

MINERAL WATERS AT *BĂILE PERȘANI* (BRAȘOV) AND THEIR USE

Rodica Mereș¹, Liliana Zaharia²

Secondary School No 19, 2 Str. Alea Lacramioarelor, Brașov, Romania, Tel. + 40-26-832 90 07,
Email: kanord2908@yahoo.com

University of Bucharest, Faculty of Geography, 1 Bld. Nicolae Bălcescu, Bucharest, Romania
010041, Tel. + 40-21-314 35 08/2155, Email: zaharialili@hotmail.com

Abstract

Mineral waters, based on their physico-chemical characteristics, can have highly beneficial effects on the human health, and, consequently, efforts have been made to study and use them since ancient times. In Romania, there are numerous mineral springs, both in and out of the Carpathian area, which were used by founding permanent or seasonal spa establishments of local or general interest. *Băile Perșani* is a spa complex located between the Perșani Mountains and the Transylvanian Depression (at an altitude of 486 m), 47 km northwest of Brașov City, on the E68 European road, towards Sibiu. The spa exploits both mineral waters, discovered in 1928, and sapropelic mud. This paper highlights physicochemical features of the mineral waters in *Băile Perșani* and certain aspects regarding their past and present exploitation. It is based on the analysis and synthesis of data collected from relevant scientific papers and field investigations carried out between 2010 and 2013. The salty springs in *Băile Perșani* have a high total mineralization, of about 18 g/l, with a high content of chloride (9.4 g/l) and sodium (6.4 g/l) ions. These mineral waters can be either chlor-alkali, sulphur, bicarbonate, alkalizing compounds or calcium and magnesium-rich. As the physicochemical features of the mineral waters at *Perșani Baths* make them therapeutically valuable, they have been exploited for external treatments at specialized establishments since 1930. Against the background of a mild climate, the mineral waters and sapropelic mud grant *Băile Perșani* an outstanding natural potential, which may be better utilized in the future through appropriate investments, based on sound scientific research.

Keywords: mineral waters, physicochemical features, exploitation, *Băile Perșani*, Brașov County.

1. INTRODUCTION

In the beginning of the twentieth century, throughout Brașov County, the research on mineral waters intensified in areas such as: 1. the west of the Eastern Carpathians, where post-volcanic phenomena and carbonated mineral waters (at Zizin - Tărlungeni) and mesothermal waters (Codlea, Măieruș) can be found; 2. southeastern Transylvanian Depression, where mainly chlorosodic mineral waters were formed at the juncture of diapirs and the mountainous area (at Rupea-Mercheașa, Grid, Veneția de Jos, Perșani); 3. the gas dome area of the Transylvanian Depression, where mineral waters are genetically related to hydrocarbon deposits (at Rodbav). Regarding the former “thermal baths” of Brașov County, they started gaining recognition towards the end of the nineteenth century and at the beginning of the twentieth century, and reached a “peak” during the interwar period. After the Second World War, the county’s spa establishments gradually deteriorated to the point that, today, only *Băile Perșani* and *Băile Rodbav* remain to attest the past therapeutic exploitation of mineral waters and sapropelic mud in the area.

While until 1950 spas belonged to private investors, and were scattered throughout the region according to their financial interests, after 1950, the first law referring to spas (importance-based classification, directions for use) opened a new chapter for the spa sector. Moreover, along with the founding of the Institute of Balneology and Physiotherapy in 1949, a balneology resource inventory is performed, spas are organized on scientifically valid grounds and treatment methods diversify (Morariu et al., 1955). Thus, new spa resorts, authorized by the Ministry of Health - Balneotherapy Division and by the Institute of Balneology and Physiotherapy, were built in Brașov County at: Zizin, Homorod, Perșani, Veneția de Jos, Rodbav and Rupea (Cohalm). Different classifications of these spas can be found in specialized literature. Thus, in Berlescu (1996) Homorod, Perșani and Rodbav are mentioned as seasonal resorts of local interest, and Veneția de Jos and Zizin as settlements with balneary factors (mineral waters that can be exploited at their sources). Munteanu et. al (1978) included Homorod and Rodbav in the spa resorts of general interest category, while Rupea is considered as a settlement with balneary factors (Morariu et al., 1955). In the National Protected Area of balneary importance rating study conducted by the Institute of Physical Medicine, Balneology and Rehabilitation, Bucharest (1995), Homorod, Perșani, Rodbav, Rupea, Zizin and Veneția de Jos fall into the spa resort settlement category.

This paper aims to highlight the particularities of mineral waters in *Băile Perșani* and of their past and current use, as well as future exploitation options. Through the data and information contained (on the physicochemical parameters of mineral waters, their history and exploitation, and their present state), we believe that the paper is relevant for supplementing and updating the existing knowledge on mineral waters in Perșani.

2. DATA AND METHODS

This paper is mainly based on processing the following categories of data: 1) information resulting from analysing relevant scientific works (including cartographic documents - geological map 1:200,000; topographic map 1:25,000, 1981 edition); 2) information collected by conducting interviews with Șinca Cityhall officials and residents of the Perșani Village; 3) measurements made between 2010 and 2013 and sample analysis performed at the laboratory of the National Institute of Research-Development for Cryogenic and Isotopic Technologies (I.C.S.I.) in Râmnicu Vâlcea; 4) observations on the current state of the *Băile Perșani* Complex. The main methods were observation, analysis, synthesis, mineral spring mapping, measuring physicochemical parameters with a Hanna 9828 multiparameter sensor. Cartographic representations were made by using GIS and graphic techniques, with programs such as: Arc GIS 10.1, Global Mapper 12, Arc Map and Photo Impact.

3. BĂILE PERȘANI: GENERAL GEOGRAPHIC DATA

Băile Perșani is a tourist complex located in Perșani Village, which is an administrative unit of Șinca Commune, in Brașov County (Fig. 1 A). During the interwar period it was included in Făgăraș County, and between 1950 and 1960 in the Stalin Region. Classified as a seasonal spa resort of local interest (Berlescu, 1975; 1996), *Băile Perșani* is located at the intersection of European route E68 (connecting the cities of Brașov and Sibiu) and the DJ 104A road, which leads to the Șinca Veche Commune. It is located 47 km northwest of Brașov City, 0.8 km northwest of Perșani Village, and 4 km northeast of Șinca Veche Village. The Perșani railroad halt, included on the Brașov-Sibiu route, is within walking distance, thus facilitating access to *Perșani Baths*. Geographically, the spa resort is located in the southwestern Perșani Mountains, at their juncture with the Transylvanian Depression (Târnaveilor Plateau), at an altitude of 486 m, and inside the Perșani catchment (Fig. 1B). Geologically, the area consists of sands, clay marls, gravels and Helvetian conglomerate lenses, up to 100 m thick (Ciupagea et al., 1970, Comitetul de Stat al Geologiei, 1967).

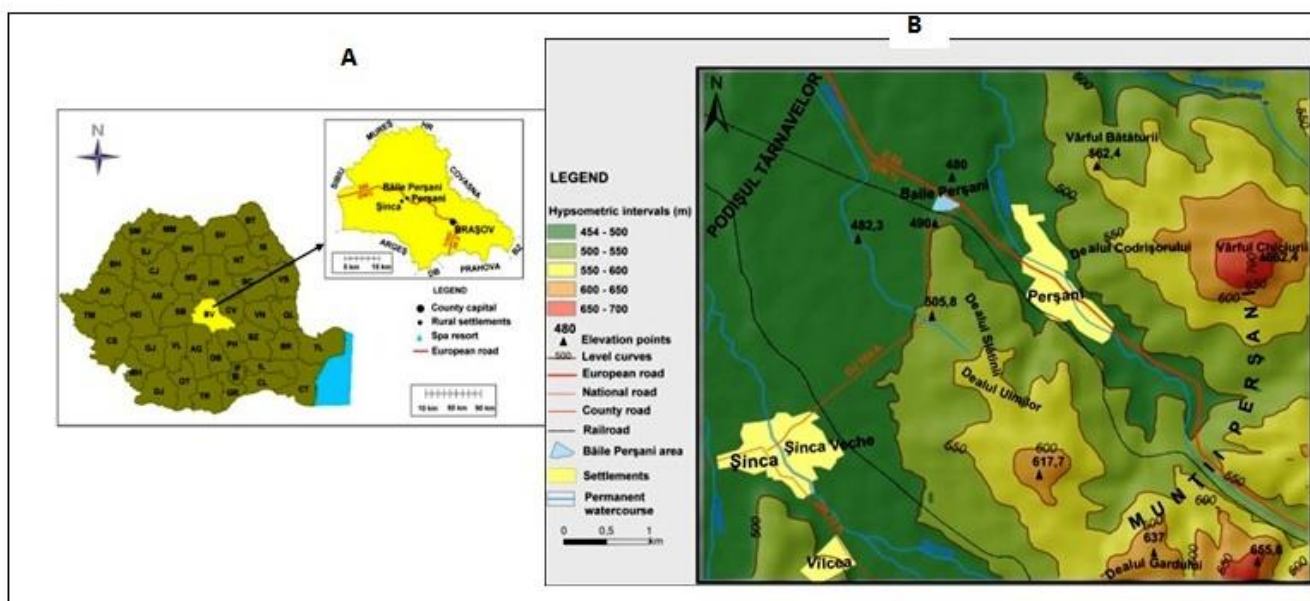


Figure 1. Location of *Băile Perșani* in Brașov County (A) and by landform (B)

The climate is that typical of forested hills and hillocks, where the average summer temperature falls between 16°C and 18°C, and the average winter temperature between -2°C and 5°C. Temperature variations (daily, monthly, annual) are neither considerable, nor sudden. Relative humidity during the summer season is

of 68%, and average annual rainfall of 710 mm. Atmospheric pressure is uniform, and ultraviolet radiation levels are low. As the surrounding hills are covered with oak and beech forests, the resort is protected against strong air currents (Morariu et al, 1955; Berlescu, 1975). The area's bioclimate is considered to be that typical of hill and hillock areas - sedative (Berlescu, 1996).

4. RESULTS AND DISCUSSIONS

4.1. Mineral Water Exploitation History in *Băile Perșani*

Mineral springs were discovered in Perșani in 1928, during natural gas drilling operations. Their use began a few years later (Fig. 2), with the help of private investors. Unlike the other *former* spa resorts in the county, it reached the peak of its development after the Second World War. The mineral springs in Perșani, with a total mineralization of 18.4 g/l (Ștefănescu, 1967), the hot bath facilities and the two outdoor cold water pools, as well as the mud area, were used by locals in order to treat various diseases, mainly rheumatism-related. Another mineral spring was captured in a cemented well (Comitetul Geologic Român, 1953). In the beginning, the mineral water was heated in a locomotive boiler, in a similar way to the spas in Cărmăz (Rupea) and Homorod (Dorgo, 2010). Subsequently, a steam engine was installed in order to heat water for the indoor hot water baths. Brașov officials came to Perșani for sunbathing and mud baths, as *Băile Perșani* was the only salt water and sapropelic mud resort near Brașov (Berlescu, 1975). The 1950 fire led to the degradation of the Perșani Complex, and it was only after 1970, when a motel and a camping site were built in the area, that tourists came back to the resort (Onciu, 2006). Visitors could take hot mineral water baths in special tubs, and locals provided accommodation for outpatients (Berlescu, 1975; Berlescu, 1982). The spa had 11 cabins that still exist (Fig. 3), 12 bath valves and a rest room in a separate pavilion. During the tourist season, medical assistance was provided by the Șinca Veche district doctor (Morariu et. al, 1955). However, in 1990, *Băile Perșani* found itself in an advanced state of degradation.

In 1991, three Perșani mineral water samples were sent to Switzerland for a physicochemical and bacteriological analysis, in view of a joint project that would have restored the spa. While the analyses were performed, the rehabilitation project never materialized. In 2005, *Băile Perșani* was leased by an investor from Zărnești (Brașov) and in 2009, a modernization process was initiated.



Figure 2. People relaxing at *Băile Perșani* in 1930 – left (Source: Okazii.ro)



Figure 3. The old cabins at *Băile Perșani* - right (Photo: Mereș, 2009)

4.2. Physicochemical Properties of Mineral Waters at *Băile Perșani*

The analysis of the physicochemical parameters of Perșani mineral waters, performed by competent institutions (Romanian Geological Committee, Institute of Balneology and Physiotherapy in Bucharest, Neuchatel Laboratory – Switzerland, National Institute of Research-Development for Cryogenic and Isotopic Technologies in Râmnicu Vâlcea) have shown that these are chlorosodic, bicarbonated, calcium and magnesium rich, of low ferrous ion content, hypertonic, athermal mineral waters of moderate concentration. One of the analysis sets belongs to Dr. V. Armeanu (1938), head of the Natural Gas Laboratory in Mediaș, working under the supervision of academician Prof. Dr. L. Mrazec, who was interested in the salty waters in the Transylvanian Basin and in the gases contained therein. Prof. Mrazec places the salty waters of Perșani and Veneția de Jos (located north-east of Perșani) in lower Badenian formations, adjacent to salt strata (Ciupagea, 1991). Dr. Armeanu's analysis revealed that in the salty waters of Perșani there is no methane, and that CO₂ is only up to 19.1 %, as the waters are not located in the vicinity of the eruptive Neogene of the

Harghita area; also, helium has a ratio of 0,025 %. According to Ciupagea et al. (1970), the salty Perșani springs have a moderate concentration of chlorides, sulphates, bicarbonates and sodium nitrates, potassium, calcium, magnesium, lithium, iron, manganese, bromine and are used exclusively for external treatments.

The March 1951 analysis made from of V. Crasu from the Romanian Geological Committee of the spring supplying the water pool, indicated concentrations of chloride and sodium ions of 9.42 g/l and 6.377 g/l, followed by hydrogen-carbonate (1.29 g/l), sulfur (0.52 g/l) and calcium (0.26 g/l) ions; *Băile Perșani* water was described as mineral chlor-alkali, sulphate, bicarbonate, calcium and magnesium rich, alkaline, of moderate concentration. Similar characteristics and the same type of water was found in the salty well spring (Table 1).

Table 1. Physicochemical parameters of the spring water supplying the water pool and of the salty well spring, in March 1951 (Source: Comitetul Geologic Român, 1953)

Parameters		The spring water supplying the water pool	The salty well spring
ANIONS (g/l)	Cl	9.4217	9.3774
	Br	0.0176	0.0072
	SO ₄	0.5245	0.5183
	NO ₃	0.0036	0.0081
	NO ₂	0.0007	-
	CO ₃ H	1.2941	1.4764
CATIONS (g/l)	Na	6.3770	6.4440
	K	0.0196	0.0227
	Li	traces	traces
	NH ₄	0.0010	traces
	Ca	0.2605	0.2607
	Mg	0.0873	0.693
	Fe	0.0015	0.0037
	Mn	traces	-
SiO ₃ H ₂ (g/l)		0.0149	0.0272
CO ₂ (g/l)		0.0102	0.0437
BO ₂ H (g/l)		0.060	0.0915
TOTAL (g/l)		18,1002	18,3502
Water temperature (°C)		12	12
Air temperature (°C)		6	9

The mineral waters of Perșani were also studied by specialists from the Institute of Balneology and Physiotherapy in Bucharest, their research showing similar values of the physicochemical parameters (Berlescu, 1975). The results of the Water Analysis Laboratory in Neuchatel, Switzerland in April, 1991 and those provided by the National Institute of Research-Development for Cryogenic and Isotopic Technologies (INCDTCI) in Râmnicu Vâlcea in November 2013, based on the samples we provided, fall in the same parameter value range (Table 2). Upon a comparative analysis of the physicochemical parameters of the salty well spring (Tables 1 and 3), it is noteworthy that, although the studies were conducted over a considerable time interval, chlorine, calcium, and other ion concentrations remained almost unchanged (Cl⁻: 9.377,4 / 9.348 mg/l; Ca²⁺: 260,7 / 253 mg/l). The same conclusion is found when analysing the physicochemical parameters of the captured spring that supplies the water pool (Tables 1 and 2). Chloride ion concentrations range from 9.421 g/l to 10.033 g/l, and Ca²⁺ concentrations from 0.26 to 0.22 g/l.

Between 2010 and 2013, a series of measurements were conducted by us on several physicochemical parameters of the *Băile Perșani* mineral water (temperature, pH, dissolved oxygen, conductivity, TDS, salinity) with a Hanna 9828 multiparameter sensor. Fig. 4 A shows the variation of the parameters measured over the June-September 2012 period, and Fig. 6B reveals the variation over the course of a day (29.07.2014). The analysis of the two graphs shows that, except for dissolved oxygen (DO), all parameters

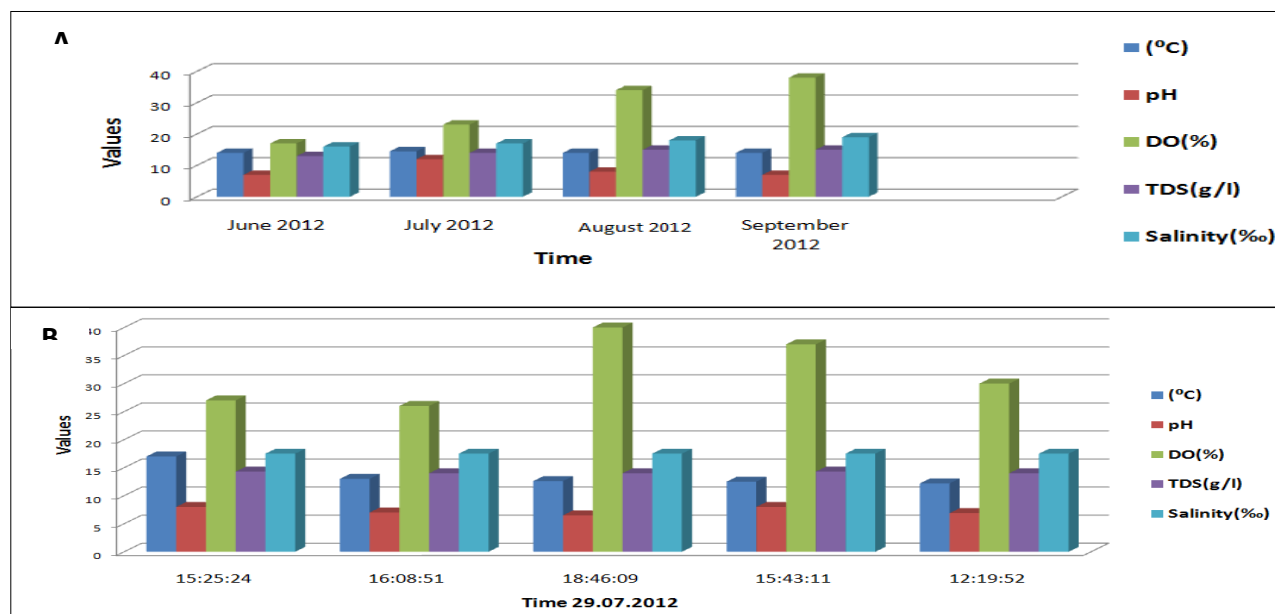
remain the same or have slight variations. Water temperature in the pool is of 17-18 °C in the evening, as it is heated by the sun during the day, while the well water only reaches 10 to 11 °C. Salinity is of 15-16 ‰ in both the pool and well, and TDS (total dissolved solids) values are of 13-14 g/l.

Table 2. Physicochemical parameters of the spring supplying the water pool (I.N.C.D.T.C.I.-Râmnicu Vâlcea analysis of the samples provided by Meret, November 28th, 2013)

No.	Parameter	Values
1.	pH	6.58 pH
2.	Chloride	10, 033 mg/l
3.	Calcium	223.9 mg/l
4.	Magnesium	163.6 mg/l
5.	Sum Ca and Mg (Hardness)	328.63 ^o G
6.	Permanganate index	4.07 O ₂ /l
7.	Sulphates	645.72 mg/l
8.	Ammonium (NH ₄ ⁺)	2.564 mg/l
9.	Nitrates (NO ₃ ⁻)	3,151 mg/l
10.	Nitrites (NO ₂ ⁻)	0.194 mg/l
11.	Conductivity	29,000 µgS/cm
12.	Potassium	24.02 mg/l
13.	Turbidity	38.6 NT
14.	Cadmium	208.0 µg/l
15.	Copper	161.8 µg/l
16.	Nickel	152.7 µg/l
17.	Lead	1,460 µg/l
18.	Manganese	< 0.05 mg/l
19.	Zinc	4.037µg/l
20.	Chromium	< 0.3 µg/l
21.	Suspensions	33.35 mg/l

Tabel 3. Physicochemical parameters of the salty well spring (Source: Berlescu, 1975)

Parameter	Cl ⁻	Br ⁻	SO ₄ ²⁺	HCO ₃ ⁻	Na ⁺	K ⁺	Ca ²⁺	Mg ²⁺	Fe ²⁺	CO ₂	Total mineralization
mg/l	9,348	5	515	1,464	6,252	256	253	86	6	140	18,383



4.3. Therapeutical Recommendation and Mineralwater Use at *Băile Perșani*

The mineral waters in *Băile Perșani* are recommended for: degenerative rheumatic musculoskeletal disorders; various types of early-stage, inactive and complication-free spondylosis (cervical, dorsal, lumbar); early-stage arthritis in the upper and lower limbs and also gynecological disorders (Berlescu, 1975, 1996). The results the Neuchatel Laboratory forwarded allowed the specialists here to state that the mineral waters of Perșani have certain therapeutic properties and can be used to this end, but not as bottled water, as EEC limit values were exceeded. Neuchatel officials explained that while the water which is used therapeutically is allowed to exceed certain physicochemical parameter limits, it cannot be used as bottled mineral water, as the mineralization degree of the Romanian samples was four times higher than the Vichy St. Yorre level (6,500 mg/l mineralization). Moreover, they mentioned that the high levels of ammonia, nitrates and organic material (probably due to the influence of swamps) could have negative effects on the human body if such a bottled water were to be consumed (Neuchatel Laboratory, 1991).

Another important therapeutic element of *Băile Perșani* is the sapropelic mud found in the lake supplied by local mineral springs. The mud was tested in Switzerland as well, long before the 90's, and the results proved that it had certain therapeutic properties and that it could be used primarily in treating rheumatic diseases. It is estimated that the Perșani mud is "stronger" than the one found in Techirghiol Lake, the latter increasingly affected by the lake's continuously rising fresh water intake (Kronidia, 2010). Currently, the mud at *Băile Perșani* is mainly used by elderly people, who come in during the summer for saltwater and mud therapies (Fig. 5), and who claim, according to the interviews conducted here, to be feeling very well as a result.



Figure 5. Mud therapy at *Băile Perșani* - left (Photo: Zaharia, 2012)
Figure 6. Mineral water pool in *Băile Perșani* - right (Photo: Zaharia, 2012)

Starting with 2009, *Băile Perșani* began a renovation and modernization process, but the investments are still rather modest. The saltwater pool was enlarged and compartmented, and throughout the season it is surrounded by sun loungers and beach umbrellas (Fig. 6). The adult pool has a depth of 1.50 m, while the children's pool is 0.50 m deep; the two are separated by a steel grid meant to protect kids from any sort of incident. The accommodation offer includes four-bed cottages (10) and couples' cottages (10), with a total capacity of 92 places, with 12 inside the Motel. Tents are also allowed in the vicinity of the lake. The outdoor facilities of the complex feature a shared bathroom for all cottages, shower cabins and two beach showers. The mud area is delimited by a small wicker-fence and there is a bench area nearby. The set-up includes a sector for relaxation and entertainment, as well as a lake used for pedal boating (Fig. 7). During the summer, 250 tourists were recorded daily. The complex include a restaurant (Fig. 8) used by the people coming in for baths during the tourist season (June 1st – September 15th), as well as by passers-by.

In order to include *Băile Perșani* on the official Romanian health resort list and to find a more efficient use of the local natural therapeutic potential (throughout the year, not only during the summer), a feasibility study is needed, one which would cover such a project's profitability, environmental and hydrogeological protection of the mineral water area, and urban planning and technical issues (water heating system, corrosion problems, sedimentation, etc.). This study should be developed by a team of specialists (geologists, architects, chemists and balneology doctors), taking into account all relevant aspects (economic, technical, scientific, environmental impact, tourist flow and related requirements, etc.) in anticipation of future development of the *Băile Perșani* Complex.



Figure 7. The lake and the paddle-boat area at *Băile Perșani* - left (Photo: Mereș, 2013)
Figure 11. Main entrance in the restaurant and the *Băile Perșani* Touristic Complex - right (Photo: Mereș, 2013)

7. CONCLUSIONS

The studies conducted over the years on the physicochemical parameters of the *Băile Perșani* mineral waters have shown that, given their therapeutic properties, they can be used for the treatment of rheumatic diseases. And due to the fact that in Brașov County, against the background of certain climatic particularities, “rheumatism is found on every corner”, it is important that the local decision makers re-evaluate this precious natural resource. Nowadays, *Băile Perșani* complex is functional exclusively during the summer and, moreover, mineral waters are being exploited in a similar way to what used to happen 100 years ago, relying on improvisation, without a clear strategy and action plan, even though the complex has been completely changed and modernized. For future development of the balneary Perșani area, research and investments are needed, which would have to cover the entire water capturing and transport infrastructure, as well as the mineral area’s protection, in order to keep the physicochemical properties close to their initial values along the path leading to the spa area. Also, in order to be officially recognized as a spa resort by the authorities (Ministry of Health, Ministry of Tourism, Balneology and Physical-Therapy Institute of Bucharest), all stakeholders (local and county administration, etc.) must work together in reviewing these matters. By attracting (mostly) European funds, through viable projects and programs, while aiming at a comprehensive feasibility study, Băile Perșani could become a major spa resort in Brașov County.

REFERENCES

- Berlescu, E., 1975, *Indicații și contraindicații de trimitere la cură balneo-climaterică* [Indications and contraindications of spa treatments], Editura Medicală, București, 319 p. [in Romanian]
- Berlescu, E., 1982, *Dicționar enciclopedic medical de balneoclimatologie* [Encyclopedic Medical Dictionary of Balneoclimatology], Editura Științifică și enciclopedică, București, 241 p. [in Romanian]
- Berlescu, E., 1996, *Mica enciclopedie de balneoclimatologie a României* [Small Romanian balneoclimatology encyclopedia], Editura All, București, 169 p. [in Romanian]
- Ciupagea, D., Paucă, M., Ichim, Tr., 1970, *Geologia Depresiunii Transilvaniei* [The geology of Transylvanian Depression], Editura Academiei R.S.R., București, 68 p. [in Romanian]
- Ciupagea, D., 1991, *L. Mrazec – Rolul său în descoperirea domurilor gazeifere din Transilvania* [L. Mrazec – his role in discovering Transylvanian gas domes], Editura Academiei României, București, 170-174 p. [in Romanian]
- Comitetul Geologic Român, 1953, *Reports Dări de seamă - Analize de ape minerale din R.P.R.* [Realizations – Mineral water analyses in the R.P.R.], București, 54p, 60-61 p. [in Romanian]
- Comitetul de Stat al Geologiei (Institutul Geologic), 1967, *Harta Geologica a României*, sc.1:200 000 [Geological map of Romania], București [in Romanian]
- Dorgo, 2010, *Stațiuni balneare din județul Brașov* [Spa resorts in Brașov County], http://amfostacolo.ro/romania-pareri,15/excursii-si-calatorii-in-ardeal,92,1486/descopera-ardealul,3541/impresii-sejur-si-fotografii-vacanta__12003.htm

- Krondia, 2010, *Băile Perșani, litoralul de la munte [Băile Perșani, a seaside in the mountains]*, http://amfostacolo.ro/romania-pareri,15/fagaras-bv,92,2959/redescopera-baile-persani,14159/impresii-sejur-si-fotografii-vacanta__12249.htm
- Morariu, F., Opreanu, I., Amărăscu, N., Borgovan, I., Chioreanu, T., 1955, *Stațiunile balneo-climatice din R.P.R. [Spa resorts of the R.P.R.]*, Editura Consiliului Central al Sindicatelor, 265 p, 280 p. [in Romanian]
- Munteanu, L., Stoicescu, C., Grigore, L., 1978, *Ghidul stațiunilor balneoclimatice din România [Romanian spa resort guide]*, Editura Sport-Turism, București, 190 p, 204 p. [in Romanian]
- Neuchâtel Laboratory, 1991, *Les résultats préliminaires sur l'analyse des eaux minérales de la vieille Spa Perșani [Preliminary results of the analysis of mineral waters at the old Perșani Spa]*
- Onciu, C., 2006, *Vine vremea băilor [The spa season is coming]*, Monitorul Expres, www.monitorulexpres.ro[in Romanian]
- Ștefănescu, C., 1967, *Stațiuni balneare și climaterice din România [Romanian spas and health resorts]*, Editura Meridiane, București.122 p. [in Romanian]