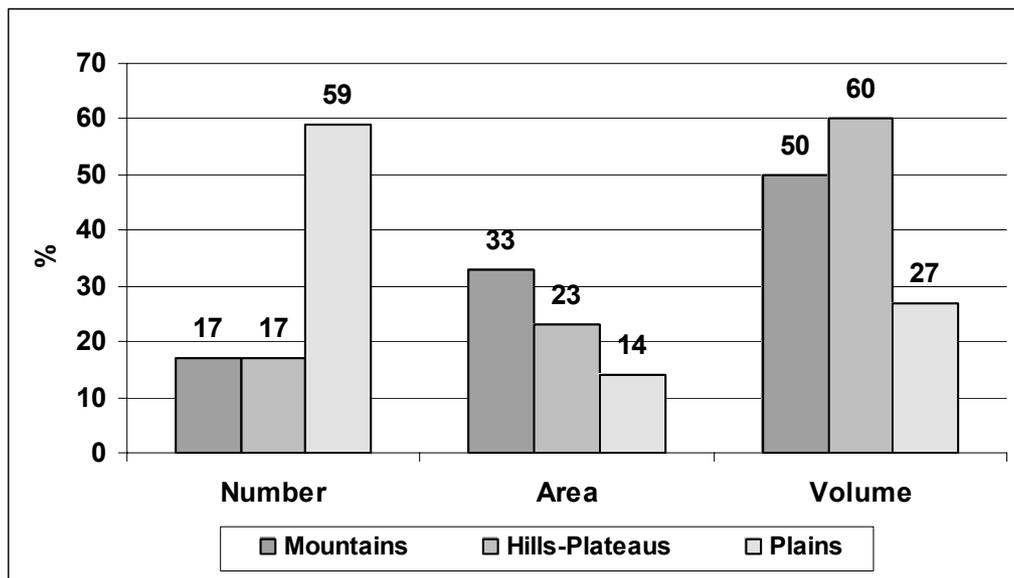


Fig. 1. The percentage of anthropic lakes for each major relief unit from the total number, from total area and from total volume of the lakes exceeding 1 million cubic meters

After an analysis of the impact anthropic lakes have on the natural socio-economic components of the environment, it is considered that in the plain regions the negative consequences of setting up such lakes are fewer than the positive ones and therefore the quality of the impact is superior to the one in the mountain and hill regions. Among the positive effects of the lakes in these zones there are: the increase of the food resources by a raise in the agricultural productivity and the development of pisciculture, the protection against floods and the retrieval of lands affected by these, the providing of necessary water for the population and industrial units, new jobs, a proper environment for engaging in sports and recreation, enrichment of the ground-water layer, the creation of new biotopes for the animal and vegetal organisms, etc. Regarding the negative effects these are generally reduced and consist mainly in: deteriorating the soils because of swamps, floods or deposits of salt marshes, changes in the bottom of the river beds, and in the flowing conditions of running waters, the proliferation of insects (mosquitoes), unpleasant marsh-like odours etc.

*In the mountain regions* there is the smallest number of the anthropic lakes (17% of the total of lakes exceeding 1 million cubic meters) which occupy only 17% of the total spread area. As they are marked by great capacity, these lakes comprise 59% of the volume belonging to the main lakes (fig. 1). Most of them have been created by building dams across the watercourses and make up basic local watermarks for the hydrographic and torrential systems. With respect to their functions 45% are used to produce electric power by supplying power plants of different capacities. An important percentage (35%) is held by the lakes having complex functionality, while 12% are restricted to providing water for the population and several economic branches. The smallest percentages belong to the lakes restricted to pisciculture (3%) or irrigation (1%) and are located only in depressions (fig. 2).

Because they imply complex constructing procedures, and of their large dimensions as well as the multiple use, the anthropic lakes settled in the mountain regions have determined and continue to determine extensive alterations in the structure and functionality of the geographic environment. Although they have been constructed to serve positive purposes regarding human society, still their effects have often been negative. The fact that these lakes are benefice is obvious, mainly at the level of socioeconomic components. Thus among the positive consequences one can notice: providing of electric power, increasing the water sources for various purposes, new jobs, regularizing flows, facilitating navigation, developing tourism, more food resources, etc.

Although the importance and necessities of these lakes is unquestionable, one must take into consideration and evaluate from the project stage the multiple negative implications that are obvious especially at the level of natural components and which refer to: the geological substratum, the tectonic and seismicity of the lake location, the stability of the mountain sides, the morphology of the riverbed and its granulometric composition, the liquid and solid flows of the rivers (the decrease of large waters and of the medium multiannual flows, the increase of minimal flows, the reduction of alluvia transit

downstream of the dam having implications on the morphology of the minor riverbed), the level and quality of underground waters, the local climatic parameters, the biocenoses (the replacement of terrestrial flora and fauna with aquatic species, the interruption of fish migration etc. the edaphic layer (its destruction through flooding or swamping).

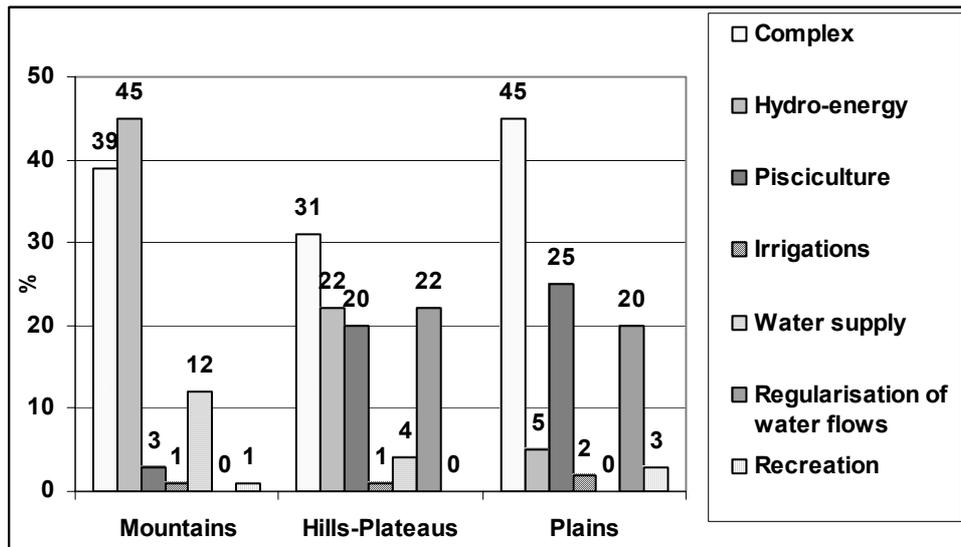


Fig. 2.. The distribution of the anthropic lakes according to relief units and functionality

The negative effects of locating lakes in the mountain regions also become manifest regarding the socio-economic components and consist in: the loss of forest or agricultural lands, shifts of population which often cause problems of access between the two banks, modifications in the route and length of the communication lines by creating deviating routes etc. Therefore, one can notice that in the mountain regions locating anthropic lakes can have favourable consequences, but it also presents a number of negative aspects with serious effects upon all the environmental constituents.

One third of the main anthropic lakes have been set up in the *hill and plateau regions*. According to the area they occupy (23%) these regions find themselves on an intermediate level between the other two relief units, while according to the water volume they comprise (14%) they take the last position (fig.1) regarding the utility, there is a prevalence of lakes with complex functions (31%) followed by those having energetic purposes (22%), those for regularizing flows and reducing high floods (22%) and those used for pisciculture (20%) the rest is restricted to supplying water (3%) and irrigation (1%) (fig. 2, table 1).

The anthropic lakes located in the hill and plateau regions are made by building dams across the watercourses or by creating sections within the river meadows. Their

impact upon the environmental constituents takes an intermediate place between the other relief zones from the point of view of quantity, as well as quality, being more moderate compared to the mountain regions and more marked compared to the plain regions.

Table 1 The distribution of the anthropic lakes according to relief units and functionality

	Number	Area	Volume
Mountains	17	33	50
Hills-Plateaus	17	23	60
Plains	59	14	27
Functionality	Mountains	Hills-Plateaus	Plains
Complex	39	31	45
Hydro-energy	45	22	5
Pisciculture	3	20	25
Irrigations	1	1	2
Water supply	12	4	0
Regularisation of water flows	0	22	20
Recreation	1	0	3

The analysis dealt with in this paper can serve as basis for elaborating impact studies which should point out the proper conditions for setting up anthropic lakes taking into consideration their relief units so that the negative effects be reduced to minimum and the lakes be less an less a factor of unbalance in the functionality of the geographic environment.

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