ASSESSMENT OF WATER DEMANDS IN THE RURAL SETTLEMENTS OF THE SOMEŞEAN PLATEAU

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ABSTRACT. –Assessment of water demands in the rural settlements of the Someşan Plateau. Through this paper we have evaluated four different water demand calculations, which would allow the development of water supply strategies on a short, medium and long term. Judging by the second variant of calculation the total water needs of the localities, from the Someşean Plateau, ranges from 40,9 l/s, for the first variant, to 199,4 l/s, in case of the second variant. Water demand was estimated at administrative level (district, commune and localities), for the main river basins and their related sub-basins, and also on a geographical sub-units level. Regardless of the variant we used when calculating the weight of units or analyzed subunits, this remains the same. For example, the Cluj County holds 66.5% of the necessary water in the Someşean Plateau, followed by the counties of Sălaj and Maramureş with 28.8% and 5.7%. The river basins of Someş and Someşul Mic represent approximately equal weights (48.3% and 48.6%), while the basin of Lăpuş is defined by a very small percentage. The share that defines different administrative subunits, either geographical or hydrographical, depends on the area, density and size of the related localities. The share of water that belongs to each geographic subunit from the Someşean Plateau ranges between 33.8% (in the Cluj Hills) and 6.3% (in the Sălătruc Hills). The water volumes required annually by the Someşean Plateau localities oscillates between 1288 m^3, in the first case scenario and 6281 m^3 in the fourth case. So, the evaluated water volumes should be decreased, on average, by about 30%, depending on the specific circumstances of the territories studied by taking into account the unfavorable position of some towns to the main hydrographical course, the size of settlements, as well as the opportunities of their future development.

Key words: water necessity, specific water consumption, Someşean Plateau, rural settlements

1. GENERAL CONSIDERATIONS

Integrant part of the Transylvanian Depression, the Someşean Plateau represents the North – North-Western compartment of it, the most extended unit from the three subdivisions of the Transylvanian Plateau. The geographic individuality of the Someşean Plateau is imposed not only by the river network but

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also by the relatively wet and cool climate, determined by the predominance of the higher relief and the relatively easy advection of the western and north western air masses through the "Poarta Someşană".

Adding to these, the particularities of the bio-pedo-geographic cover, manifested in the predominance of the forestry – predominantly maintained in the high hills- and the luvisoils at different grades of argil-lluviation. Another particularity of the region is the lack of cities, which are grouped in the Someşul Mic Valley, and at the confluence of the two Someş Rivers, the Someşul Mic and the Someşul Mare rivers.

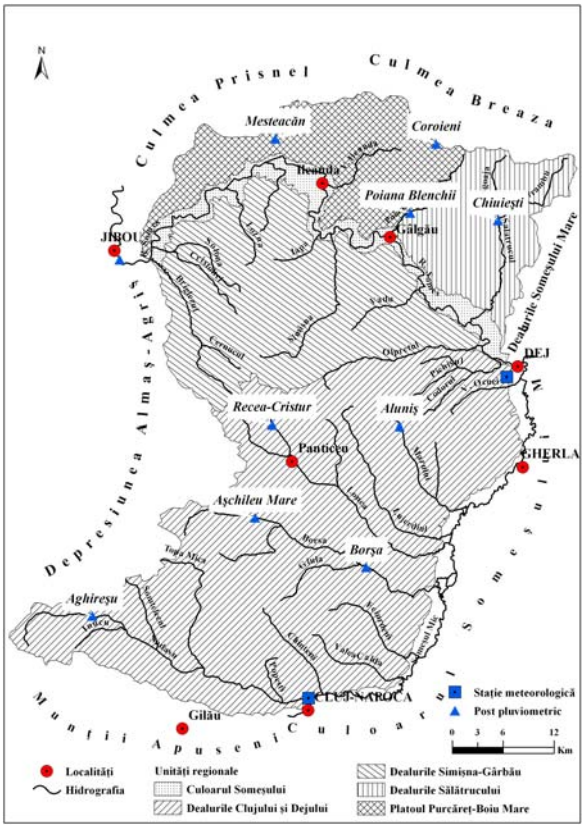

Fig. 1. ***Someşean Plateau main subdivisions***

The small and mid sized rural settlements are situated, in most cases, in the major river valleys, in the tributaries or at the inflow basinets of these. According to the particularities of the geographic features, in the Someşean Plateau, we can delimitate more subdivisions (Fig. 1).

The key elements which were taken into consideration at the assessment of the present water needs were the population numbers, the number of small and large animals, the economical specifics and the social facilities – utilities of the settlements.

In the assessment for the population water needs (public and household needs) there were considered the following four specific variants represented by four contingency consumptions: 40 l/resident·day, 65 l/resident·day, 110 l/resident·day and 195 l/resident·day.

In assessing the water need for the animals, there were considered the following specific consumptions: 50 l / day for large animals and 8 l / day for small animals. The total water requirement values, calculated for the four variants, in the Someşean Plateau ranges between 40.9 l/s and 199.4 l/s.

2. WATER DEMAND AT COUNTY LEVEL

For the four mentioned alternatives, the water demand was computed at the level of settlement, communes and the Someşean Plateau related counties.

The assessed water needs for the Someş Plateau in the four variants of calculation varies between 40.9 l / s (in the 1st variant) and 199.4 l / s (in the 4th variant) (Table 1).

Tabel 1. ***Corresponding water demand variants in the Someşean Plateau related counties***

County	Water needs variants (l/s)			
	I	II	III	IV
Cluj	26.796	43.543	73.689	130.630
Sălaj	11.755	19.101	32.325	57.304
Maramureş	2.344	3.808	6.445	11.425
Total	**40.895**	**66.452**	**112.459**	**199.359**

Regardless the computation variant, the percentage on the three counties from the total water demand remains the same. Thus, Cluj County ranks first with 66.5% of the necessary water of the Someş Plateau, followed by the counties of Salaj by 28.8% and Maramures with 5.7% (Fig. 2).

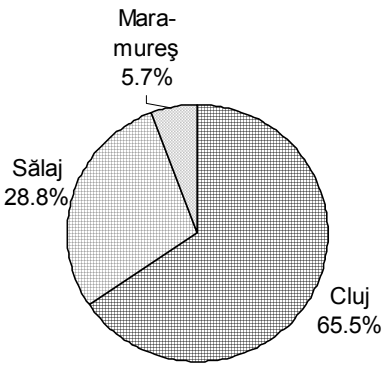

Fig. 2. ***Comparison of water needs on counties related to the Someşean Plateau***

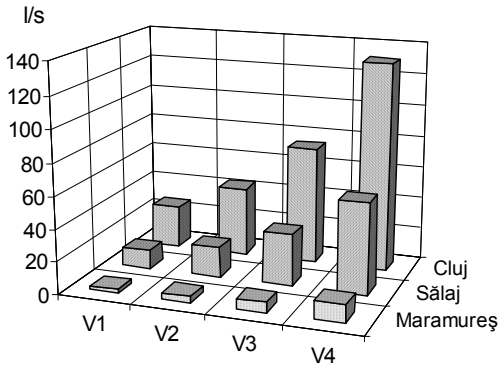

Fig. 3. ***Water demand on county level assessed with the four computation variants***

The differences between corresponding values for the extreme water needs variants calculations, at the county level, are very large and can be provided in stages. In Cluj County the difference between the mentioned computed variants is 103.8 l / s, and for the settlements related to Salaj county is 45.6 l / s (fig 3).

Analyzing the water demand measured at the parish level by the second variant of calculation, it is noted that of all communes (39), only in two (Aghiresu and Baciu) the water necessity is included in the range between 5 and 6 l / s.

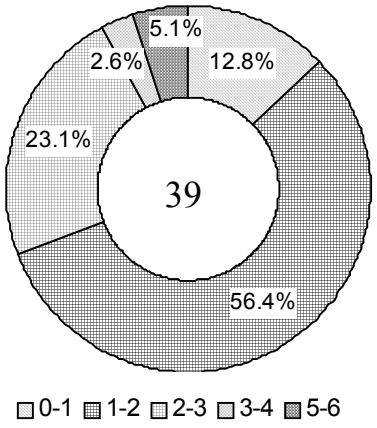

Fig.4. ***Communes weight assessed on the water demand intervals***

In the water demand interval of 3 and 4 l/s only one commune (Căşeiu) is included, and between 2 and 3 l/s nine communes, which represent 23.1 % of the total demand. The most communes are included in the water demand interval of 1 and 2 l/s (56.4%) and those included in the interval of 0 and 1 l/s represent a much smaller percent (fig. 4).

The weight of water demand on different communes has been assessed also on the three counties related to the Someşan Plateau. This depends on two parameters which are closely correlated: the area owned by the county in the study area and the number of the involved communes. Of course, there are also other parameters which intervene, included such as the number of population in the commune center and villages, the morpho-logical features of the landscape etc. So, the communes related to Cluj County are included in the five defined water requirement intervals, but in area related to Salaj and Maramures counties there were no communes in which the water demand exceeded 3 l / s or 2 l / s.

Whichever variant of calculation we use, the weight held from the water demand, by communes in the Cluj County, is maintained between 0.02% (Apahida represented by a single town) and 13.4% (Baciu). From the Cluj County water necessity a large weight is assigned to Aghiresu (12.5%), Căşeiu (7.7%) and Chinteni (5.3%) communes. Smaller percentages of 4 and 5 % have Chiueşti, Gârbău, Sânpaul and Câţcău, also between 3 and 4 % the communes Vad, Bobâlna and Aşchileu.

From the Salaj county water necessity, the communes of Gârbou, Gâlgău and Ileanda each hold between 11 and 12%, and the percentages in the communes Surduc (10.9%), Letca (10.6%) and Băbeni (9.3%) are close to these. Lower percentages, between 5 and 7%, occur in the communes of Cristolţ, Şimişna, Poiana Blenchii, Zalha, Rus and Lozna (fig.5).

The communes of Maramures County, which are related to the Someşean Plateau, are few and have weights ranging from 8,8% (Valea Chioarului) and 36.2% (Coroieni) from the total water demand. In the other two other communes the weight is between 26 and 30%, Boiu Mare (28.7%) and Vima Mică (26.2%).

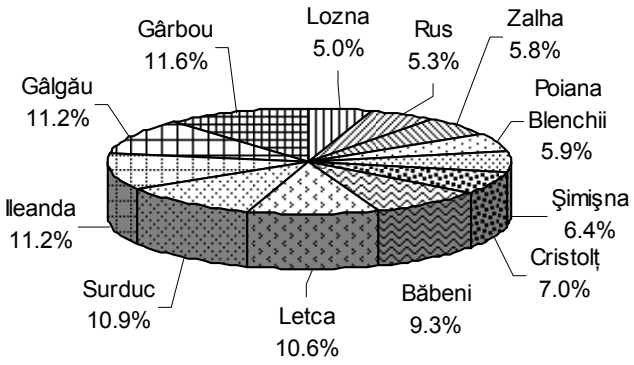

Fig.5. ***Weight of communes, from the water demand, assessed at the Sălaj County level.***

Calculation of water demands at local level reveals a number of other spatial and quantitative features, which are useful in determining the water supply systems in the Someş Plateau. So, out of the total 215 localities, in nearly one quarter (22.3%) the assessed water demand has values below 0.100 l/s and this may be ensured in most cases from their own. The settlements included in this category do not require their involvement in water supply systems. Exceptions are only those that are in advantageous situation regarding the main supply network.

If we take into account that, localities with water demand between 0,100 and 0,200 l/s (24.2% of total) are located unfavorably regarding the water supply network, the required water demand of the Someş Plateau rural areas are far reduced from the first stage of evaluation.

The number of localities with water requirements greater than 0.200 l/s, represent a little more than half of rural settlements of the Someşan Plateau (53.5%).

3. WATER DEMAND COMPUTED AT WATERSHEDS LEVEL

The water demand for the four calculated variants was computed at the level of the first-order watersheds of the major collectors (Someş, Smeşu Mic and Lăpuş).

From the analysis of the total water requirement at the level of the three major watersheds stands out the fact, that from the entire 66.391 l/s (2nd variant), which represents the Someşean Plateau total water necessity, the Someş and Someşului Mic watersheds have approximately equal weights (48,3 % and 48,6 %) while the Lapus catchment represents only a very small percentage (3,1 %). Whichever variant of calculation, the weights remain the same, only the total water requirement values range between 40 856 l / s (variant I) and 199,175 l / s (variant IV).

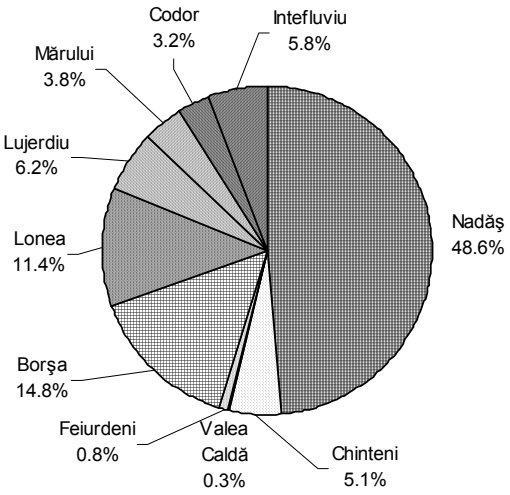

Fig. 6. ***Assessed water demand related to the Someşul Mic River catchment***

The assessed water needs in the Someşul Mic watershed (computed with whichever variant), almost half is represented by the Nadăs basin (48.6%). This is followed by the Borşa and Lone rivers, which hold between 10% and 15% of the total water demand (Fig. 6). And lastly, with insignificant water demand appears Valea Caldă and Feiurdeni (less than 1%).

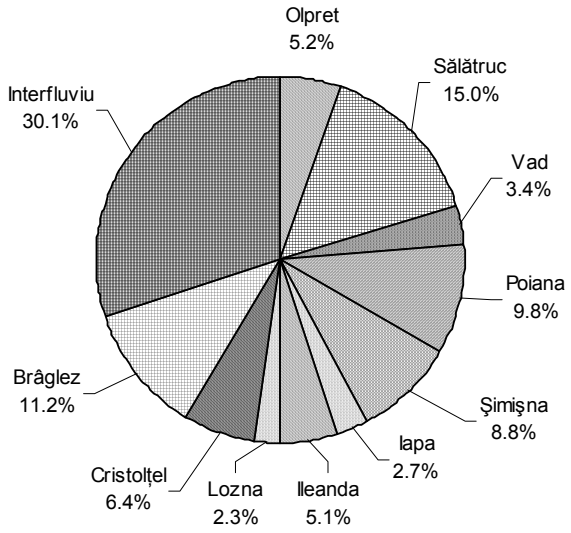

Fig. 7. ***Water demand assessed in the catchments related to the Someş River***

From the assessed water demand in the Someş Basin, the most significant percentage, between 9% and 15%, have the following sub-basins: Sălătruc, Brâglez, Poiana and Şimişna; and the rest, represent a much smaller percentage, between 3% and 6% (Fig. 7).

4. WATER DEMAND COMPUTED AT GEOGRAPHICAL SUBUNIT LEVEL

The knowledge of the water demand required by the rural areas, at geographical subunit level, is useful in the research conducted by specialists dealing with the regional sustainable development studies. Like in case of the water demand assessment at catchment level, the required water volume depends on the area, the density and size of rural settlements. Thus, the localities of Cluj Hills, which cover the largest surface from the Someşean Plateau, regardless of the variant of calculation, require the largest quantities of water from 13,8 l/s (1st variant) to 67,4 l/s (2nd variant).

The Someş Corridor ranks second in the amount of water demand, however occupies a smaller area than the other subunits (Şimişna-Garbou Hills Dej Hills, Purcăret Boiu-Mare Plateau), but it has a much higher density of rural settlements. So, the water requested by the rural settlements in the Someş Corridor has been evaluated at values between 7.9 l/s in case of the 1st variant and 38,6 l/s in the 2nd variant.

The smallest quantities of water are needed by the settlements of the Sălătrucului hills, between 2.6 l/s and 12.6 l/s (Table 3).

Tabel 2. ***Computed water demands in the main geographical subunits of the Someşean Plateau***

Geographical subunit name	Water demand variant (l/s)			
	I	II	III	IV
Clujului Hills	13.8	22.5	38.0	67.4
Dejului Hills	7.0	11.4	19.3	34.3
Şimişna-Gârbou Hills	5.5	8.9	15.1	26.7
Someşului Corridor	7.9	12.9	21.8	38.6
Purăreţ-Boiu Mare Plateau	4.1	6.6	11.2	19.8
Sălătrucului Hills	2.6	4.2	7.1	12.6
Total	**40.9**	**66.5**	**112.5**	**199.4**

The weight held, from the total water demand, evaluated at the entire Someş Plateau by the settlements of Dej Hills (17.2%) and the Someş Corridor (19,4%) are close in magnitude. These are followed in sequence by the Şimişna - Garbou Hills with 13,4%.

Also the Purcaret Boiu-Mare Plateau's settlements water demand is relatively small, representing only 9,9% of the total water necessity in the Someş Plateau. The explanation is that however the Purcaret Boiu-Mare Plateau occupies a very important area, though the density and the population of the rural settlements are reduced.

5. CONCLUSIONS

The annual water volumes required by the settlements of the Someşean Plateau oscillate between 1288 m^3, 1st variant, and 6281 m^3 in the fourth variant (Table 3).

Tabel 3. ***Water volumes required by settlements at the major watersheds level***

Watersheds	Water demand variant (m^3)			
	I	II	III	IV
Someşu Mic	627	1019	1724	3056
Someş	621	1010	1710	3031
Lăpuş	40	65	109	194
Total	**1288**	**2094**	**3543**	**6281**

The assessment of water demand in several variants enables decision makers to develop strategic plans for the rural settlements water supply, for short, medium and long terms.

Knowing the water demand at watersheds, administrative units and geographic subunits level is necessary for long time planning and integrated management of water resources. It is also important in the knowledge of water necessity at the level of counties, communes and villages to eliminate existing faults or others that may occur in the water supply of settlements. The geographic subunits water demand assessment provides useful data in regional studies conducted by experts in various fields (geography, environment, agriculture, etc.).

Acknowledgement

This work was supported by CNCSIS –UEFISCSU, project number PNII – IDEI 2549/2008.

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