

MINERAL WATERS AND THERAPEUTIC MUDS FROM HOMOROD BATHS (BRAȘOV). CHARACTERISTICS AND EXPLOITATION

R. MEREȚ¹, L. ZAHARIA²

ABSTRACT. Mineral waters and therapeutic muds from Homorod Baths (Brașov). Characteristics and exploitation. The work aims to present some physico-chemical characteristics of mineral waters and muds from Homorod Baths, a succinct history of knowing and capitalizing on these resources and the possibilities for future development. It is based on the synthesis of information from specialized scientific papers (including cartographic documents), archive documents, as well as on the performance of own measurements on physical-chemical parameters (2011-2016) and interviews with locals and local authorities. On the basis of observations and field investigations, there are also presented aspects of the arrangements that existed for the purpose of exploiting the therapeutical factors and the present state of the Homorod Baths.

Key words: mineral waters, therapeutic mud, physico-chemical properties, exploitation, Homorod Baths.

1. INTRODUCTION

Mineral waters represent an important natural resource in Brasov County. Among the first information on the existence of mineral water sources on the current territory of this county, there is the dissertation thesis of the doctor Lucas Wagner (1773), entitled "*De Aqua Medicatis Magni Principatus Transilvaniae*", quoted by Berlescu (1971) and others, appeared in Brasov. Also, other places with mineral water sources in the county, such as *Perșani Baths*, *Homorod Baths*, *Baile Cohalm* (Rupea) and *Sărata Baths* in Veneția de Jos, are mentioned in important works: "*Carierile și apele minerale din România*" (Pascu, 1927); "*Apele minerale și stațiunile balneo - climaterice din Ardeal*" (Țeposu and Câmpeanu, 1921); "*Apele minerale și nămolurile terapeutice din R.P.Română*" (I.B.F., 1965), etc..

During the Second World War, the small spa facilities existing in the areas affected by the war were destroyed. Some were rebuilt and operated until 1975 - 1985 (eg. Homorod Baths, Rodbav Baths), others got "lost" over time (eg. Zizin Baths).

¹ Școala Gimnazială nr.19, 500218, Brașov, România, e-mail: kanord2908@yahoo.com

² Universitatea din București, Facultatea de Geografie, 010041, București, România, e-mail: zaharialili@hotmail.com

The present paper aims at highlighting some specific aspects regarding the mineral waters and the therapeutic mud from Homorod Baths: physico-chemical characteristics, short historical data on their use and possibilities for future use. It presents numerous information based on observations and measurements, which contributes to the completion and updating of the data on this site with mineral water and mineral sludge sources, therapeutic factors that could be used in the future, thus contributing to the development of spa tourism at the level local and regional.

2. DATA AND METHODS

The paper is based on the use of four data categories: 1) information obtained after consultation of specialized scientific papers (including cartographic documents); 2) information and data obtained from the study of archive documents from the County Directorate of the National Archives in Brasov (Homorod Monograph, Activity Reports, Minutes, etc.); 3) information obtained through observations and direct measurements on some physico-chemical parameters of the mineral water sources and the therapeutic mud, carried out during the period 2011-2016; 4) information resulting from own investigations during the aforementioned period: interviews with representatives of Homorod City Hall, with local people, observations on mineral water springs and current state of the former spa resort.

The methods used are of general character (eg, observation, analysis, synthesis, comparison) or strictly geographic (mapping of mineral water springs, maps, graphs, etc.) and statistical methods were used for the processing of hydro-climatic data. In order to identify some physico-chemical characteristics of the mineral waters at the Homorod Baths, measurements were carried out with the Hanna 9828 multiparameter, the obtained values being compared with those found in the bibliographic sources. Also, samples of water and therapeutic mud were collected, which were analyzed in specialized laboratories: the Laboratory of physico-chemical analyzes from the National Society of Mineral Water S.A. in Bucharest, the Water Quality Laboratory from the Water Management System in Braşov and the Laboratory of the Multidisciplinary Scientific and Technological Research Institute in Târgovişte. Characterization of mineral water springs was accomplished using the Mio Digiwalker C250 GPS device. For the morphological analysis of therapeutic mud samples and the determination of component chemical elements, was used the SEM electronic scanning microscope (SEM) SU-70.

GIS programs and techniques (Arc GIS 10.1, Arc Map, Globler Mapper, etc.) and Excel programs have been used to produce cartographic and graphical materials and reference data tables.

3. RESULTS AND DISCUSSIONS

3.1. General geographic characteristics of *Băile Homorod*

From an administrative point of view, the Homorod Baths belonged to the Homorod commune (Brașov County), the former balneary establishment being developed at approx. 2 km east of the town center. In the interwar period, the Homorod area was included in the county of Târnava Mare, and between 1950 and 1968 in the Stalin region. After the administrative division of Romania's territory in 1968, the location belonged to the territory of Brașov County. Homorod Baths were situated at 64 km from Brașov. From the national road DN 13 (E 60), in the Rupea-Gara area, the road DJ 131 A leads to Homorod (about 5 km). It continues on DN 132 in the direction of Jimbor and close to the exit from Homorod, it enters the Băilor Street (DC 30), the road leading to the former Homorod Baths (Figure 1). Homorod Baths could be reached also by train (Brașov - Oradea line), at about 800 m being Homorod Halt.

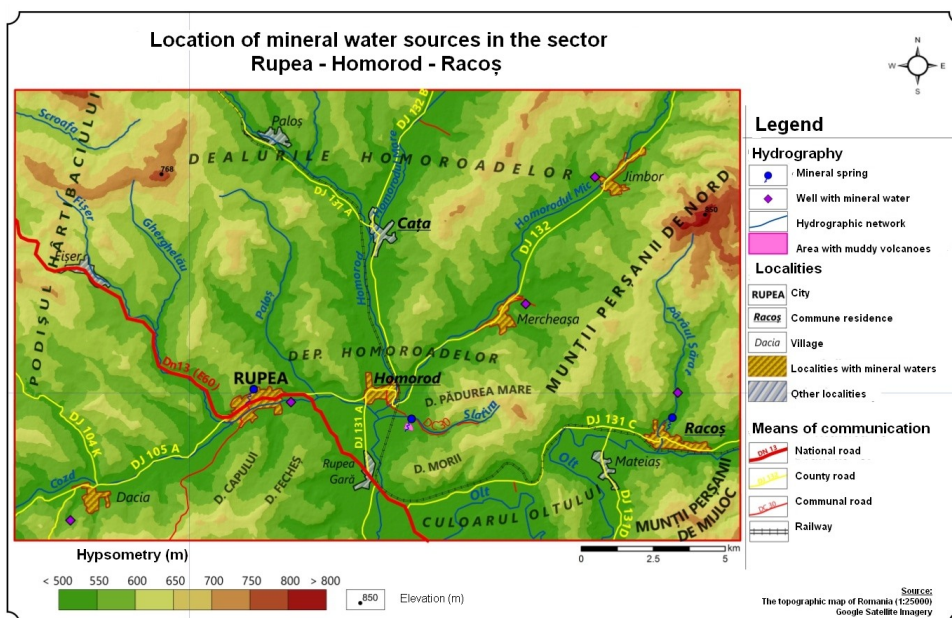


Fig. 1. Rupea - Homorod – Racoș Sector: the location of Homorod locality in the area where Homorod Baths were located (Basic maps: Topographic Map of Romania, scale 1: 25,000, Google Satellite Imagery)

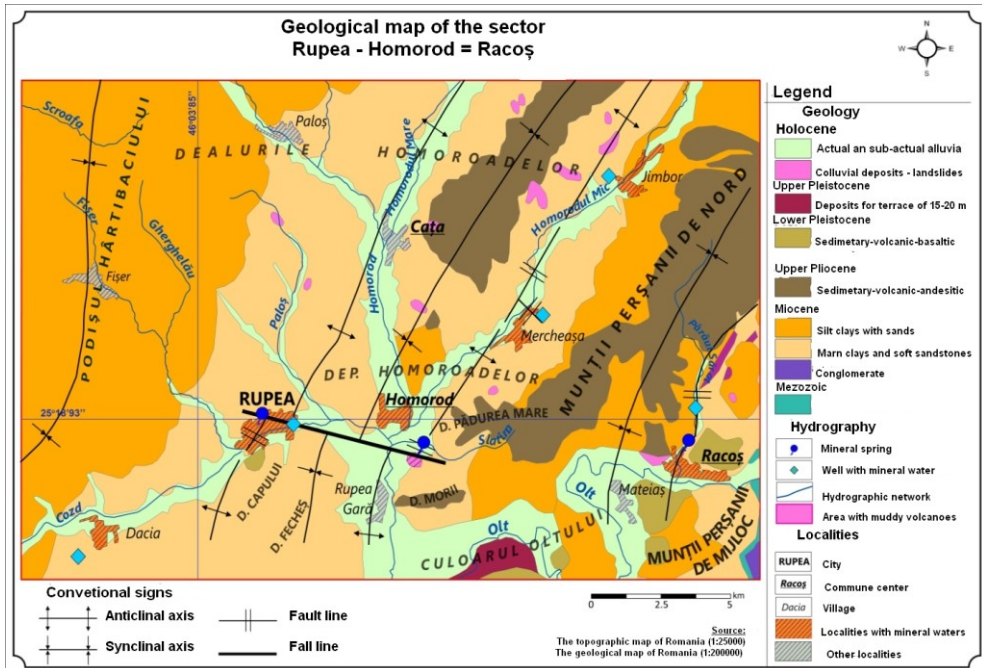


Fig. 2. Geological map of the Rupea - Homorod sector and the location of Homorod locality in the perimeter of Homorod Baths (Basic maps: Geological map of Romania, scale 1: 200,000, Romania topographic map, scale 1: 25,000)

From a geographic point of view, the location of the former Homorod Baths is in the Homorode Depression from the "Transylvanian Subcarpathians", on the left side of the Slatina Brook (the Zeifan Creek), a tributary of the Homorod River. The altitudes range between 460-470 m, and the mineral water sources are situated at 463-467 m altitude. As for the geological composition of the area where the former Homorod Baths were located, specific are sedimentary formations (sandy silt clays, marl clays and soft sandstones (Miocene formations)), and in the area of the Perșani Mountains - eruptive sedimentary formations (Upper Pliocene), such as andesite (Fig 2). In torrent piedmonts, proluvial deposits of river cones and in the geological formations from the area the terraces of the Rupea-Homorod basin are of Quaternary age, being represented by current and sub-actual alluviums (Ciupagea, 1970). The lithological characteristics influence the chemistry of the mineral waters in this area, which present a complex mineralization.

The specific climate in the Homorod area is the one of intracolinary depression. Between 1961 and 2013, the multiannual average temperature was 8.3°C, the maximum monthly average temperatures exceeding 25°C in the summer months (Figure 3). The average annual sunshine duration was 2042 hours. The average multiannual rainfall was 588 mm/year, and the atmospheric nebulosity was

6.15 tenths. The area is protected from strong winds, the predominant circulation of air being from northwest (Geographical Encyclopedia of Romania, 1982). The vegetation is represented by broadleaf forests (predominantly oak) alternating with secondary pastures, spontaneous vegetation being complemented by agricultural land, and specific soils are classified in the class of luvisolles.

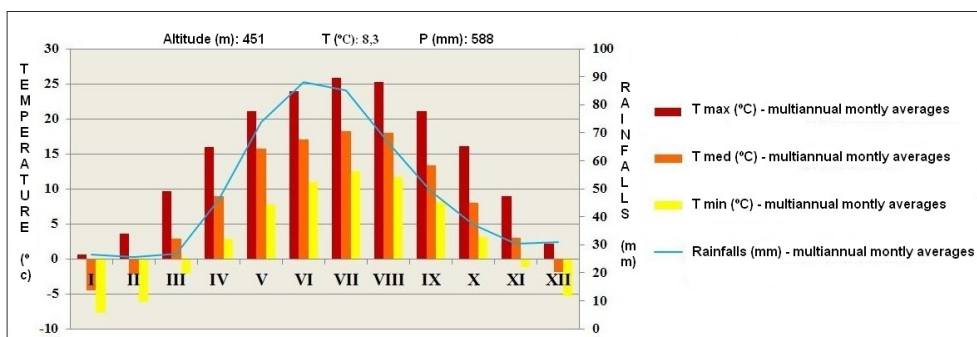


Fig. 3. Variation of air temperatures and rainfalls at Homorod between the years 1961 - 2013 (Data source: Dumitrescu și Bîrsan, 2015)

3.2. Characteristics of mineral water sources at *Băile Homorod*

The specialized bibliographical sources mention for Homorod Baths the existence of six - seven mineral springs captured and used for baths (external cure), springs formed on the Rupea - Homorod Fall (Fig. 2). During the study period (2011-2016), two springs (drillings) were identified on the left side of the access road to the former Baths, which we named Izvorul 1 (Spring 1) and Izvorul 2 (Spring 2) and one on the right, called Izvorul 3 (Spring 3) (Fig. 4).

Spring 1 (Figure 5.a) is about 20 m away from the access road and at an altitude of 463 m. The former trapped spring is enclosed in the form of a basin of 3 m long and 2 m wide, which allows the accumulation of mineral water around the drilling. The drilling (tube) is damaged.

Spring 2 (Figure 5.b) is at approx. 6 m away from the access road and at an altitude of 463 m. It is trapped, the drilling (pipe) having the same dimensions as Spring 1, without being fenced.

The spring 3 (Figure 5.c) is located on the right side of the road at a distance of about 30 m from it and at an altitude of 467 m. Until 2016 (January), the drill pipe was covered with a lid metal fixed in screws. Later (July 2016), it disappeared. Probably, it was stolen and taken to scrap iron, the verb "stealing" being the "word of order" at the former Homorod Baths.

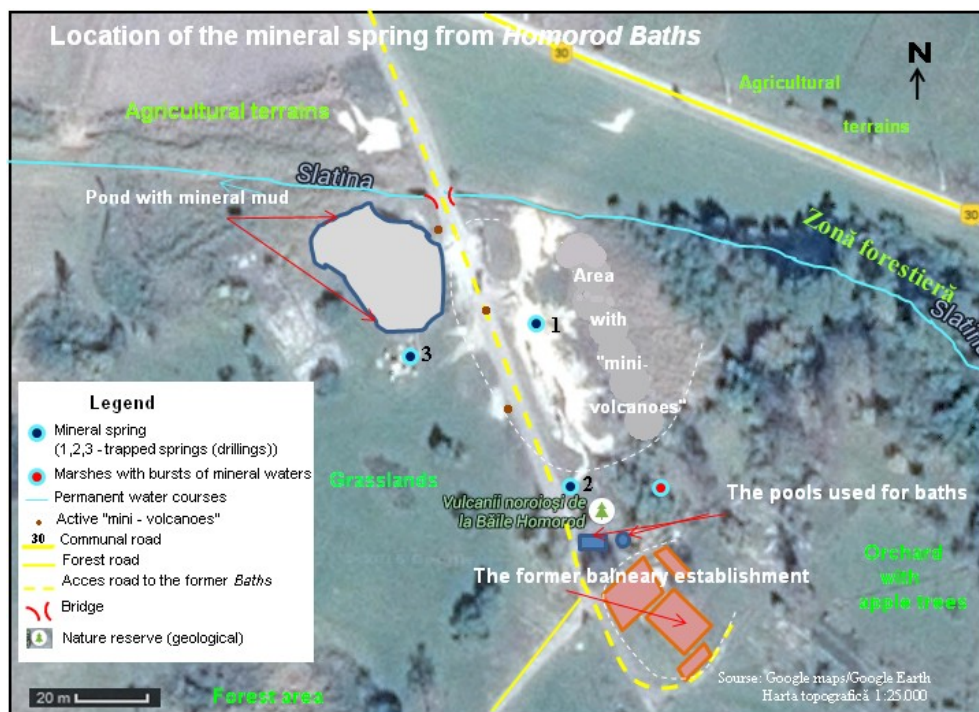


Fig. 4. Location of mineral springs at Homorod Baths (Source: Google Earth/Google Maps; topographic map of Braşov County)

The current state of the three springs is precarious, the drillings are largely destroyed or the water is not recovered, they were collapsed by depositing mineral salts. The other springs mentioned in older sources were probably trapped in the two basins used for bathing (Fig. 6.a, b).

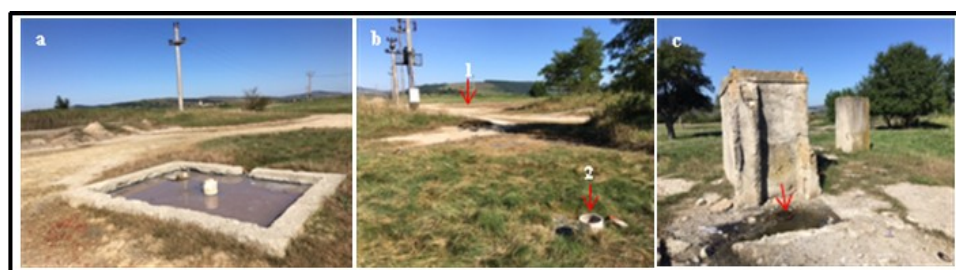


Fig. 5. Mineral water sources at Băile Homorod: a - Spring 1; b - Spring 2; c - Spring 3 (Author: Meret, 2011, 2016)

At a distance of approximately 35-40 m from the road, in the shrub / tree area and at an altitude of 467, during the study period (2015), small springs of

mineral water were observed. The deposition of "brimstone" at the surface of the soil, determines us to include these small springs in the category of sulfuric waters specific to the Homorod Baths. The old basins, used in summer for external cure, are located a short distance from the access road (2-7 m) and at an altitude of approx. 464 m.



Fig. 6. Other mineral water sources at Băile Homorod: a and b - mineral water trappement basins; c - area with small springs of mineral waters

The eruption sites of the sulphurous "mini-volcans" (Fig.7) also represent "points" of surface appearance for the mineral water.



Fig. 7. Location of sulphurous "mini-volcanoes" at Băile Homorod (Author: Meret, 2015)

According to the old physic-chemical analyzes, at Homorod are present sulphurous, chlorinated, bicarbonated, sodium, and hertone mineral waters (I.B.F., 1965; Berlescu, 1971 and others).

During our study, water samples from Spring 2 were analyzed at the National Mineral Water Society S.A. (S.N.A.M. S.) in Bucharest (September 2015) and the Water Management System (SOG) in Brașov (July 2014). Measurements for different physico-chemical water parameters were performed with the Hanna 9828 multiparameter for Spring 2 (most measurements) and sporadically for Spring 1 and Spring 3, and two samples of sulfide mud were taken and analyzed at the Institute of Scientific and Technological Multidisciplinary Research in Târgoviște.

The water sample from Spring 2 analyzed at S.N.A.M. S.A. in Bucharest, showed a pH value of 7.635 upH (neutral to alkaline water), a water conductivity of 22,600 mS/cm (22,600 mS/cm) and total dissolved salts (TDS) of 11,47 g/l. Among the anions, higher values were recorded for chlorine (Cl⁻) with 5.445 g/l, bicarbonates (HCO₃⁻) with 4.544 g/l and sulphates (SO₄⁻) with 0.849 g/l. Nitrate (NO₃⁻) and nitrite (NO₂⁻) recorded low values, but above the quantification limits (nitrates by 3.71 mg/l and nitrite by 0.03 mg/l). Of the cations, the higher value was recorded by sodium (Na⁺), ie 5.477 g/l. Specific for Homorod mineral waters is hydrogen sulphide (H₂S), the value indicated in Bucharest (S.N.A.M. S.A.) being 6.7 mg/l, but it should be specified that it was not fixed on site as specified in the sampling methodology. We think the value is higher, with a strong smell of sulfur in the area ("rotten eggs").

Measurements performed with the Hanna 9828 multiparameter in the period 2012-2016 for Spring 2 indicated a pH with an average value of 7.74 upH, a water conductivity of 21.55 mS/cm, total dissolved salts (TDS) with a mean value of 11,260 g/l and water salinity with an average of 12,99 g/l. The water temperature of the spring varied according to the month / season (the average value being of 10.82°C), which illustrates that the groundwater is not deep. Pascu (1927) mentions that the drilling has a depth of 8 m. Mineral water presents impurities, determined by the deposition of mineral salts on the drill pipe, it has a salty taste and a strong sulfur odor. The flow rate is small and with very small variations in time (0.005 l/s in August, 2014, 0.008 l/s in May, 2015), the average being 0.006 l/s (Figure 8). It may have been unused for many years (since 1975) that the drilling is clogged and therefore the flow measurements have not shown an exact situation.

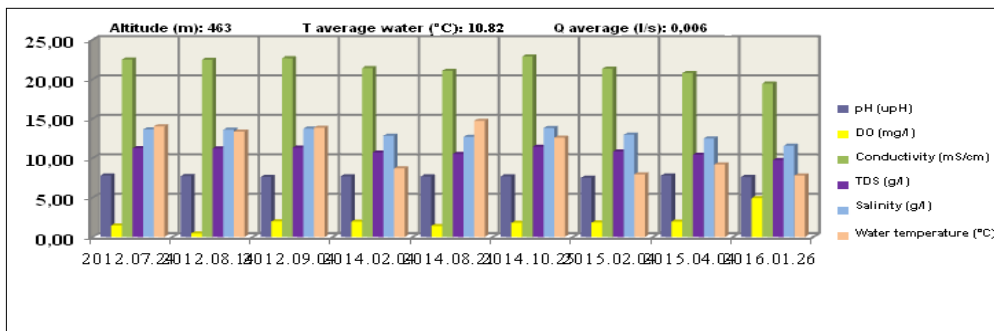


Fig. 8. Spring 2 from Băile Homorod: physical and chemical parameters variation in the period 2012-2016 (Data source: measurements made by Meret)

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Comparing the physico-chemical parameters of Spring 2, obtained from the measurements performed with the multiparameter Hanna 9828, with the other sources of mineral waters in the county, it is observed that the water of this spring presents a medium mineralization towards the sea (Fig. 9).

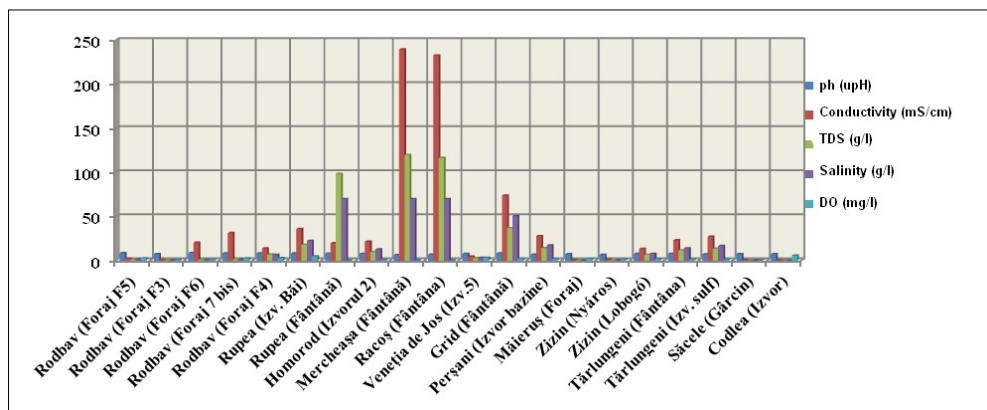


Fig. 9. Localities with mineral water sources in Brașov County: variation of the main physico-chemical parameters during the period 2012-2016 (Data source: measurements made by Meret)

Also, comparing the results of the analyzes carried out during the study period in the field or in the specialized laboratories with the results of the older analyzes, existing in the literature, for Spring 2, we can state that the water has physico-chemical parameters unchanged and, as a result, may represent a therapeutic potential of local or regional importance in the future as well.

For Spring 1, only two measurements were performed with the multiparameter Hanna 9828, as we considered that the results would not be relevant. Drilling water accumulates in the surrounding pond and stagnates over time, changes its physico-chemical parameters or is diluted by the intake of precipitation water and snow melting. The measurements made indicate a salinity value of 12.10 g/l, water conductivity of 20.41 mS/cm, when the total dissolved salt (TDS) value was 10.530 g/l.

For Spring 3, a single measurement was performed with the Hanna 9828 multiparameter in January 2016 (found to be the end of the study), with water having a pH of 7.53 upH, a conductivity of 21.50 mS/cm, total salts (TDS) of 10.68 g/l and salinity of 12.70 g/l. We believe, however, that the values were slightly altered by the melting of the snow around the drilling, the resulting water, mixing with the drilling water.

3.3. Physico-chemical characteristics of the therapeutic mud from Homorod Bath

Two samples of sulphurous sludge, one of the eruption sites of a sulphurous mini-volcano, called Homorodul Mare, and a sample of mud accumulation called Homorodul Mic were taken from Homorod Baths. For Homorodul Mare, SEM morphology images indicated that the sample has a granular structure and is compact without any other impurities (leaves, stones, roots, etc.). From the chemical composition point of view, the data obtained by EDS have shown that it is a fairly homogeneous sample, the chemical elements being uniformly distributed. The chemical elements with the highest atomic and mass weights are oxygen, silicon, aluminum, iron, calcium etc. (Fig.10.b, c).

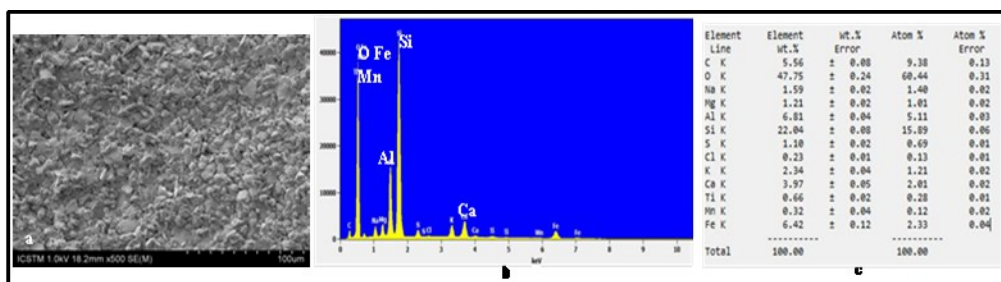


Fig. 10. The mud sample from Homorod Baths, called Homorodul Mare: a - image of SEM morphology; b - graphical representation of the chemical composition of the sample; c - the atomic and mass percentages of the sample (Data source: sample harvested by Meret and analyzed at I.C.S.T.M. of Târgoviște, 2016)

The specimen, called Homorodul Mic, also featured a compact, granular structure with coarse inclusions, and from a chemical point of view, the elements showed an uneven distribution, but similar to the sample called Homorodul Mare.

3.4 Brief historic of the Homorod Baths Spa Establishment

The Homorod Baths were founded by Ioan Weiss in 1880 and functioned in a first stage until 1939. On the map from "*Carierile și apele minerale din județul Târnava Mare*" (Pascu,1927), Homorod Baths appear as chlorosodic, sulphurous water baths, and Pricăjan (1985) mentions that hot and cold baths were carried out at the Homorod Baths between 1926 and 1927.

By Ministerial Decision no. 94 655 of the Ministry of Labor and Social Welfare, dated December 12, 1933, the Homorod Baths were declared a "small spa facility" (a bath of local interest) (File No. 94/1937, D.J.A.N., Braşov). Also, according to the Report made by Weiss, in 1937, at the request of the National Tourism Office (ONT) in Bucharest, the spa facility at Honterus Baths was

represented by a building in which there were 12 double rooms and 22 rooms with one bed, and for bathrooms (external cure) there were seven rooms. In other archive documents, it is mentioned that in 1938, the Homorod Baths - "Honterus", were equipped with a spa facility, a restaurant and the adjoining terrain, the surface being 14 "juggery", the equivalent of 8.0850 m² (Pretura Platei Rupea, File No. 186, DJAN, Brasov).

According to the statistical bulletin made in 1948 (December 10, 1948), at the request of the Mediaș Mines Inspectorate, the Homorod Baths functioned until 1939. The fighting waged in the area towards the end of the Second World War (the retreat of the German troops) led to Destruction of the Homorod Baths. Also, it was mentioned that large investments were required for the rehabilitation of the spa facility (Pretura Platei Rupea, File 186, D.J.A.N., Brașov). There were no documents showing that the spa was rebuilt, but from interviews with local people and other informative sources (newspaper articles and TV shows), it was possible to establish that at Homorod were performed works of reconstruction of the main building and treatment facilities, the Baths serving as a spa of local interest (especially) until 1975. During the 1970s, the Baths were administered by the Predeal branch of the National Tourist Office (Morariu et al., 1955).

According to the article entitled "The Homorod Baths destroyed from the grounds" in the local newspaper "Bună ziua Brașov" at Homorod, "people came in crutches, helped by companions and left on their feet. There were seven, eight treatment valves, and a terrace "(Cioineag, 2010, discussions with locals in 2012 and 2014). As a result, the mention of the Homorod Baths in the work "Stațiunile balneare de-a lungul timpului și azi" (Berlescu, 1971), where the location appears as a permanent spa of local interest where rheumatic, gynecological and dermatological diseases were treated Berlescu, 1975).

After 1990, the Homorod Baths land was returned to the heirs of Ioan Weiss, owner Emilia Binder. She tried to sell the land and what was left of the former Baths, but there were misunderstandings over the price, the transaction did not take place. After the new owner left the location (by the year 2000) (Homorod City Hall), from that moment, the total degradation of the spa was started.

In 2014, remnants of walls, ditches that were the foundations of buildings (Fig. 11a), sandstone debris (Fig. 11b) and mineral springs trappement basins remind of Homorod Baths in 2014. In 2009, 2010, at the entrance there was the indicator on which the Homorod Baths were written, and the fir tree alley ("the promenade alley") was almost intact. But in 2014, tree trunks only witnessed some past "deeds" (Figure 11.c).

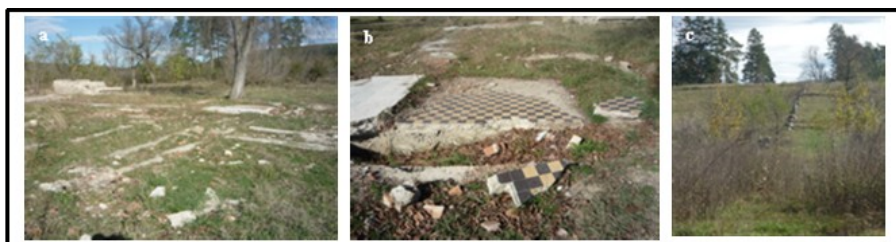


Fig. 11. Homorod Baths: a - "traces" of the old spa establishment; b - "image" inside the former establishment; c - "the promenade alley" (Author: Meret, 2014)

Slowly, these last "proofs" of the existence of a treatment site for the local population will disappear, and the inhabitants will nostalgically remember the "restaurant", the "beer served on the terrace" and the fact that "the mud was very good for bone recovery".

3.5. Prospects for the exploitation of mineral waters and therapeutic mud at Homorod Baths

The therapeutic factors specific to the Rupea - Homorod area (mineral waters, sulphurous mud and sparing bioclimate) could be redeemed by building a spa complex located somewhere in the middle of Rupea and Homorod. For this purpose, it is necessary to co-opt all competent and interested "forces" in making such a joint project. Also, the establishment of such a location would be justified by the fact that the groundwater in that area had a much higher salinity than that in the area of the former Rupea iodo - sulfurice Baths or Homorod Baths, and on the other part, the complex would be closer to the area with mineral waters and mineral mud from Homorod Băile. As a result, due to the existence of various therapeutic factors, the benefits would be much greater for those who would come to treatment in the Homorod - Rupea area. The existence of two spa resorts with a very small distance between them (4-5 km) and having similar therapeutic factors, we think it would not be a favorable solution either for Rupea or for Homorod. Feasibility studies should be complete and complex and taking into account the legal situation of the land so that no disputes arise between landowners and local authorities or other institutions wishing to invest in such a project. In this sense, we think that the "first step" would be to solve the problem with the Homorod Spa, where no consensus has been reached between the owner and the local authority (Homorod City Hall).

4. CONCLUSIONS

Situated in the contact area of the Transylvanian Depression area (the diaper fault area) with the western side of the Persian Mountains (extensions of the volcanic unit specific to the western Carpathians), the location where the Homorod

Baths have been developed has benefited from mineral water sources with therapeutic effect. These waters, which have different physico-chemical characteristics and a degree of medium mineralization to high (especially chlorosodic, sulphurous mineral waters), to which sulphurous mud is added, determined the establishment, starting with the year 1880, of a small a spa establishment that has expanded over time and which functioned intermittently until 1975. The conditions that could be treated here were mainly of rheumatic nature.

Nowadays, there are only a few "traces" on the site of the former Homorod Baths, although the measurements made by us indicate that the physico-chemical parameters of the water have not changed from the values identified in old bibliographic sources.

Achieving a viable project based on complex feasibility studies (targeting the trappment and transport infrastructure, delimiting the area of protection of the area with mineral waters, etc.) could result in the transformation of the Homorod Baths into a local spa area and regional as it once was, contributing, together with other localities with mineral water sources in Brașov County, to the development of the spa tourism in this county.

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