

THE ROLE OF HYDRO MINERAL RESOURCES IN THE TERRITORIAL DEVELOPMENT OF THE LAND OF DORNA

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ABSTRACT. – The role of hydro mineral resources in the territorial development of the Land of Dorna. Identifying and analyzing the hydro mineral potential of the Land of Dorna is an essential condition for understanding how this resource has made its mark over time over the process of territorial organization and planning. At the same time knowing the main hydrographic features will help to shape the future directions for their use. The study analyses both qualitative and quantitative components of groundwater, being pursued especially the following levers: the manner in which water resources have influenced the human component established in those parts, the way in which the resources were used and the way in which those resources were integrated in the local and national economic circuit. In conclusion we can say that the Land of Dorna has a high potential of hydro mineral resources, which highlights the role of this in the territorial development at the same time.

Keywords: resources, mineral waters, spa, development, regression.

1. INTRODUCTION

The geological characteristics given by the presence of highly tectonic and faulted morphological structures as well as the climatic elements have determined the hydro mineral potential of the Land of Dorna. In the middle of this community the great variety of hydro mineral and mineral resources have given a certain type of behaviour on capitalizing these waters. Among the ancient uses we can mention floating activities, empirical medicine, and balneotherapy combined with climatotherapy, mineral waters bottling etc. Nowadays there are in use activities related to balneology and mineral waters bottling.

The organization of balneo spas has been an important preoccupation for the specialist from the ancient times. The concept of *balneo spa* and its related activities differs from one place to another. In Romania and not so long ago in other European states, the concept only referred to the treatment of medical diseases, while in the U.S.A. the significance of the concept has evolved in the past few decades aiming at touristic relaxation activities and mental and spiritual recovery, all this industry being based on profit (Lund, J.W., 1996, p. 105). Thus, on the greatest part of the international touristic market, balneary tourism relies on the satisfaction of modern man's demands and needs (tourist accommodation and treatment facilities, relaxation and beauty spas, leisure areas etc.).

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In Romania³ the balneary segment has known a progressive regression beginning with the '90s, in spite of the current potential.

Taking into consideration the balneary tradition in the Land of Dorna (Cârlibaba, Ciocănești, Coșna, Dorna Arini, Dorna Candrenilor, Iacobeni, Panaci, Poiana Stampei, Șaru Dornei, Vatra Dornei) the purpose of this paper is to emphasise the impact of hydro mineral resources and other local elements (mineral and climatic resources) over the development of this region, revealing possible measures for revitalization of balneary segment at the same time.

2. THE CHARACTERISTICS OF HYDRO MINERAL RESOURCES AND OTHER LOCAL NATURAL ELEMENTS

The hydro mineral potential in the Land of Dorna is given by the existence of a great number of mineral springs placed in seven reserves: Coșna (Poiana Vinului), Coșnița (Poiana Coșnei), Dorna Candreni, Păltiniș, Poiana Negrii, Șaru Dornei and Vatra Dornei. The hydro mineral emerges of the deposits are given by bicarbonate, carbonated, calcic, , ferruginous, hipotone, magnesian, sodium, slightly chloride and arsenic mineral waters.

The northern part of the Coșna-Poiana compartment includes the *Coșna (Poiana Vinului)* hydro mineral deposit accumulated in the Oligocene shales and gritty sandstones near the Măgura Coșnei dyke (Pricăjan, A., Airinei, Șt., 1979, p. 98). Their main features are the high levels of Fe content (13.3 mg/l) and a total amount of mineralization of 4717.3 mg/l, from which 2941.6 mg/l being CO₂ (Pricăjan, A., Airinei, Șt., 1979, p. 98).

Table 1. Chemical composition of Coșna deposit
(sources: Goliță and colab., 1969, quoted by Chiriță, V., 2003, p. 201)

Coșna (Poiana Vinului) mg/l							
Cl ⁻	NO ₃ ⁻	SO ₄ ⁻	AsO ₄ ⁻⁻⁻	HCO ₃ ⁻	Na ⁺	K ⁺	Li ⁺
66.7	1.2	8.0	absent	1134.1	354.6	24.3	0.5
NH ₄ ⁺	Ca ⁺⁺	Mg ⁺⁺	Fe ⁺⁺	Mn ⁺⁺	Al ⁺⁺	HBO ₂	CO ₂
absent	68.1	8.1	13.3	absent	absent	17.2	2941.0
Total amount of mineralization 4710.34							

Poiana Negrii (Negrișoara) deposit lies on the eastern part of the Coșna-Poiana compartment consisting of clay silicates, andes, nummulitic limestones, conglomerates and grindstones. The gas lift phenomenon using CO₂ and the pressure of the aquifer layers determine the artesian character of the springs (Pricăjan, A., Airinei, Șt., 1979, p. 92).

³ By "balneo spa" we can understand the locality or/and the area with mineral resources, scientifically proven and traditionally admitted as effective in therapy, using proper equipments in treatments and with a structure that allows adequate balneary medical assistance – chapter I, art.1 (1), let. a, from Decree Law nr. 109/31 August 2000 regarding balneo, climatic and balneoclimatic spas and balneo and rehabilitation assistance, published in the Official Monitor nr. 426/2 September 2000.

Table 2. Chemical composition of Poiana Negrii deposit
(source: Goliță and colab., 1969, quoted by Chiriță, V., 2003, p. 201)

Poiana Negrii (Negrișoara) mg/l							
Cl^-	NO_3^-	SO_4^-	AsO_4^{---}	HCO_3^-	Na^+	K^+	Li^+
40.5	absent	0.36	absent	1801.7	184.3	22.5	0.52
NH_4^+	Ca^{++}	Mg^{++}	Fe^{++}	Mn^{++}	Al^{++}	HBo_2	CO_2
absent	322.6	61.3	12.3	3.1	2.3	6.8	2522.3
Total amount of mineralization 5080.79							

The existence of *Coșnița (Poiana Coșnei) deposit* at 950 m altitude identifies with the presence of Borcutului fault, which makes it possible the emergence of CO_2 and the occurrence of breaks in crystalline schist's covered by thick deluvial-proluvial sediments and a thick layer of turf (Pricăjan, A., 1980, p. 125).

Table 3. Chemical composition of Coșnița deposit
(source: Goliță and colab., 1969, quoted by Chiriță, V., 2003, p. 201)

Coșnița (Poiana Coșnei) mg/l							
Cl^-	NO_3^-	SO_4^-	AsO_4^{---}	HCO_3^-	Na^+	K^+	Li^+
11	1.2	9.9	absent	525.1	59.4	11.4	0.1
NH_4^+	Ca^{++}	Mg^{++}	Fe^{++}	Mn^{++}	Al^{++}	HBo_2	CO_2
absent	92.3	9.8	15.3	8.0	absent	9.8	2593.4
Total amount of mineralization 3410.6							

The presence of Negrișoara and Obcina faults, alongside the geological complexity of Dorna Candreni area, has eased the storage of mineral waters in the water bed. Thus, the hydro mineral deposit from *Dorna Candreni* contains 11 mineral springs and 2 gauges disposed on two alignments running E-V and NV-SE with a total amount of mineralization between 1112-3266 mg/l in the case of springs and 4800-5464 mg/l in the case of gauges, having low natural discharges (0.1 l/s) (Chiriță, V., 2003, p. 202-205).

Table 4. Chemical composition of Dorna Candreni deposit
(source: Goliță and colab., 1969, quoted by Chiriță, V., 2003, p. 201)

Dorna Candreni mg/l							
Cl^-	NO_3^-	SO_4^-	AsO_4^{---}	HCO_3^-	Na^+	K^+	Li^+
2.5	1.2	3.2	$PO_4 = 4.1$	901.1	5.1	1.3	1.7
NH_4^+	Ca^{++}	Mg^{++}	Fe^{++}	Mn^{++}	Al^{++}	HBo_2	CO_2
$Sr^{++} = 4.6$	258.4	12.4	10.7	0.69	1.3	1.3	2250.6
Total amount of mineralization 3494.6							

The hydro mineral deposit from *Păltiniș* is located in the south-eastern part of the area having carbonated origin and canted in the magnesian limestones of the crystalline-mesozoic zone. The western part of this area lies under the volcanic rocks of the Călimani Mountains. In the south we can find the *non-carbonated deposit from Băjenaru* formed by interbedding the magnesian limestones and mica-schists (<http://aquacarpatica.com/#/ro/tara-izvoarelor/hidrogeologie>, seen on 4.12.2012, 11.30 hours).

Table 5. Chemical composition of Păltiniș deposit

(source: <http://aquacarpatica.com/#/ro/cea-mai-pura-apa/compozitie>,
seen on 4.12.2012, 12 o'clock)

Păltiniș mg/l							
Cl^-	NO_3^-	SO_4^-	AsO_4^{---}	HCO_3^-	Na^+	K^+	Li^+
absent	absent	absent	absent	1281.0	4.8	0.93	absent
NH_4^+	Ca^{++}	Mg^{++}	Fe^{++}	Mn^{++}	Al^{++}	HBo_2	CO_2
	280.0	86.0	0.096	absent	absent	absent	3520.0
Total amount of mineralization 1765.11							

Table 6. Chemical composition of Băjenaru deposit

(source: <http://aquacarpatica.com/#/ro/cea-mai-pura-apa/compozitie>,
seen on 4.12.2012, 12.15 hours)

Băjenaru mg/l							
Cl^-	NO_3^-	SO_4^-	AsO_4^{---}	HCO_3^-	Na^+	K^+	Li^+
absent	0.73	absent	absent	219.6	0.66	0.9	absent
NH_4^+	Ca^{++}	Mg^{++}	Fe^{++}	Mn^{++}	Al^{++}	HBo_2	CO_2
<0.03	48.6	14.3	0.087	absent	absent	absent	absent
Total amount of mineralization 278.8							

The presence of realgar and orpiment seams in the crystalline schists of the Șarului compartment and the presence of yellow sulphured of arsenic layer confers to Șaru Dornei deposit various qualities because of the existence of arsenium (As). The specific element of the deposit is given by the slightly arsenic mineral waters.

Table 7. Chemical composition of Șaru Dornei deposit

(source: Goliță and colab., 1969, quoted by Chiriță, V., 2003, p. 201)

Șaru Dornei mg/l							
Cl^-	NO_3^-	SO_4^-	AsO_4^{---}	HCO_3^-	Na^+	K^+	Li^+
37.98	1.7	11.37	6.9	1083.25	225.76	9.7	0.6
NH_4^+	Ca^{++}	Mg^{++}	Fe^{++}	Mn^{++}	Al^{++}	HBo_2	CO_2
absent	147.4	17.06	5.8	1.26	0.7	51.2	1874.2
Total amount of mineralization 3525.9							

The hydro mineral deposit from Vatra Dornei is formed by approximately 17 mineral springs located in the alluvial deposits of the Dorna river terrace. Different types and structure of the rocks have determined a great variety of carbonated mineral waters: bicarbonate, calcic, magnesian and sodium ones, having a total amount of mineralization between 250-4000 mg/l and 500-2800 mg/l of CO_2 (Pricăjan, A., Airinei, Șt., 1981, p. 73).

Table 8. Chemical composition of Vatra Dornei deposit

(source: Goliță and colab., 1969, quoted by Chiriță, V., 2003, p. 201)

Izvorul de Est -Vatra Dornei mg/l							
Cl^-	NO_3^-	SO_4^-	AsO_4^{---}	HCO_3^-	Na^+	K^+	Li^+
4.3	absent	6.9	remains	135.7	14.7	0.8	0.7
NH_4^+	Ca^{++}	Mg^{++}	Fe^{++}	Mn^{++}	Al^{++}	HBo_2	CO_2
absent	12.4	7.8	11.4	0.67	1.0	11.1	1474.9
Total amount of mineralization 1709.7							

Natural aerosols with attars emanated from coniferous forests related with high ionization and ozonation of the atmosphere and the benefic influence of the sunbeam determine the climatotherapeutic potential of the Land of Dorna. The

parks from Vatra Dornei, Dorna Candreni and Iacobeni, as well as the Runc Plateau represent buffer zones for climatic treatments because of the clean air stimulating the nervous system.

Another local resource that influenced the development of the most important economic sector was peat. It was used in balneotherapy as medical paste and mud baths mixed with mineral waters. In the past, a piece of the turf resources with therapeutic effects (those with high qualities) was exported, leading to the exhaustion of some deposits and cutting down this kind of services in the present time.

3. DEVELOPMENT OF BALNEARY HEALTH RESORTS IN THE LAND OF DORNA

Because of the therapeutical properties of the hydro mineral, mineral (turf) and climatic resources in the Land of Dorna they were used in treating various medical affections even from ancient times. In popular belief mineral waters were thought to have had magic properties being used not only in religious practices but also in empirical medicine.

The organization and planning processes of balneo-climateric resorts have encountered a series of problems, which detained the development of the locality in the Land of Dorna. Frequent attempts of establishing modern balneary settlements have always “bumped into” the disapproval of Austrian authorities. Many scholars of those times believed that „including mineral waters from Dorna in the category of the noble ones in Europe could harm to the development of balneary resorts from Freuenberg [...] and Offen (Țăranu, P., 1999, vol. 3, p. 30).

In spite of the difficulties, there were built three balneoclimateric resorts in the Land of Dorna: Dorna Candreni, Iacobeni and Vatra Dornei, which have worked on the basis of local traditional principles inherited from one generation to another. Also there were designed some projects for raising other resorts (Șaru Dornei, Runc etc.), but these remained only on paper.

3.1. Balneoclimateric resort from Vatra Dornei

Despite the existence of natural resources with curative properties and a central position in the region, the resort in Vatra Dornei has had a sinuous development.

In the first stage (traditional one) the main hydro mineral and mineral resources were used by the locals in empirical medicine and religious rituals. Because of the intensification of commercial trades (after 1775), the curative properties of these waters have reached the ears of the Habsburg Empire, leading to the increasing of ill people coming for medical treatment. By the year 1813 Vatra Dornei became “the Mecca of health” (Țăranu, P., 1999, vol. 3, p. 31) without having modern infrastructure to face other balneary resorts.

The lack of proper infrastructure overshadowed the Vatra Dornei locality for a long period of time (1820-1845). At the same time the modernisation of some services led to the increase in tourist arrivals and the locality was raised at the rank

of town in 1855. Thus, the Izvorului Ioan building became a heraldic element emphasizing the role of the mineral springs in the community.

The fame and profitableness of the balnear treatments here in Vatra Dornei have brought forth the necessity of building a modern balneary resort. Thus, in 1886 the Austrian sovereign agreed on the beginning of reinforcement the international balneo-climateric resort in Vatra Dornei. Therefore, they started building dwellings (Oțelul I, Casa Vladimir etc.), modern capitalization of mineral waters was implemented (Ioan, Sentinela, Ferdinand etc.); started the construction and acquisition of modern equipment in the Băilor Establishments (I și II); the construction of other public interest buildings (the Băilor Casino, the Romanian National Palace, Vatra Dornei-Băi train station, Catholic Church, Jewish Temple etc.); the rearrangement of the central park as well as other works to be implemented in the modernization of local technical infrastructure. In 1907 Vatra Dornei became city and this period of time represented the climax of balneoclimatology in the region.

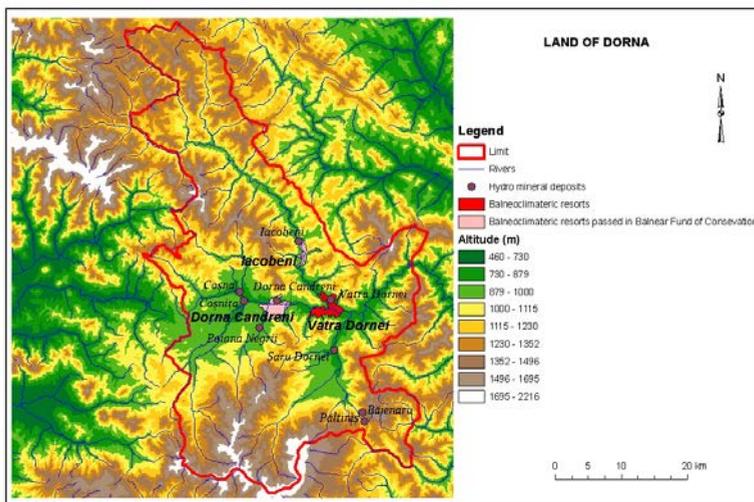


Fig. 1. The hydro mineral resources in the Land of Dorna

However the two World Wars have brought a series of material damages to these resorts and to the main dwellings of the spa, but all of these being overcome along with the nationalization (1948), when the greatest part of the affected buildings were rebuilt. Especially in this period of time balnear activities concentrated on the scientific part, when rest homes were built and balnear treatments became very complex.

When the political régime changed (1989), the balneary resort in Vatra Dornei knew a continuous downfall because of the lack of interest from the local and national authorities and simultaneously creating dysfunctions in balneary tourism.

For the past few years (after 2000) the authorities have tried to fix these problems by attracting tourists with improved services and to satisfy the needs of modern man. Thus, besides traditional balneary treatments (mud bath and wrapping, natural plant baths, aerosol therapies etc.) there were included some

modern ones such as galvanic baths, artificial mofettes, magnetotherapy, ultrasound and ultraviolet therapy, sulphur baths and other services: kinetotherapy, indoor swimming pool, sauna, gyms etc.

These mineral waters have provided reliefs for many medical disorders and illnesses including rheumatism, locomotor problems, blood circulation, nervous diseases, metabolism and gynaecological disorders.

3.2. Balneoclimateric resort from Dorna Candreni

The quality of the hydro mineral resources in the Dorna Candreni deposit and the local climate have led to a modern balneary establishment (1898) equipped with hitechnology (apparatus for carbonic acid baths, peat baths and climatotherapy), which assured treatment for some disorders such as nervous diseases, blood circulation, cardiovascular problems etc.

After World War I many buildings were destroyed. Thus, using local funds, the authorities were able to rebuild certain dwellings and reopen for tourists. Because of the importance of these waters, Dorna Candreni locality became a balneoclimateric resort in 1925 (Decision no. 9892 of the Ministry of Health and Social Welfare, Țăranul, p., 1999, vol. 3, p. 201). This facility ran until 1937 when the main establishment burnt to the ground.

After World War II the balneoclimateric resort was included in the Balnear Fund of Conservation (Elena Berlescu, 1982, p. 140, quoted by Țăranu, P., 1999, vol. 3, p. 201) and all the activities were stalled. Any attempt of reopening the resort remained only on paper.

3.3. Iacobeni resort

Therapeutical values of sulphurous and oligomineral springs in Iacobeni have generated continuous flow of tourists beginning with the habsburgic period. These waters were used for internal and external purposes (baths with mineral water, medicinal plants, arnica etc.) treating different nervous system and peripheral affections. Thus, in 1927 the first balneary establishment was raised with the help of the Romanian Orthodox Church in Bucovina.

Besides the arrangement and organization plans of the new spa there were made some works to modernise the whole town with improved public services and technical-urbanistic endowments.

Material damages after the two World Wars and the lack of money (accent being set on the restoration and modernisation of the balneoclimateric resort in Vatra Dornei) led to the closure of this facility and it entered the Balnear Fund of Conservation in spite of the therapeutic potential (Elena Berlescu, 1982, p. 178, quoted by Țăranu, P., 1999, vol. 3, p. 203). As well as in the case of the balneoclimateric resort in Dorna Candreni there were some trials to reopen the facility but with no success.

4. PERSPECTIVES ON DEVELOPING BALNEOCLIMATOLOGY IN THE LAND OF DORNA

The hydro mineral resources in the Land of Dorna were the main natural components which influenced the development of one traditional economic sector of the region namely the balneoclimateric one. An important role lies on the mineral (turf) and climatic resources. Besides the expansion of balneoclimateric resorts there were other economic activities in development (food industry, hotel industry, wood-working industry etc.), which have brought benefits to the local community.

Taking into consideration the balneary tradition in the Land of Dorna and the existing natural potential we can suggest that they should focus on revitalizing the balneary segment to a better economic development of the region.

In order to achieve a modern tourist infrastructure we recommend that they should emphasise the development of traditional balneary segment and combine it with Spa or wellness type of tourism. Thus, the authorities should invest into: the modernisation of balneary establishments and existing mineral springs; reopening the closed resorts and focus on treating multiple diseases using hydro mineral resources from other deposits (eg. Vatra Dornei or Dorna Candreni resort can benefit from arsenic hydro mineral resources from Șaru Dornei deposit); the modernisation of dwellings and technical infrastructures; improving and adjusting the services according to market demands; setting up the recreation areas.

In a certain way travel agents from Vatra Dornei have learned to adapt their balneo packages and serve not only elders but also young people. At the same time they have managed to combine the balneo segment with winter or leisure tourism. All these aspects represent a crucial condition that may develop the Land of Dorna.

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