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The Characteristics of Thermal Water and Their Impact in the Sustainable Development of Tourism in Dibër Area

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ABSTRACT: *The objective of this study has been the defining of the characteristics of thermal water in Peshkopi and their impact in the sustainable development of the area. The study has been carried out during years 2011-2013. The indicators analyzed have been: pH, conductivity, N, P_2O_5, K, $CaCO_3$, Na as well as assessment of treatment in individuals in regards to different reumatismal, skin and gynecological diseases. The samples of waters are analyzed near the Centre for Transfer of Technology based in Fushë Krujë. Based on the studies conducted through years and based on the results achieved during this study it results that by exploitation of the quality of these waters are treated and recovered about 37 400 persons and the economic benefit of 44. 300 000 ALL is invested for the development of tourism and infrastructure of the area. The protection of this water resource (Grade I) by eliminating pollution, its continuous monitoring and prevention and improvement of infrastructure are key elements for the future sustainable development of the area.*

Keywords: *Economic benefit, impact, quality of water, sustainable development, tourism*

I. INTRODUCTION

The thermal water of Peshkopi is a natural resource that flows in the territory of this town. The source is positioned in a distance of 1.5 km far from the city in a valley that is formed from the hills of Deshati mountain range. The thermal water source can be found in latitudes 41° 41' 9.77" and its altitude is 20° 26' 57.05". The source can be found in the height 750 meters above the sea level and its flow is 14 liters/second. This afflux of water comes from 3 sources that are nearby each other and before usage they are collected in only one watershed. The water temperature in the watershed is 42 grades.[1]
The water is blue. This fact shows that the existence of hydro- sulfate gas is very high, and the evaporation of water creates the smell of spoiled egg.

Figure 1. *Ortofoto of Thermal Water in Peshkopi.*

Geologically waters flow out in depositions of lime- sand- clay with Paleozoic age. According to the data received from literature, the water is of fractures type associated with karst and tectonic contact between the gypsum and the above mentioned depositions Because of their characteristics, these waters are used for curative and tourist purposes since ancient times. Their use dates back to the VI century, period in which two large basins were built for collective use. The first institutional investments were realized in 1928, when the first

covered basin was built. At this period the municipality put a tax for each user of thermal waters for curative and relaxing / tourist effects. The use of thermal waters of Peshkopi for touristic and relaxing purposes continued even before '90s. The first hotel was built in 1952, with a capacity of 20 individual bathtubs. The increased interest for the use of thermal waters was followed by the increase of accommodation capacity. In 1974 another hotel was built in Peshkopi, with a capacity of 120 beds, while in 1989 a medical compound with 44 individual bathtubs and other facilities was built near the source for a wide range of services to users. These services included the cabinets of clay, gynecology, physiotherapy, biotherapy, therapeutic gymnastics, massage-therapy facility including a gym and a swimming pool of 10x8 m in size. [2]

The curative effects of thermal waters with sulfur content through evaporation for the internal infections are as well confirmed from the studies carried out from foreign experts.

Despite the curative effects the Peshkopi thermal waters have, there are also negative effects, depending on the level of exposure to them. The intense content of sulfur and the high rate of evaporation even due to high temperature create a very heavy suffocating smell in a relatively wide area around the sources. This is quite a big problem especially for families who have built their businesses close to the medical compound and also for 35 employees who serve in this activity. Although there are not precise data (not specific researches) on the side effects those waters have on the health of families living nearby, it has been noticed a decrease of body strength and breathing problems in the inhabitants etc. [3]

To avoid these effects to visitors / tourists is has been determined the initial stay in the bathtub with water in the medical compound 10 minutes the first day and in the days following it increases by 1 minute stay until the 5th day. It is recommended a stay of 15 minutes until the end of use time. Failure to respect this scheme (longer stay) leads to weakness of body, dizziness, fainting and even death of the person. In recent years, the impact of these thermal waters in the tourism development has been very high. The revenues profited from the services offered in the service sectors are used for building of guest houses and businesses near the spa and medical compound, by creating a new neighborhood in this area of Peshkopi. Considering the great importance these waters have for the area and the lack of detailed studies about them, this is why we undertook this study with the aim to define the quality of thermal waters and their impact in the tourism development of the area. [4]

II. MATERIALS AND METHODS

We based our research on data related to thermal waters of Peshkopi, statistical information collected in the field as well as information from the hospital and Municipality. The sampling was conducted according to ***APHA 2005*** *and* ***EPA 2001*** *methodology, according to which water samples were taken at intervals of 3 hours, were kept in sterilized bottles of 0.5 liters capacity. There were received 4 samplings a month in June 2013 and February 2014. Water was stored at 4 ° C before being sent to laboratory. The analysis of samplings was done at ATTC laboratory in Fushëkrujë.*

Water samples were taken at two different periods of time, in June and in February of the following year. The average level of indicators and results were compared to the ordinary water content (used for washing) based on Standards defined in the State Standards Catalogue 2011.

In order to better realize the research are also used various data related to the history of these waters, the income from use of these waters at Community level, statistical data used to evaluate the extent of curative / relaxing values, as average monthly and yearly indicators as well as to assess their trend over the years. All collected data have undergone an evaluation process of analytical comparison. [5]

III. RESULTS AND DISCUSSION

Based on our findings, it has resulted that Peshkopi thermal waters have a very high content of sulfur in the water in the form of evaporating compounds (H2S). The measure of emission in the air has shown the lack of presence of H2S in the mud room after 30 minutes of patient treatment. In the bathing/washing room, the H2S content in the air 30 minutes after was 56.4 mg / m³, 70% air humidity and the temperature 20.4 ^{0} C. In the corridors between rooms the content of H2S has resulted to be 56.4 mg/m³, humidity 60% and temperature 20°C and in the after washing room 84.6% and humidity 88 %. [6]

With reference to the norms of National Catalogue of Standards for H2S presence (10 mg / m³), it results that there is a containing several times higher of H2S in thermal waters. The results have demonstrated values of CE = 3.75 µs/m, Ca^{2+} = 424 mg/l, Mg^{2+} = 24.96 mg/l, Na^{+} =320 mg/l, $HCO3^{-}$ = 3977 mg/l, SO_4^{2-} =1.651 mg/l, and Cl^{-} = 518.3 mg/l. Thermal waters have also nutrients in them. Nitric nitrogen level is 13.9 mg/l, nitrogen ammoniac NH4 is 8.6 mg / l, phosphates were 0258 mg / l and potassium 49.5 mg / l.in the analyzed water. The values of pH has resulted to be in the limits that have moved from 6.7 to 7.32, while dry residues are 2.06 gr / l.

Based on the results found in the report on the usage of thermal waters from users (patients treated in the state medical compound, the patients staying in the private hotels and family tourism, patients that are having ambulatory baths), curative effects of these waters are identified in about 40 diseases and high number of users throughout the year, during a three-year period shows that there are 4600 ambulant users, and the largest flux of this category is observed in April-May.

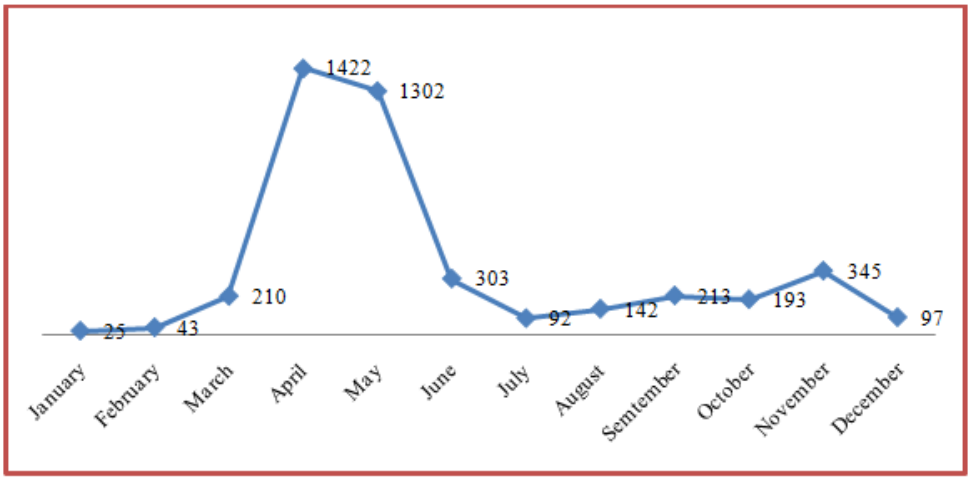

Figure 2 .*Average monthly attendance from ambulant individuals*

The number of accommodated users per year is about 6400 people, with a great flux in autumn (October-November) (Fig. 3).

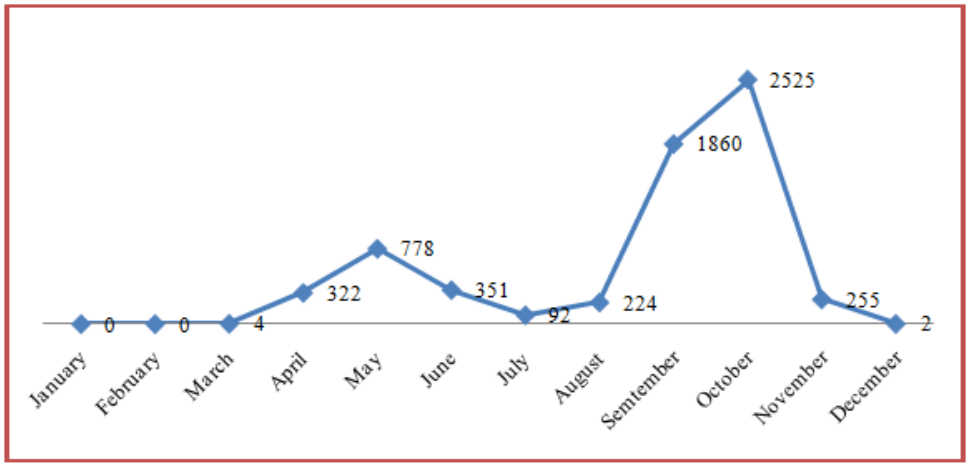

Figure 3. *Average monthly attendance from accomodates individuals*

From the analyzing of data it has resulted that the accommodated vacationers coming for curative treatment are mainly from other regions of the country such as Shkodra, Lezha, Mirdita, Tirana, Durres, Mati, Bulqize and remote municipalities of Dibra, while the number of foreigners has resulted to be lower (Fig 4).
The data have shown that the number of foreign individuals has increased from 2009 to year 2011. The low number of visitore is closely linked to the lack of promotion of the quality and positive effects of these waters for the man health.[7]

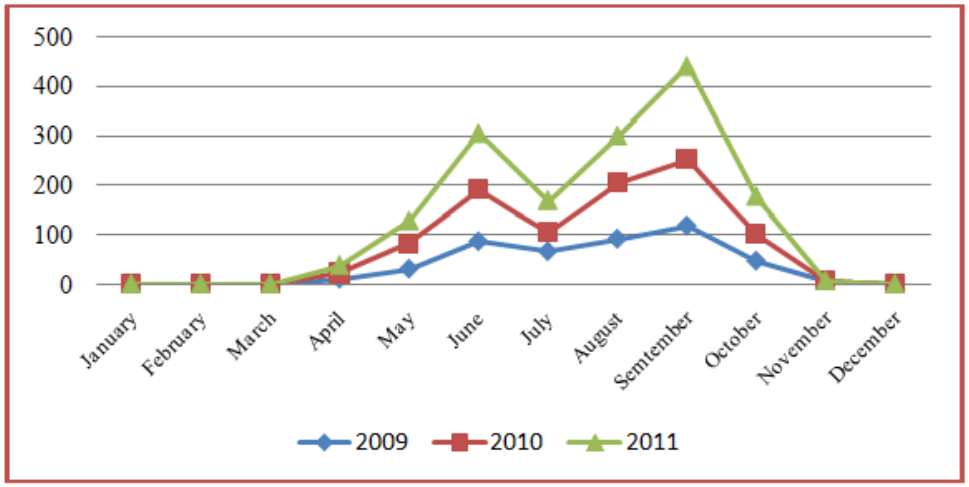

Figure 4. *Average monthly attendance of foreign individuals*

Thermal waters of Peshkopi provide the average yearly turnout of ALL 23 -24 million, of which 19-20 million are reinvested for the management of thermal waters activity, while the Municipality benefits ALL 3-4 million for investment realized from municipality.[8] *While the private businesses consist of about 100 families that accommodate 5 to 50 vacationners in 10-15 days.Investment in tourism during the recent years from the use of these funds results in starting up of about 17 businesses who have employeed about 185 women and girls.*

IV. CONCLUSION

Results have demonstrated the high value of H_2S, bicarbonates, calcium and sodium in the content of thermal waters in Peshkopi. This positively affect the treatment of many rheumatic diseases. We think this impact must be continuously monitored to assess the affects in the human health and its impact on families (individuals) who live in the surrounding area and on the other hand to make the impact assesment of these waters when they are used for irrigation of agricultural crops in the area especially in crops such as Zea Mays.[9] *The use of these waters based on the qualities they have, constitutes a permanent source of revenue for the development of tourism and, together with the implementation of a continuous monitoring to preserve the environment (quality of water in surface) and ground pollution would affect a sustainable development of the area.* [10]

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