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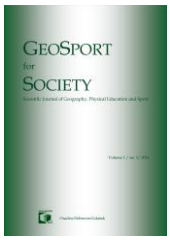

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Snow cover in support of development of winter tourism activities in Muntele Băişorii resort

Ovidiu GACEU[1,*], Luca ZARRILLI[2], Maria GOZNER[3], Anca-Cristina POP[4],

1. University of Oradea, Department of Geography, Tourism and Territorial Planning, 1 University st., 410087 Oradea, Romania, e-mail: *ogaceu@uoradea.ro*
2. University "G. D'Annunzio" of Chieti-Pescara, Department of Economics, Viale Pindaro 42, 65127, e-mail: *lucazarrilli@iol.it*
3. University of Oradea, Department of Geography, Tourism and Territorial Planning, 1 University st., 410087 Oradea, Romania, e-mail: *mariagozner@yahoo.com*
4. University of Oradea, Department of Physical Education, Sport and Physical Therapy, 1 University st., 410087 Oradea, Romania, e-mail: *popancacristina@yahoo.com*

* Corresponding author

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Abstract. The paper presents the characteristics of snow cover in Muntele Băişorii resort expressed on the basis of analyzing the data from meteorological observation from Băişoara station during 1961-2007 and processed on the basis of classic methodology used in climatological studies. Analyzing the values of the main parameters characterizing the snow cover was found that it enables and promotes winter tourism activities, that is why we have proposed new types of winter tourist activities such as ski touring, which would help diversify and increase the tourist flow in the resort.

Keywords: snow cover, parameters, touristic activities, winter, Muntele Băişorii, ski

Introduction

Climatic resort Băişoara is part of the Romanian resorts with high tourism potential given by the natural relief (elevation, slopes, slope length), climate (cool, not very wet summers, winters with long and stable snow season, tonic and stimulating bio-climate favourable for hiking and useful in the treatment of psychiatric disorders such as neurosis, overwork, mild depression etc) and also by the ten protected areas in the immediate vicinity, but insufficiently exploited (in the resort there are only two ski slopes, nine hotels and guesthouses, many private pensions which are not included in the tourist circuit, and the access road is poorly maintained). Skiing is an important part of winter mountain tourism, the natural environment represents the base for practicing it and depends essentially on the characteristics of snow cover (Higham, 2005).

Practicing skiing in the simple or organized form through activities such as ski lifts, ski schools, infrastructure development (accommodation, restaurants, parking etc) and various leisure opportunities lead to a spectacular development of mountain areal (Bull,

2005; Dehoorne et al., 2010; Ilieș, 2008; Ilieș et al., 2008, 2014).

Located in Muntele Mare in Western Carpathians at about 60 km from Cluj-Napoca, at an altitude between 1,200 to 1,400 m, in a picturesque landscape of pine forests, the resort Băișoara is open to the north where the Peak Muntele Băișorii rises (1268 m) and closed on the other cardinal directions by higher peaks of 100-500 m: Babana Peak (1504 m) to the west, Șovarului peak (1310 m) and Pietrele Mărunte (1731 m) to the east (Figure 1).

Băișoara Commune is integrated into the administrative boundaries of Cluj county (Figure 1), at its south-western extremity, where it is connected to the mountain unit Muntele Mare with Transylvanian Depression through Iara Depression. From an administrative point of view, Băișoara commune is at the limit between Cluj and Alba counties, at an altitude of 600 m. It is a tourist resort in continuous formation due to the existing tourism potential and the large number of tourists who choose the commune as a holiday destination, especially in the cold season. The commune consists of the following villages: Frăsinet, Moara de Pădure, Muntele Băișorii, Muntele Bocului, Muntele Cacovei, Muntele Filii, Muntele Săcelului, Săcel and abuts on with communes Ocoliș and Poșaga in Alba county and communes Valea Ierii, Savadisla, Ciurila and Iara from Cluj County (Figure 1).

Figure 1. Geographical position of Băișoara Commune

The spatial development of sports facilities in Băișoara Commune

From a geographic point of view Băișoara commune is placed at the level of Apuseni Mountains, Gilău – Muntele Mare group, in the eastern part of Muntele Mare and north-east of Munții Gilaului, respectively. The group Gilău – Muntele Mare represents the second highest division of the Apuseni Mountains, located about north - east of them. They are made of crystalline schist and granite intrusions, to the south-west they have

Cretaceous sediments (on reduced surface), where the valleys deepened visibly. This unit is characterized by many round peaks and flat surfaces, from which versants with steep slopes descend towards the valleys (Pop, 2000).

Muntele Mare Peak has the highest altitude (1826 m) in Gilău – Muntele Mare group being located in Valea Ierii commune (Figure 2). From a hydrographic point of view, Băişoara commune is situated in Valea Arieşului basin, on the middle course of Iara river.

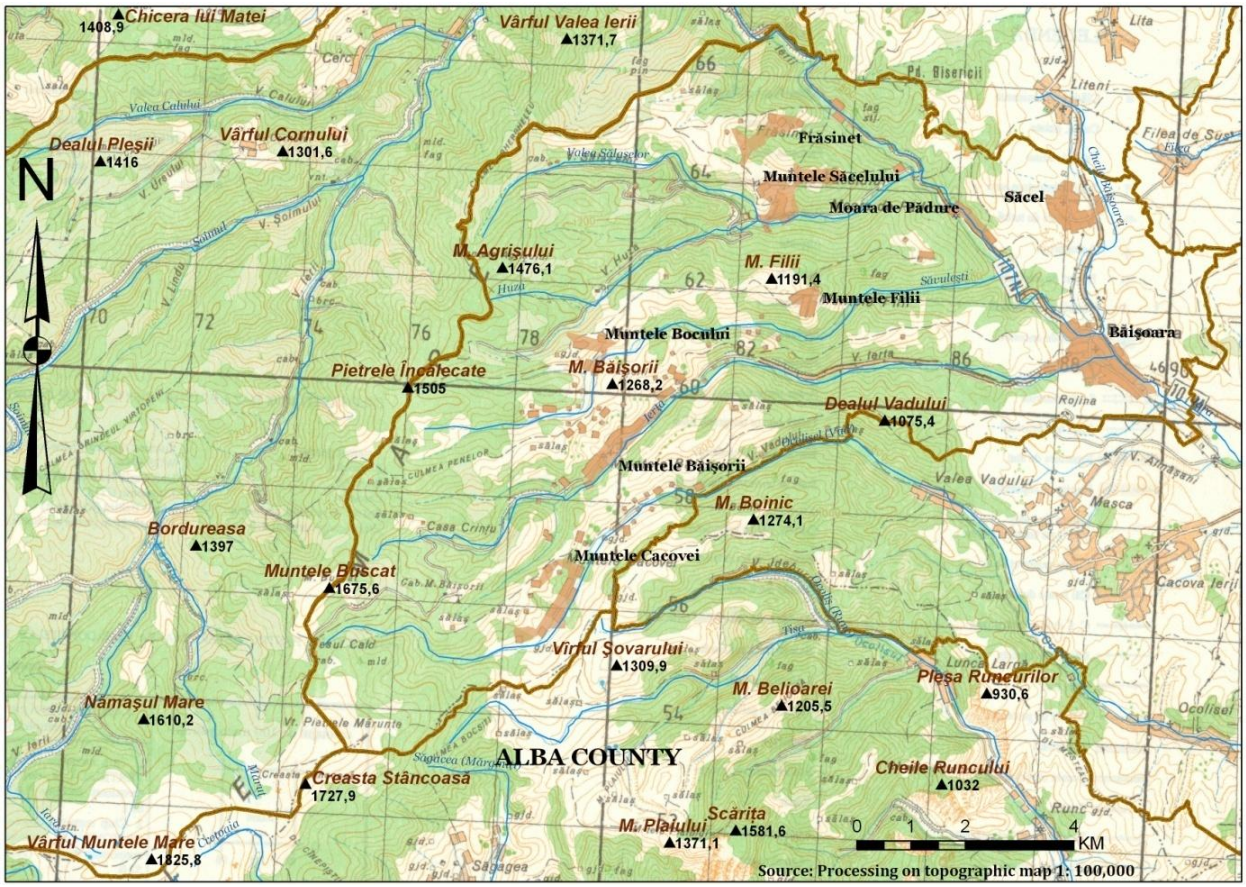

Figure 2. Cartographic landmarks of Băişoara commune

Figure 3. Landscape from Buscat Mountain

The resort's relief is diversified by numerous rivers (Figure 2) radially arranged that are deepening in their own channel and present a landscape of deep valleys separated by large, round, sprawling meadows interfluvials, allowing some great panoramic views onto

Transylvanian Plain, Turda Gorge, and when the atmospheric stability conditions allow, with clear skies and high transparency one can admire the Eastern Carpathians (Călimani, Gurghiu, Harghita, Rodna, Maramures, Țibles), Southern Carpathians (Retezat, Parâng, Șureanu) and exceptionally even the High Tatras (Figure 3).

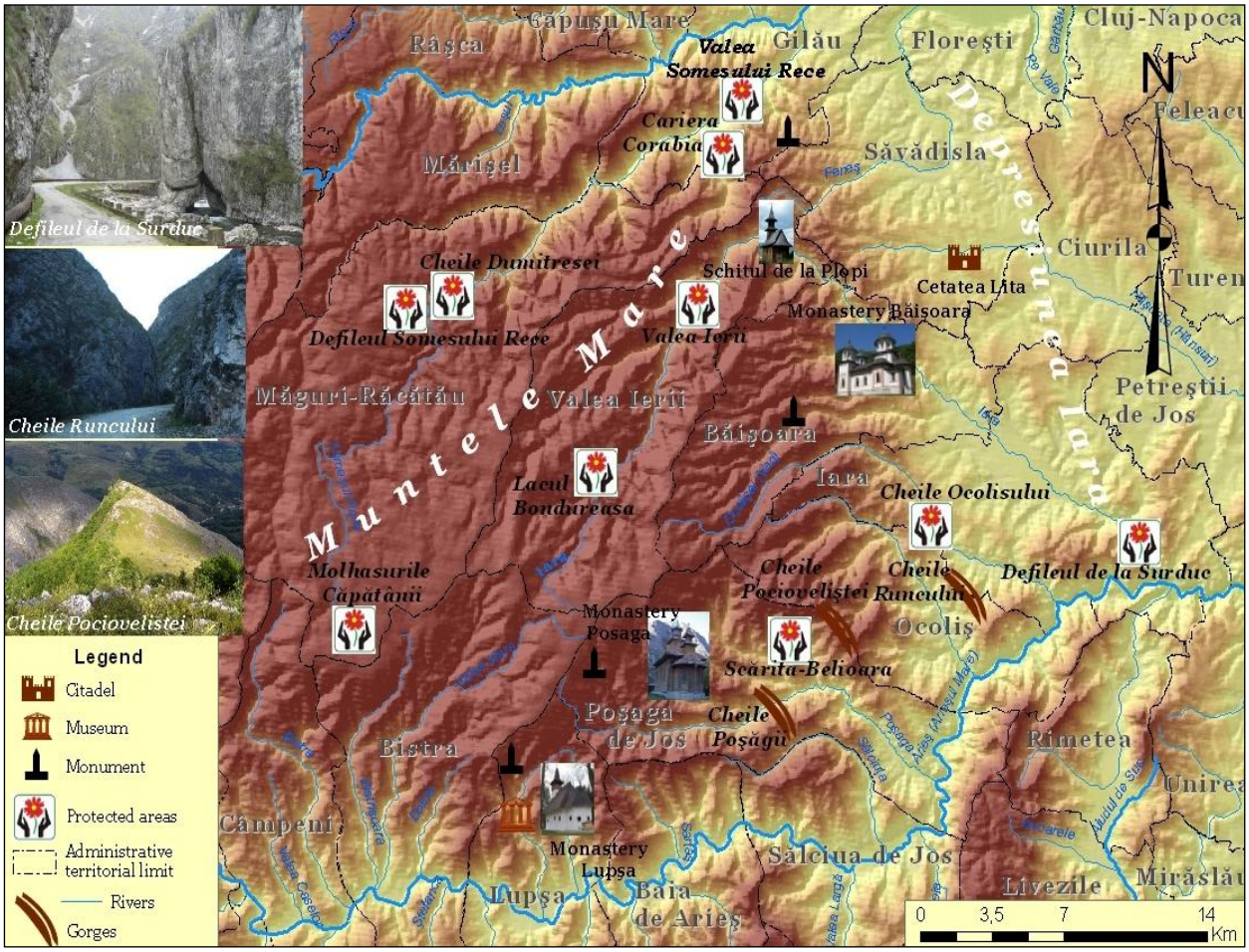

Figure 4. The tourist attractions and surroundings of Băişoara resort

Also in the resort surroundings there are ten protected areas (Figure 4): Geo-botanical reservation Scărița-Belioara with the hay field Șesul Craiului situated on a limestone plateau at over 1300 m altitude and forest on the mountain Scărița, which houses many species of rare plants and animals with slopes, screes, sharp ridges, grottos and caves on the Belioara valley; Someșul Rece Defilet located in the Măguri-Răcătău commune, which is deep, savage, with numerous rocks covered with debris trails; Surduc Defile formed on the Ierii valley on territory of the village of the same name characterized by the alternation of steep and high walls that the forest manages to climb overcoming gravity and by numerous twists and turns of the river forced to cut its way through solid rock; Dumitresei Gorge are carved by the homonym river in Măguri-Răcătău commune have steep, wild slopes through which water imposed itself flowing tumultuously in waterfalls; Ocolișului Gorge is located in Iara commune on the River Ocoliș, 3-4 hours' drive from the resort Băișoara is characterized by the wilderness of the valley with steep, wooded, spurred slopes which rise lofty, with steep screes, the tourists being forced to go through them by jumping down from a rock to another without any road or trail; Ierii Valley lying on the direction of access to Băișoara resort has a very picturesque view given by a succession of narrow and broad sectors with spruce forests and rocky slopes; Bondureasa Lake is located 3 hours drive from the Băișoara resort on Ierii

valley near its spring, in a small depression like an amphitheatre, populated at the base with deciduous trees and closed to the summit by the rock walls with ridges drowned in screes on which are popping here and there isolated birch and spruce; Căpăţânii Swamps are a kind of bogs which are accommodating species of plants on a wooded plateau at 1600 m in Măguri-Răcătău commune, at 6 hours' walk from Băişoara resort; Someşului Rece Valley drains Gilău commune and it attracts by its wide meadows and scattered hamlets on the slopes; Corabia Quarry is located in Gilău commune and it attracts by its very old metamorphic rocks, easy accessible by road and then 15 minutes on the footpath (Mititean, Kadar, 1996) (Figure 4).

In Muntele Mare Here are included other touristic objectives that are accessible from Băişoara resort: Poşăgii Gorge, Runcului Gorge, Pociovaliştei Gorge, Lita fortress, Ethnographic Museum from Lupşa, Băişoara, Lupşa, Poşaga monasteries, Ploli hermitage, monuments dedicated to heroes from Lupşa, Băişoara, Poşaga, Someşu Rece etc.

Also, the tonic and stimulating bio-climate (Figure 5) characteristic to small and medium mountains with thermal comfort in summer months and early autumn, especially at noon, with cold and moderately wet air baths during winter, but less stressful, cool, moderately moist and dynamic during summer with high nebulosity in the summer days afternoon due to diurnal thermal convection so that the longest period of sunshine is in the morning hours and is with frequently covered sky during winter days with significant negative air ionization favouring the practice of mountain climate-therapy, winter sports and tourism in general.

Figure 5. Tonic and stimulating bio-climate characteristic to Băişoara resort
(source: Teodoreanu, Gaceu, 2013, processing after "Balneal resorts" Map, Geographic Atlas, pl. VIII-7, 1977)

Access to the resort is made by European road E60 (Oradea–Huedin–Cluj-Napoca) from the west, E81 (Alba Iulia–Turda–Cluj-Napoca) from the south and north, and E576

(Baia Mare–Dej–Cluj-Napoca) also from north up to Cluj-Napoca, where it continues on the county road DJ 107 M (Someşul Rece–Ierii Valley–Băişoara) to Băişoara, from where a modernized main road detaches (but poorly maintained today) which climbs 10 km to the Muntele Băişorii village and then another 8 km to the resort. Being situated at 1200 m altitude the resort is not crossed by any railway, rail access is allowed only to Cluj-Napoca, where it continues on the path mentioned, Cluj-Napoca city is important for air transport, its airport facilitates access to all Romanian and foreign tourists to all the northwest of the country.

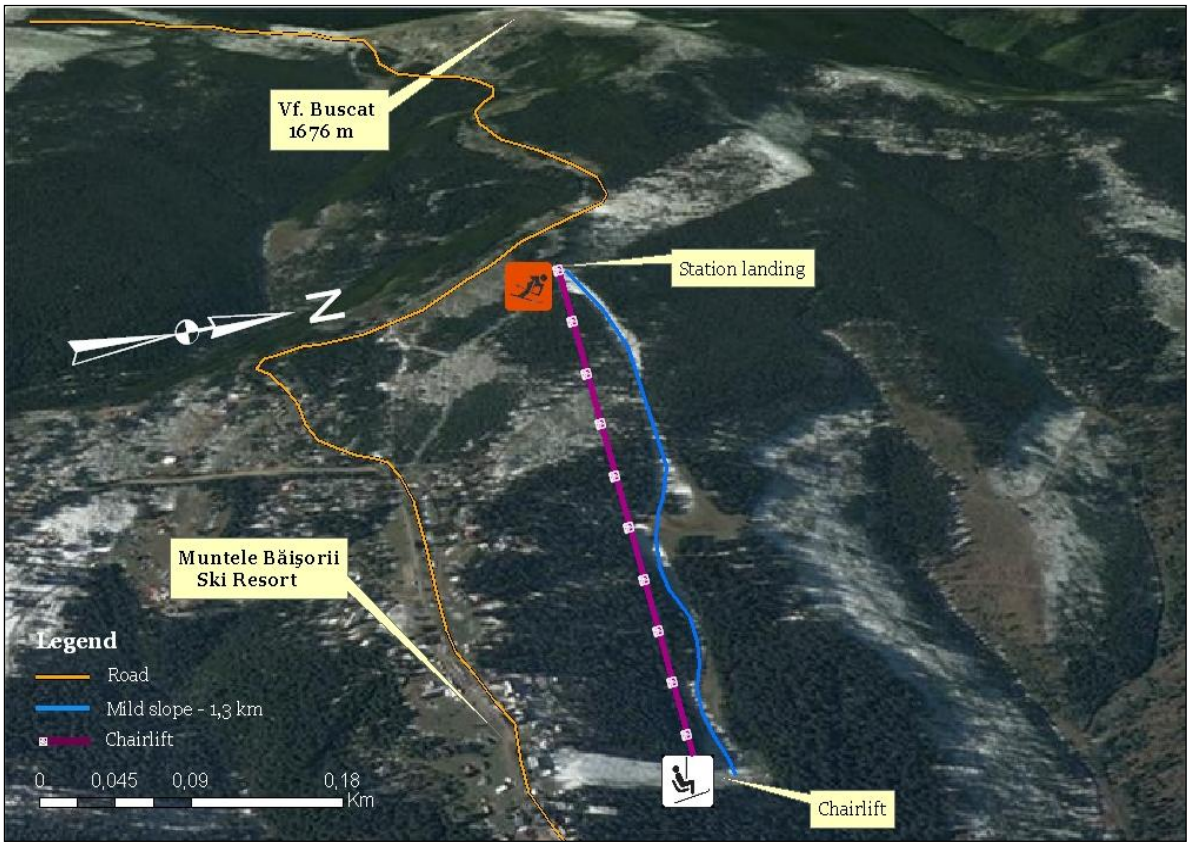

Figure 6. Ski slope arranged in Muntele Băişorii resort (Source: after orthophotomap)

Figure 7. Images with the ski slopes from Muntele Băişorii resort

Muntele Băişorii resort offers the tourists several ski slopes (Figures 6, 7). One of the ski slopes is mainly used for beginners, it is 250 m long and about 20 m wide. This track is facing south it has beginners lift installation and night lighting.

The big ski slope is used mostly by tourists. It has northern orientation, which leads to better retention of snow, has a length of 1300 m, a width of approximately 20 m and 247 m difference in level. The slope is serviced by a ski lift (Ganea, 2006).

On Buscat Mountain 1676 m were arranged several ski slopes (Figure 8). The easiest ski slope is marked with blue and has a length of 1300 m. The slope of medium difficulty, marked in red has a length of 900 m. The highest degree of difficulty is marked in black and has a length of 800 m. The slopes are serviced by a chairlift which has a capacity of 1500 people per hour (Figure 9) and a baby lift[1].

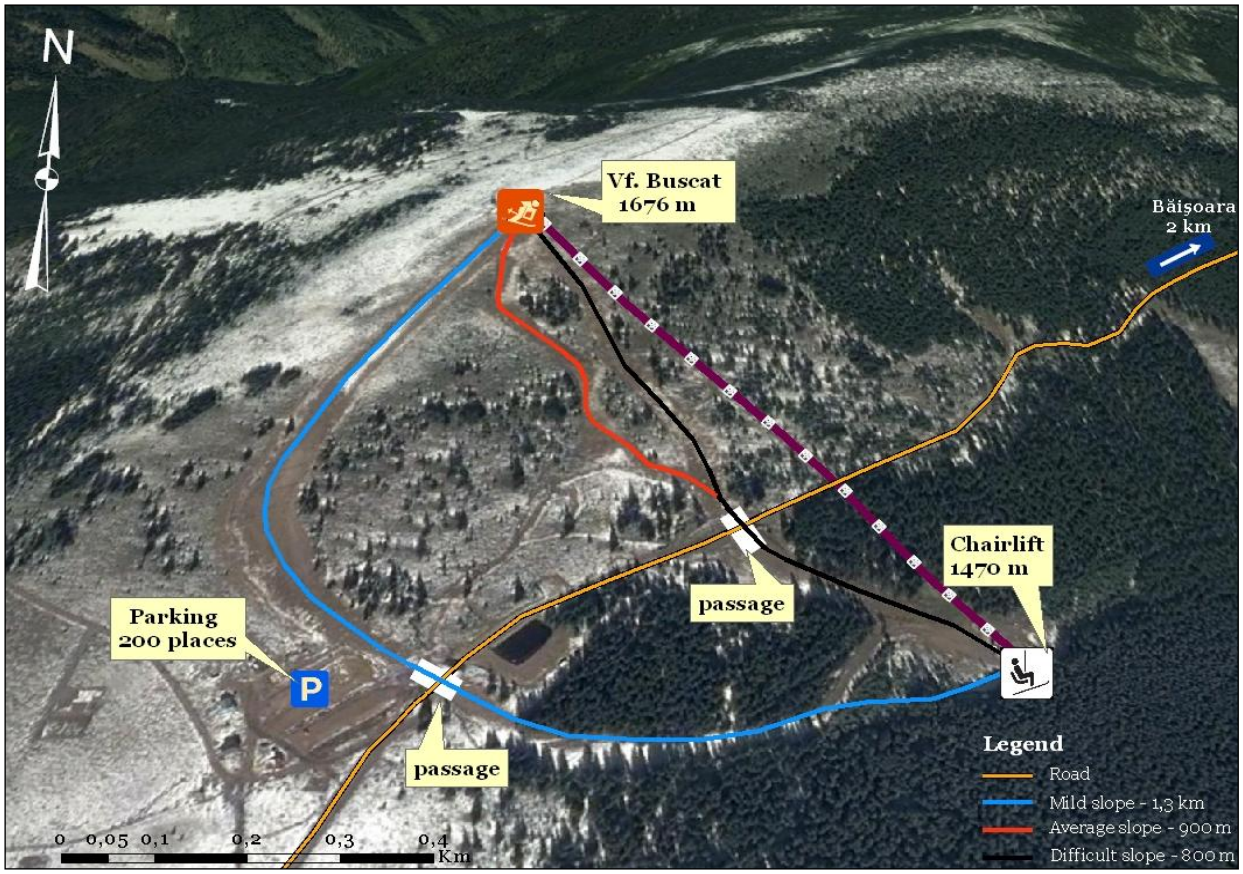

Figure 8. Ski slopes on Buscat Mountain (source: after orthophotomap)

Figure 9. Transport on ski lift on Buscat Mountain

[1] http://buscat.ro/winter/zona-de-ski/telescaun.html

"The arrangement of Romania's relief in almost equal proportions under the form of mountains, hills and plains inevitably attracts a wide variety of natural tourist resources. All these are reflected in the diversity of relief and, implicitly, in the landscape diversity as well, in the climatic-tourist potential, upon the variety of hydro-mineral and lake fund, of hydrographic network and especially of the biogeographic fund formed of extremely rich and diversified vegetation and fauna.

The tourist resorts in Romania have experienced quantitative and qualitative changes, especially after 1990. After a period of maximum development specific to the 70's, when their number was over 130, in 2006, by applying a new law referring to the qualitative aspect, their number decreased considerably to 47 resorts of national interest and 49 of local interest" (Ilieş et al., 2014).

Data and method

To perform this work were used topographic map at the scale 1: 100,000, orthophotoplans, digital terrain model (DEM), tourist maps existent at that moment as well as the snow weather data regarding the snow cover for the period 1961-2007 from Băişoara station. The meteorological station is located at an altitude of 1360 m on a flat, open area, so it is very valuable. These data were processed on the basis of standard methodology used in climatologic practice and presented numerous papers of this kind (Bogdan & Niculescu, 1999; Erhan, 1999; Gaceu, 2002 etc) Although it is an important climatic resort, especially for tourists from Cluj, but not limited to it, Băişoara has not taken advantage yet of a detailed analysis regarding the annual and seasonal climatic and touristic potential. However, there are two studies showing climatic conditions in Bihor Mountains, Vlădeasa, Muntele Mare and Gilău in support of tourism activities (Bogdan & Iliescu, 1971, 1999) and a book (Gaceu, 2012) which is an analysis of climate and climatic risks in Bihor Mountains and Vlădeasa, where is also included Băişoara station, without presenting its potential, the degree of favourability and tourist attraction of the resort.

In order to carry out the paper we made use of specialty literature, personal observations, preliminary research documentation were made on the terrain, to perform an overview image of the tourism heritage and its qualitative state. We identified and photographed the amenities and winter landscape of the resort and surrounding area. Finally, solutions were proposed for arranging slopes for cross-country ski and ski touring in order to improve and promote the quality of the tourist resort Băişoara.

Results and discussions

The formation and maintenance of snow is possible only if three conditions are met, namely the existence of negative temperature in air and soil, snow that should generate a sufficient amount of snow and the predominant atmosphere of calmness. Snowfall appears as a result from the interaction between cold polar and arctic air masses generated by Eastern European, Scandinavian, Greenlandic and sometimes Siberian anticyclones, with warm tropical air pushed up to our country's latitude of European cyclones with normal or retrograde development (Bogdan &Niculescu, 1999).

The most important parameters of the snow characteristics are:

- The earliest and the latest snow cover;
- The maximum possible duration of snow cover;
- Average date of appearance of the first constant snow cover and disappearance of the constant snow cover;
- Average duration of constant snow cover;
- Decadal average and maximum thickness of constant snow cover;

- Number of days with snow-covered ground;
- The risk period of snow cover;
- Average duration of first and last snow cover;
- Possible average duration of snow cover.

1. Extreme dates of appearances and possible maximum duration of snow cover in Băişoara resort

The first and last snow cover occur due to exceptional weather situations determined by non-periodic climate variability, which is why most times the snow covers cannot resist on the ground being melted by the first rays of the sun that occur after scattering the clouds or the advections of hot air. The first snow cover appeared in Băişoara in the period under review (1961-2007) on September 6th and last snow was registered on June 10, so in the resort is theoretically possible to exist snow up to 270 days per year.

2. The average dates of appearance and the possible average duration of snow cover in Băişoara resort

The average dates of appearance of the first and last snow cover highlight the period when the resort is full of snow, respectively the possible average duration of snow cover is of course shorter than that mentioned in the previous paragraph.

The first snow appears on average around October 27 and the last on 18 May, the average possible duration with snow cover is of 204 days compared with 161 days, that is the average period length without snow cover.

3. The average dates of appearance and disappearance and average duration of constant snow cover in Băişoara resort

The average duration of constant snow cover is the most important climatic parameter of snow cover in order to carry out tourism activities specific to winter as it is maintained continuously at that time and it indicates the best period to organize trips, holidays or sports events. Snow cover is stable due to the high altitude of the resort (1200-1400 m) which determines a decrease of air temperature, and because of high albedo and snow insulating capacity and comes with a delay of almost two months compared to the first snow cover ever appeared in Băişoara and 5 days later than the average date of appearance of snow in this resort, November 2, respectively. Last stable layer of snow disappears in Băişoara resort on 1 May, so more than one month and one week earlier compared to the latest snow cover ever produced and about two weeks compared to the average time to produce snow. So Băişoara climatic resort enjoys a long stable layer of snow for 180 days, giving it a significant potential suitability for winter sports tourism.

4. Decadal average and maximum thickness of snow cover in Băişoara resort.

The thickness of the snow during a winter varies greatly depending on the amount of solid and liquid precipitation, the period of frost, wind speed, insolation intensity, and less variable factors such as heat and Earth's gravity.

In Băişoara resort the decadal maximum thickness of snow reached 100 cm in March and frequently exceeded 80 cm in December, January and February, but the average thickness was much smaller, and the minimum necessary for carrying out winter tourism activities, that is 20 cm is recorded from December to February, so for three months. For skiing it is needed a thicker layer of snow, at least 30 cm and it is recorded on average in Băişoara only in January and the first decade of February, i.e. during a continuous interval of just five weeks, which is why it is necessary to use the snow cannons.

5. The number of days with ground covered by snow in Băişoara resort.

It is different from the possible average duration with snow cover and show that snow is not maintained continuously over a period of time (month, season) because it can

be blown by the wind, can be melted by warm air advection or a moist mass of air that generates liquid precipitation. Most days with ground covered of snow in Băişoara resort recorded in January and February (30 days or 27 days on average), followed by months of December and March with 24 days each. The months November (10 days), October, September and May (one day) these have few days with snow and being located in extra season its presence make it difficult to develop tourist activities during autumn and spring and it could catch the tourists unprepared.

6. The risk interval for winter tourism activities in the climatic resort Băişoara.

The risk interval for winter tourism activities in the resort Băişoara is the period of the season when the snow cover could fall, but for various reasons it does not accumulate and it is comprised in fall between the extreme date of the earliest snow cover and the average date of the first snow, 50 days respectively, and in spring between the average date of the last snow cover and the date of the latest snow cover at the end of the cold season, that is 34 days. It also has the nature of risk and during the winter season (given by the average duration of stable snow layer) if it is caused by heavy snow accompanied by the snowstorms that are making routes, trails and slopes inaccessible, or is deposited in layers thick, unstable on hillsides where it can cause avalanches.

7. Proposal of facilities for practicing winter sports in Muntele Băişorii resort.

Negative influences of modern lifestyle on the organism, makes it necessary to practice physical exercise as a means of prevention and compensation, relaxation and leisure, capable of protecting the human being against these negative phenomena (Pop, 2014). Engaging in physical activity helps to improve the functions and structure of various organs and systems of the human body (Kirițescu, 1964; Albu, 1999; Dragnea, 2000; Drăgan, 1977, 2002).

Specific arrangements for practicing winter sports existing in Muntele Băişorii resort are not diversified. With relief configuration, issues related to snow cover it should be mentioned the possibility of developing the resort for practicing ski touring.

Literature presents different physiological aspects arising from practicing ski touring (Cassirame et al., 2014; Haselbacher et al., 2014; Bosch et al., 2011; Eisenman et al., 1989).

In recent years ski touring and ski mountaineering have had a spectacular development (Volken et al., 2007). More and more people have realized that they can spend time in nature, climbing the mountains in winter practicing ski touring enjoying the powder snow and escaping from daily stress (Branigan & Jenns, 2014).

For practicing ski touring one needs special skis, bindings and boots that allow free movement of the heel (Figure 10).

The first slope for ski touring proposed for Băişoara resort is listed on the map with the number 1 (Figure 11) and it has a length of about 20 km and north-west orientation. The first proposed route begins at the foot of Muntele Buscat, at an altitude of 1600 m and it reaches an altitude of 1826 m at the top of Muntele Mare Peak (third highest peak in the Apuseni Mountains). It is a track with high difficulty level is not due to the difference of 200 m, but due to its length. It passes at the foot of the Creasta Stâncoasă Peak of 1727 m in altitude and Pietrele Mărunte Peak of 1735 m, and the panorama they offer is unforgettable. For planning it is necessary to clear some portions of forests where the minimum width does not allow safe passage.

The second ski proposal (Figure 11) has a common portion with the current slope from Muntele Băişorii resort. Firstly it should be intervened by lengthening the ski slope. Thus it is necessary to clear the top portion of the existing slope up to the highest point from Buscat Peak. Currently the ski slope is 1300 m, and after extending it will have approximately 4000 m. The trail of the route number 2 starts at an altitude of 1676 m from Buscat Mountain Peak

to connect with the ski slope from Muntele Băişorii resort at an altitude of 1400 m. It is a medium difficulty ski slope due to the difference in level of about 300 m.

Figure 10. Ski touring equipment
(source: http//www.feedthehabit.comgear-reviewsdynafit-titan-tf-x-alpine-touring-ski)

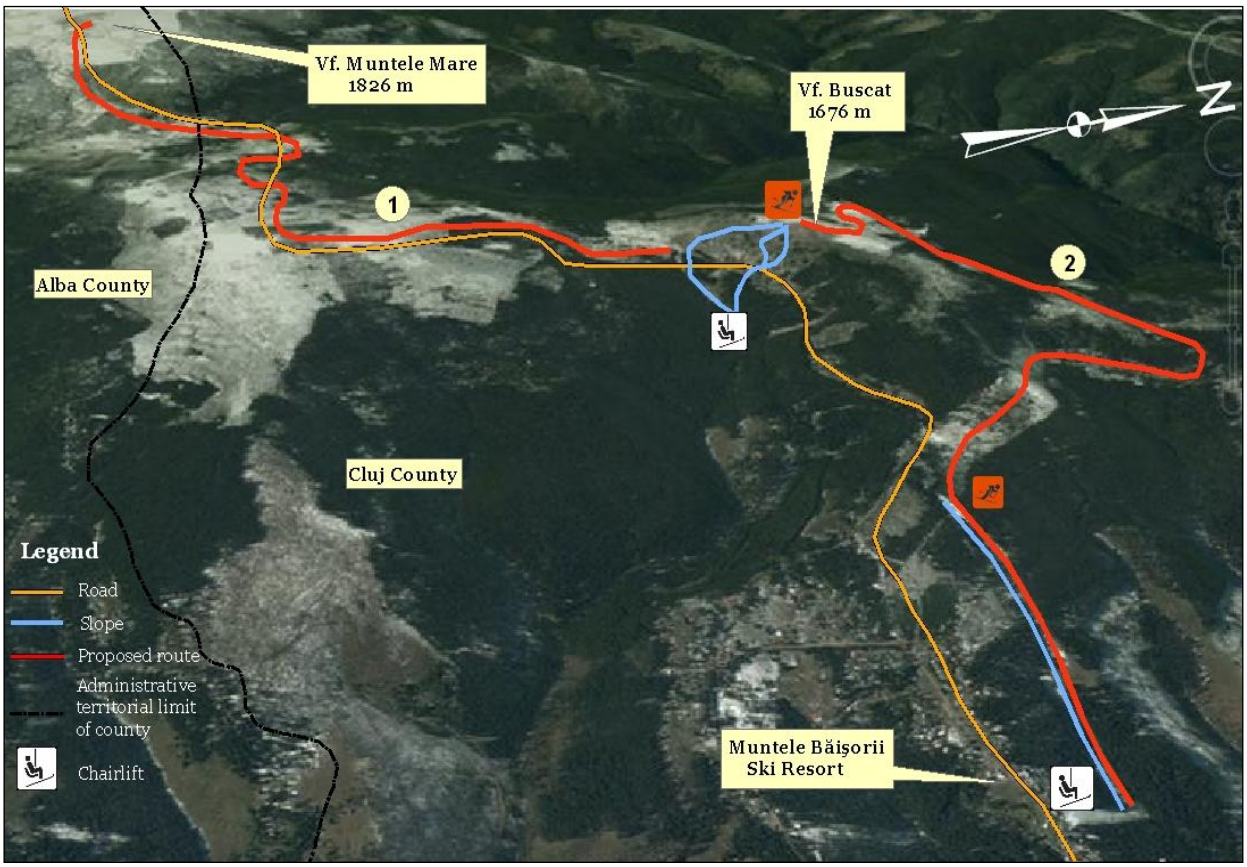

Figure 11. Proposal of arrangement of ski touring slopes (source: Google Earth after processing)

Another route easier for beginners and children is proposed for Muntele Cacova (Figures 12, 13) having a length of about 5000 m. The altitude from which starts the ski touring slope is 1140 m and goes up to 1240 m atop of Muntele Cacova Peak. The trail may continue up to Dealul Vadului Peak at an altitude of 1075 m. From the point where the trail starts it can be arranged a parking for those wishing to cover this ski touring route. From Muntele Cacova Peak one can admire the highest altitudes in the Apuseni Mountains, and during atmospheric stability conditions with clear sky one can see Cheile Turzii, Munţii Rodnei, Maramureşului, Ţibleşului, Retezat, Parâng etc.

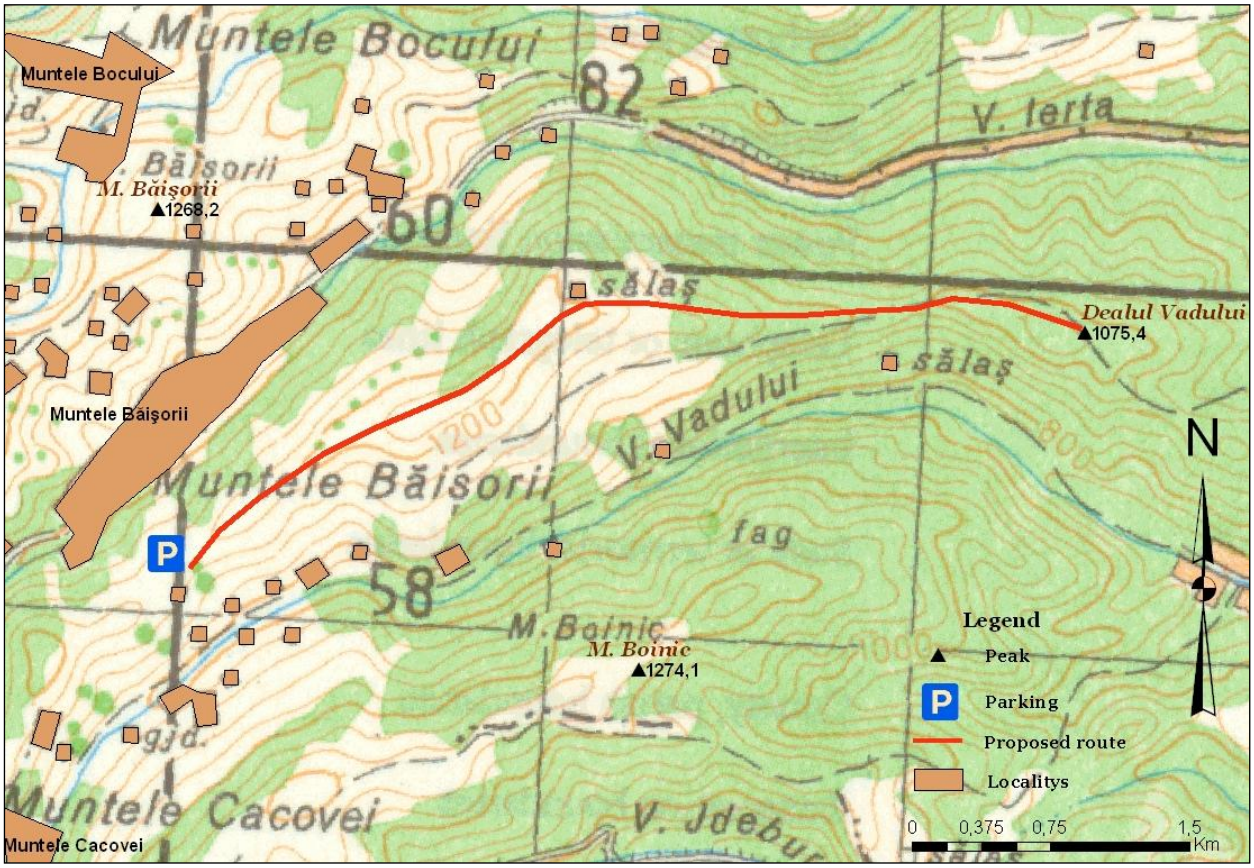

Figure 12. Proposal for landscaping the ski touring slope (processed after topographic map 1: 100,000)

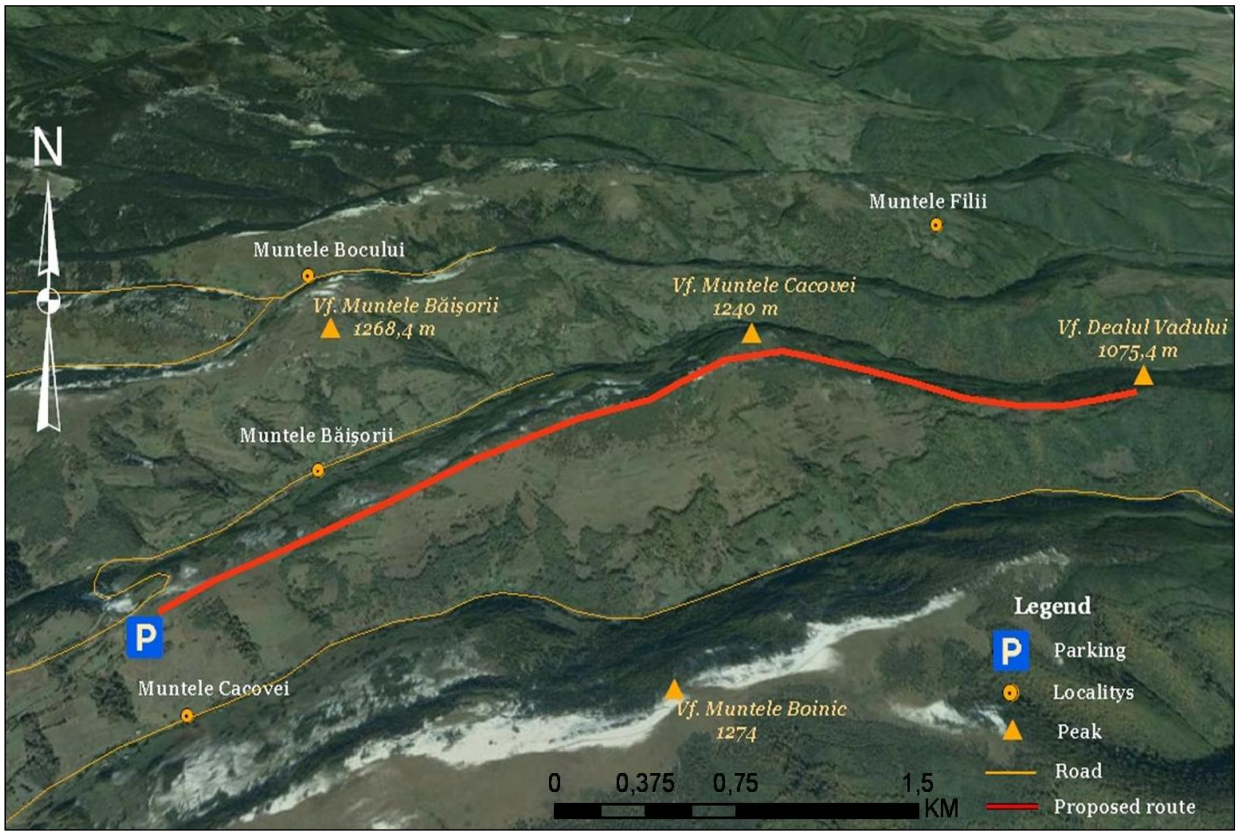

Figure 13. Proposal for landscaping the ski touring slope (processed after orthophotomap)

Conclusions

As a result of the study the following conclusions are made:

a) Băişoara climate resort features a significant tourism potential given by the natural environment highlighted by numerous routes (75 out of which 11 are marked) and touristic objectives from the surrounding area and the 10 protected areas, by the stimulating bio-climate that enables and promotes the practice of mountain climatotherapy, winter sports and tourism in general.

b) The constant snow cover totals 180 days per year and the average thickness required (minimum 20 cm) and sufficient (minimum 30 cm) for practicing winter sports, skiing respectively covers a period of three months (between December and February) five weeks respectively (January and first decade of February). In order to extend the period favourable for practicing skiing, snow cannons should be introduced and the interval with thinner snow cover can be used for practicing ski touring. In this regard three proposals for trails were made. They have different difficulty levels and are addressed to all levels of training. It was proposed a trail with high difficulty due to its length, which can be used by trained people and one with medium difficulty. For children and beginners a less difficult route was proposed.

c) The most favourable months for practicing winter sports are January and February (30 and 27 days on average of ground covered of snow), followed by December and March (with an average of 24 days of ground covered of snow).

d) During spring and autumn there is a risk of snow formation in out of season on an interval of 30 days and 50 days respectively which may take by surprise the tourists who are not prepared for those conditions on the routes and during the season there is the risk that snow cover may block access ways, especially when there is blizzard.

e) It is also needed an infrastructure improvement and diversification by maintenance of the access road to the resort by arranging new ski slopes for ski touring and construction of hotels and guesthouses to European standards, currently only Skyland, Montana and Andreea pensions and Muntele Băişorii cottage being classified 4 and 3 daisies respectively, but they have a reduced total capacity of accommodation.

It is a basic problem that in the course of the 3rd five-year plan, the city of Debrecen fell behind similar large cities of the country as far as sports-related developments are concerned." (MTS, 1971, p. 15).

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