

## **BJELASNICA'S SKI TRAILS CAPACITY ANALYSIS AS A PREREQUISITE OF TOURIST SEASON PLANNING**

**Emir Temimović, Muamer Muratović**

University of Sarajevo, Faculty of Science, Department of Geography,  
Zmaja od Bosne 33-35, Sarajevo, Bosnia and Herzegovina

*One of initial factors which affecting on tourist movements is organization or planning of tourism and the smallest time unit for planning is one tourist season. The leading approach in traditional planning of tourism is the economical approach which is reduced to achieve the largest gain, which leads to neglecting of sustainable development. Along with real existing tourism potentials or with already affirmed tourism motives, the main factor for analyze of tourism are tourists or number of tourists, be it on actual or potential number. The specific problem appears when some space became visited over its limits of possibility acceptance. The limits of possibility acceptance of tourists are being determined on basis of physical carrying capacity. Apropos, physical carrying capacity imposes as a basis in process of planning tourism season.*

*Ski-trail capacity and vertical transport capacity were taken as a starting basis for studying of physical carrying capacity ski center on Bjelašnica, because the ski-trails are main motive for tourists and vertical transport allows activities on that ski-trails. Assessment of carrying capacity ski center actually is finding appropriate relation between ski-trail capacity and vertical transport capacity. The planning of tourist season starts on the basis of obtained results about carrying capacity and with adequate analysis of demand.*

**Key words:** *Physical carrying capacity, planning, tourist season, Bjelašnica, ski-trails capacity, vertical transport capacity.*

### **INTRODUCTIONS**

In planning of tourism it is not always possible to expect continual growth number of tourist because tourism is activity in space and despite of potential growth of demand there are limits which do not allow further growth of tourists, and that limits deriving from that space. This does not mean that is necessary to stop development of tourism at a certain level, but that should be planned action to extract the maximum and reveal the ways how to use possible demand for further development but that development must not generate negative aftereffects like that was in case of mass tourism. It is usually achieved with development of alternative forms of tourism and with inclusion of wider space around central tourist place to unload central tourist place in a moment of tendencies to overload capacity of space.

Although as a main goal of this paper imposes a quantitative data about carrying capacity because of process of its calculation, the real main goal is to extract conclusions about current situation, potentials for development and promotion of tourist activity on Bjelašnica on basis of carrying capacity and also to show advantages of planning tourism on basis of carrying capacity.

The main method of carrying capacity calculation is based on indicators of carrying capacity, especially on physical indicators. This method is the most applicative in cases of calculation carrying capacity for cultural-historic monuments or in cases of calculation

carrying capacity for spaces in which tourists spending their time passively. Considering that tourists spending their time on Bjelašnica actively, this method is adapted for calculation of carrying capacity. Adaptations were made by finding an appropriate relation between basic factors of carrying capacity such as ski-trails capacity and vertical transport capacity, and other factors such as working time of vertical transport, period of maximum daily load, average time spent on skiing during the day etc. Because of these additional factors which are not included in basic method of calculation carrying capacity on basis of physical indicators, used method could be observed as an original method. In this paper also will be used an analysis method for component analysis of this theme, and synthesis method to unite all components.

### SKI-TRAILS CAPACITY

Normal ski-trails capacity means maximum number of skiers which can ski in a moment without disruption each other. There are few categories of ski-trails capacities depending of comfort of tourists. According to the some assessments 1 000 m<sup>2</sup>/skier is comfortable capacity, 500 m<sup>2</sup>/skier is normal capacity and 200 m<sup>2</sup>/skier as a minimum capacity. Load capacity is double normal capacity or 250 m<sup>2</sup>/skier.<sup>1</sup>

Ski-trails were built for Winter Olympic Games in zone Babin Do-Top of Bjelašnica, and that ski trails are:<sup>2</sup>

- Observatory – Babin Do, downhill ski-trail, north-east exposition, length 2850 m, height difference 803 m, area 16300 m<sup>2</sup>
- Plato – Štinji Do, giant slalom ski-trail, east exposition, length 1 047 m, height difference 382 m, area 8900 m<sup>2</sup>
- Štinji Do, slalom ski-trail, east exposition, length 511 m, height difference 209 m, area 4700 m<sup>2</sup>

Training ski-trails: „A“, „B“, „C“, „D“, „E“

According to the data of KJP „ZOI'84“ OCS Sarajevo d.o.o. total ski-trails area is approximately 40 000 m<sup>2</sup>. With applying standard of 250 m<sup>2</sup>/skier, the ski-trails capacity is 1600 skiers. Accordingly, this is the number of skiers who can ski on ski-trails at the same moment. However, the number of 1600 skiers does not giving true insight in problem of planning tourist season on basis number of tourists which ensuring comfort. The problem is clearer with setting question about dispersion of tourists because it is clear that all skiers will not come in a same moment to ski, question about time spent on skiing because not a single person can ski whole day, question about accommodation of tourists (resting from skiing and overnight stay for tourists who came to spend more days on the mountain), question about vertical transport capacity and other questions which need to be considered in resolving this issue. Finally and the main question is how many tourists can smoothly spend time on the mountain in a certain unit of time in order to plan the season. By insight in the current condition it is possible to determine measures for extending and enriching of the season if there are real space and technical conditions.

---

<sup>1</sup> Martinović-Uzelac, A. 2001: Prostorno planiranje, Zagreb, pp 473

<sup>2</sup> Plan aktivnosti, KJP ZOI 84 d.o.o. Sarajevo za lokaciju Bjelašnica, Sarajevo, 2011 pp 20

<http://www.fmoit.gov.ba/userfiles/file/Plan%20aktivnosti%20ZOI%20Bjela%C5%A1nica.pdf> (15.12.2015.)

## VERTICAL TRANSPORT CAPACITY

The basic infrastructure in ski-centers is vertical transport which includes ropeways and ski-lifts. On Bjelašnica there are two ropeways (three-seater and two-seater), five ski-lifts and three baby lifts. Total vertical transport capacity is 7645 skiers/hour. Data about vertical transport capacity does not giving true insight in carrying capacity and that is clear from next explanation. Specifically, on basis of vertical transport capacity it is possible to determine a daily number of tourists on Bjelašnica. Considering ski-lifts on Bjelašnica are opened from 7:30 – 16:00 h, that is 8.5 working hours. In one day vertical transport can transport 64980 skier. Certainly this number is unreal and there are more reasons and logical explanations because it is clear that one skier will not use ski-lift just once, that in morning hours will be less skiers on trails, that lifts can not always be on maximum load, that any skier can not ski whole day, etc.

**Tab. 1. Basic characteristics of ropeways and ski lifts**

	Ropeway (three-seater) Babin Do	Ski-lift BX	Ski-lift BY	Ski-lift Kolijevka
Length	1340 m	612 m	840 m	886 m
Average slope			39%	18%
Number of pillars, direction	14 right	9 right	11 right	9 left
Manufacturer	Doppel – Poma	Doppel – Mayer	Doppel – Mayer	Swoboda
Capacity,	1350	900	900	1195
Number of panniers,	150	-	-	-
anchors,	-	52	52	85
poles	-	-	-	-
Power	274 KW	75 KW	120 KW	75 KW Inst. 120 KW
Start	1270 m	1273 m	1384,7 m	1280 m
Finish	1640 m	1440 m	1706,26 m	1436 m
Height difference	370 m	167 m	321,56 m	156 m
Traveling time	12 min	3 min	4 min	4 min
Cable	41 mm	16 mm	24 mm	24 mm
Coils	420 mm		355 mm	355 mm
Investment (KM)	1.460.000	650.000	307.000	268.000
Year	1998	1997	2006	2005

Source: Plan aktivnosti, KJP ZOI 84 d.o.o. Sarajevo za lokaciju Bjelašnica

**Tab. 2. Basic characteristics of ropeways and ski lifts**

	Ski-lift Heliodrom	Ski-lift Kotlovi	Baby lift x3	Ropeway (two-seater) Štinji do
Length	725 m	665 m	150 m	1172 m
Average slope		40%		
Number of pillars, direction	9 right	8 right		15 right
Manufacturer	Doppel – Mayer	Doppel – Mayer		Doppel – Mayer
Capacity,	1200	900	250 – 300	900/1200
Number of panniers,	-	-	-	146
anchors,	-	-	-	-
poles	79	70	-	-
Power	200 KW	75 KW		220 KW
Start	1588 m	1822 m		1370 m
Finish	1864 m	2067 m		1754 m
Height difference	276 m	245 m		384 m

Traveling time	3,5 min	3 min		6 min
Cable	24 mm	16 mm		33,1 mm
Coils				420 mm
Investment (KM)	800.000	276.500		
Year	2011	2004		2007

*Source: Plan aktivnosti, KJP ZO1 84 d.o.o. Sarajevo za lokaciju Bjelašnica*

Further, there is obviously reduced comfort in the peak of the season when during the day there is 10 thousands tourists which is six times less then vertical transport capacity for one day. Regardless of all disadvantages of analysis carrying capacity on basis of vertical transport capacity, vertical transport capacity is still one of the basic factors in final carrying capacity assessment. Vertical transport is important for several reasons. First reason is that vertical transport must have enough capacity to accept and transport as many skiers as maximum ski-trails capacity without standing in the rows and because bigger profitability, functionality and pleasure for skiers. Second reason is that vertical transport partly or wholly performing dispersion of tourists in approximately equal intervals and in this way have an effect on reducing a crowd, and on the same way have an effect on increasing a comfort on ski-trails in order to meet standards about minimum needed space per skier. Third reason is that construction of vertical transport is big investment for some ski-center and considering the necessary or needlessly of that investment must be clearly determined.

#### PHYSICAL CARRYING CAPACITY OF SKI CENTER ON BJELAŠNICA

As stated above, ski-trails capacity is 1600 skiers in a moment while vertical transport is 7645 skiers/hour. Considering unit of time for vertical transport capacity and really a lot shorter time spent during downhill, logically thinking it is possible to conclude that vertical transport can provide unobstructed transport of skiers without standing in the rows, at the same time vertical transport will be maximum loaded which is a goal because of bigger number of sold tickets. Accordingly, current situation is satisfactory because vertical transport capacity corresponds to the ski-trails capacity. The bigger problem about vertical transport is outdated equipment which causing failures and jam on others ropeways and ski-lifts. Resolving this problem is technical staff while the bigger problem is further analysis of carrying capacity because ascertainment about 1 600 skiers and restriction on this number of skiers during the one day will be catastrophic decision considering that no one skiing whole day. Conditionally speaking, for one day optimum number would be in situation that is possible to determine number of groups of 1 600 skiers and under condition of regular changes of this groups. Considering this is not possible, it is necessary to start with assessment based on few parameters.

First parameter to consider is that vertical transport is opened from 7:30 – 16:00 h and that is time frame of one ski day. Arising problem from this is that is not possible to expect the same visit in early morning hours and during the day. According to some analysis and assessments for alpine ski-centers, maximum daily load is from 9:00 – 15:00 h and that is logical, and also the skiers spending 30% on skiing of all time spent in ski-center, while rest of time spending for resting, eating etc. According to these it is possible to speak about maximum three hours of skiing during the day and that means that is possible to speak about triple capacity with regard on ski-trails capacity and vertical transport capacity, and still this is correct under condition of regular changes of groups. Still, because of period of maximum

daily load from 9:00 – 15:00 h to avoid overloading of capacity, optimum number of skiers is double ski-trails capacity or  $2 \times 1600 = 3200$  skiers. This number is optimum under condition of equally distribution of skiers who are ski and skiers who are spend time in another way. In other words, in moment of maximum daily load it is expected the approximately equal number of people on ski-trails and out of ski-trails from any other reason (rest, eat, drink etc).

On basis of determined number of 3200 skiers it is possible further analyze of planning tourist season on basis of this number. Still, it is necessary to accent that carrying capacity of ski center is not limited on 3200 visitors, but this is optimum number of skiers considering on the factors taken into consideration. To get a final capacity it is necessary to add a number of non-skiers, and after analysis of potentials of wider spaces it is possible to speak about planning season, about further steps to improvement of tourist season and about increase in tourist traffic (if it is possible). According to another standard for alpine ski-centers total number of visitors is 30% more than number of skiers. Applying this standard, total carrying capacity of ski-center on Bjelašnica is  $3200 \times 1.3 = 4160$  persons per day. If this number is multiplied by 90 days which is the lower limit of season duration, the result will be 374 400 or approximately 374 thousands of tourists in one season. Certainly, there is no way to determine what will be the structure of visitors/tourists, how many overnights will be realized, will Bjelašnica be primary motive of tourists or it will be complementary offer of Sarajevo, and many questions that could be asked.

#### PLANNING TOURIST SEASON ON BASIS OF CARRYING CAPACITY

According to director of ski-center Bjelašnica – Igman, in last season there was over 250 thousands visitors and that was a record. There is no data only for Bjelašnica because Bjelašnica and Igman are parts of the one ski-center. Still, on basis of this data is clear that number of skiers and also number of visitors was less then maximum carrying capacity. Considering that carrying capacity was not overloaded in high record season, the question is – how and why coming to reduced comfort of visitors on Bjelašnica? There are many reasons and answers on this question.

One of the main reasons is unequal distribution of tourists especially distribution over weekends in comparison with distribution over working days. Because Bjelašnica is very near to Sarajevo, many citizens of Sarajevo go to the mountain on weekends and very often total number of visitors goes over 10 thousands. In this way coming to overloads of ski-trails capacity, vertical transport capacity and total carrying capacity. Number of visitors during working days in most cases is in limits of carrying capacity or far lower of maximum limit. All this is correct with favorable meteorological conditions. In case of unfavorable meteorological conditions, saving part of season all whole season is only possible with snowmaking system.

Even that carrying capacity is bigger then current tourism demand, it looks like that ski-center on Bjelašnica is overloaded. This impression is result of mentioned overloads of carrying capacity during weekends. Decreasing of comfort can affect on visitors to make decision that will never come again on Bjelašnica and such decisions are catastrophic for tourist destination because of spreading negative image and loosing of tourists. This situation can be avoided with adequate planning and with forming a variety of tourist attractions. Extension of tourist offer is basic step in planning of tourism development. Carrying

capacity assessment can serve as indicator of limits for tourism development without negative consequences.

Through planning tourist season it is possible to extract conclusion that carrying capacity, offer and demand are in direct relation. The growth in demand is expected if tourist offers is broadened by additional contents or with using all potentials, and in the same time with new contents the carrying capacity is increased also. Concretely in case of Bjelašnica where main motives are ski-trails and opportunities for different kinds of winter sports, also it is possible to use wider spaces of Bjelašnica, not just space of Babin Do. Accordingly, there is enormous potential for development of ski touring. There are many benefits from development of this type of skiing. In that way, the ski-center could be unloaded because many skiers would enjoy ski touring especially more experienced and skilled skiers. Ski touring enables visits to mountain homes and to villages on Bjelašnica, and provides possibility to connect ski tourism and ethno tourism, cultural tourism, gastro tourism etc. Example of development this or similar kinds of touristic products shows that carrying capacity assessment for central zone does not constitute strictly restriction number of tourists and development level of tourism, than that capacity should be indicator of necessity for planning development of tourism when some space is maximum loaded in moment when in wider spaces existing real potentials for forming complementary tourist offer on basis of primary tourist motive.

Bjelašnica is spacious mountain and developing tourism on one relatively small space is illogical. Babin Do needs to be central tourist zone because of preconditions such as ski-trails, vertical transport and traffic infrastructure, but extension of tourist offer by potentials from wider spaces is necessity because carrying capacity is limiting factor for increasing number of tourists and visitors in central zone. Increasing number of tourists does not imply building a new hotels and catering objects because the situations with objects is already alarming. Mountain homes, private houses in villages on Bjelašnica and especially accommodation in Sarajevo because nearness, would have impact in tourism development. To the most famous alpine ski-centers tourists traveling from nearby cities and this show how big advantage is necessity of Sarajevo because Sarajevo is capital city and it is bigger than alpine mountain centers. In this way there are multiple benefits from planned tourism development on tourist destination Bjelašnica. Ski-center would be maximum loaded but without crowded and potential loosing of guests, villagers would have additional source of incomes, accommodation in Sarajevo would be more loaded, other tourist motives in Sarajevo would be more visited, companies which providing transport service would have a great number of passengers by establishing regular traffic line on relation Sarajevo – Bjelašnica, tourists would get higher service quality, and all this leads to the higher economic profit and general social progress.

## CONCLUSION

Carrying capacity in tourism is new concept of planning and development tourism, and this concept began to be developed as an answer on negative consequence of mass tourism and these consequences are result of overloading space. Determining limits of capacity for some space is complex problem mostly because tourism is one of the most complex human activities and it is conditioned directly or indirectly by many factors.

Chosen methodology for assessment of physical carrying capacity is based on components of physical indicators of carrying capacity. These components were chosen considering on dominant type of tourism. Considering that type of tourism is in correlation with winter sports, there are two basic indicators of physical carrying capacity. First indicator is ski-trails capacity and second indicator is vertical transport capacity. To obtain precise data of carrying capacity, beside of basic indicators also have been added and other indicators related to maximum daily load, average time spent on ski-trail and percentage of non-skiers in total number of visitors.

Nakon uzimanja u obzir svih faktora koji djeluju na fizičku nosivost kapaciteta određena je konačna nosivost kapaciteta na osnovu kojeg se može donijeti nekoliko zaključaka. Kada posmatramo kapacitet Bjelašnice za cijelu sezonu dobiven na bazi kapaciteta za jedan dan i kada taj kapacitet uporedimo čak i sa rekordnom sezonom po broju posjetilaca onda se dolazi do zaključka da kapacitet Bjelašnice nije prekoračen. Ovaj zaključak se mora uzeti sa rezervom zbog neravnomjerne raspodjele turista usljed koje se dešava da vikendima imamo više nego dvostruko prekoračenje nosivosti kapaciteta. Iz ovog zaključka se može naslutiti da postoji prostor za povećanje broja turista na nivou sezone ali da se nešto mora poduzeti po pitanju raspodjele turista tokom sezone.

Total carrying capacity is assessed considering on all indicators which affecting on physical carrying capacity, and on basis of carrying capacity is possible to extract few conclusions. Analyzing capacity of Bjelašnica for whole season obtained on basis of capacity for one day and when that capacity is compared with high record season, conclusion is that carrying capacity is not overloaded. This conclusion have to be taken with caution because of unequal distribution of tourists, causing more than double overload of carrying capacity during weekends. From this conclusion is clear that there is possibility for increase number of tourists on season level, but something has to be done in terms of the distribution of tourists. This can be achieved by planning season right on basis of carrying capacity, and this proves carrying capacity as base for tourism planning or planning tourist season, and that is main goal of this paper. One of conclusion is that vertical transport capacity and ski-trails capacity are in appropriate correlation, and this provides that vertical transport works with maximum load, which is in interest for larger number of tickets sold, and in the same time ski-trails capacity will not be overloaded. Certainly, all this is correct under condition that there is so much demand.

Another conclusion is that carrying capacity calculated on this way is not limiting factor for development of tourism. This conclusion is drawn from fact that whole concept of carrying capacity is harmonized with concept of sustainable development which implies most appropriate development of all human activities. On basis of carrying capacity is possible to get clear insight when some space has become overloaded and when is necessary to start finding alternative solutions for tourism development, and all this is additional proof that carrying capacity is not limiting factor in tourism development. Alternative solutions were planned before, and the basic step in extension of tourist offer is using potentials from space around central zone where carrying capacity is maximum loaded or overloaded.

## Literature

- Allmen, B.V. & Salzmann, S. 2007: Balancing trail with lift design, Alpentech, Inc., Salt Lake City
- Castellani, V. & Serenella, S. 2012: Carrying capacity system of tourism system: Assessment of environmental and management constraints towards sustainability, University of Milano – Bicocca, Department of environmental science, Milano
- Martinović-Uzelac, A. 2001: Prostorno planiranje, Zagreb
- Spahić. M. 1999: Osnove geoekologije, Harfograf Tuzla, Tuzla
- PAP/RAC, 1997: Guidelines for carrying capacity assessment for tourism in mediterranean coastal areas. PAP-9/1997/G.1., Priority Actions Programme Regional Activity Centre, Split
- Plan aktivnosti, KJP ZOI 84 d.o.o. Sarajevo za lokaciju Bjelašnica, Sarajevo, 2011
- European Commission-Environment [http://ec.europa.eu/environment/iczm/pdf/tcca\\_en.pdf](http://ec.europa.eu/environment/iczm/pdf/tcca_en.pdf)

## Autors

**Emir Temimović**, doctor of geographical sciences, associate professor at the Faculty of Science, University of Sarajevo, Bosnia and Herzegovina. Editor of the scientific journal *Acta geographica Bosniae et Herzegovinae*; author of 20 scientific papers and two books from the scientific domain of physical geography.

**Muamer Muratovic**, master of geography in the field of Tourism and environmental protection at the Faculty of Science, University of Sarajevo, Bosnia and Herzegovina, Department of Geography.