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Winter Tourism Development Trends in Georgia in the Background of Climate Change

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Abstract. The relevance of the research topic is dedicated to tourism, that holds a particular place in the development of world economics. This economic sector significantly develops the trade and service sectors in developed countries, which leads to an increase of foreign exchange earnings and employment, to protection of national traditions, cultural heritage, and, most importantly, their financial security. Tourism is the most dynamically developing and highly profitable sector. Therefore, during the transition to a market economic system, tourism is among the priorities for the development of our country's national economy.

There can be actually developed all different sub types of tourism, gaining equal success, such as: educa-

tional tourism, extreme tourism, recreational tourism, mountain and ski resorts tourism.

As a number of studies show, the tourism industry, in addition to a number of risks, such as, foreign exchange currency, frequent changes in fuel and transportation prices, has been particularly affected climate conditions in recent years.

It should be noted, that mountain ecsystems react strongly to climate change. This process can lead to a number of negative consequences, such as shortening of winter seasons, glaciers retreat and reduction of the duration of the ski season and recreation areas. Therefore, it is necessary to pre-determine the regularity of changes in the climatic characteristics of winter resorts, in order to determine the dates of the start and end of the season in a timely manner for the planned development of mountain and ski tourism.

Although Georgian tourism is experiencing a number of difficulties today, its recognition and the need for development are already evident. It should be noted that its revival is not only related to the time factor.

This article clearly responds to the objectives of the United Nations General Assembly's global "Sustainable Development Goals" 1, 2, 8, 9, 12, 13. " Extreme Poverty for All People is Eradicated, There is Zero Hunger, Economic Growth, Industry, Innovation and Infrastructure, Responsible Consumption and Production, Urgent Action to Combat Climate Change.

Keywords: Sustainability; Development; Climate change Glacier recession; World Tourism Organization ((WTO); Natural resources; Mountains; Tourism industry..

Introduction

The natural climate fluctuations have negative impact on the environmental area. One of the issues facing humanity is the climate change, to which UN summits are periodically dedicated.

The World Meteorological Organization (WMO) has organized a number of events for tourism support. It provides World Tourism Organization (WTO) members with early warnings about natural disasters, glacier recession, water resources and climate change. WTO closely cooperates with WMO. Forecasts of climate and extreme hydro meteorological events provided by the National Hydro meteorological Services are particularly important in today's world, as regional climate variations have emerged in the wake of global climate change. Georgia, with its preconditions of the need for the assessment of tourism recreation potential, has been a member of both organizations (WMO & WTO) since 1990. It has a unique geographical location, complex dissected relief, land cover diversity and specific climate, containing almost every type of climatic zones.

Georgia has been actively involved in the implementation of the UN Framework Convention on Climate Change since 1996.

There were determined the average and extreme values of snow cover duration for the multi-year observation period, to study changes in snow conditions in various winter tourist regions of Georgia. According to the Student's criterion, the regularities of changes in this parameter were determined between in the first 1956÷1985; - the second 1986÷2015 and the third - 1956÷2015 periods.

By the analysis of observational data in Georgia, four regions have been distinguished: light snow, medium snow, heavy snow and especially heavy snow. According to a number of scientists, the western part of Adjara, namely Mount “Mtirala” and its surrounding area, is distinguished by the greatest abundance of snow and solid precipitation.

Main Part

The distribution of snow cover height has undergone great changes, especially in the last years of the last century. The amount of snow and the height of the snow cover characterize the snow cover of a territory.

In order to determine the minimum, average and maximum values of the snow cover, were used the data of solid precipitation observations at the meteorological

stations of the National Environmental Agency of Georgia over the last 50 years.

As a result of the analysis of multi-year snow cover data from a number of meteorological stations in Georgia, starting from 1956 and ending in 2024, it was determined that in the last decades of the last century, the height of the snow cover underwent a major change and far exceeded the maximum height of the snow cover observed in earlier years.

As the analysis of observation data showed, the snow cover reached 295 cm in Lentekhi in 1976 (which is 167% of the previously recorded maximum), in the same year the snow cover on Ritsa reached 490 cm (190% of the previously recorded maximum height). The snow cover reached 365 cm in Shovi in 1987, (which is 163% of the previously recorded maximum height), in Khulo in 1989 - 318 cm (131%), on the Goderdzi Pass in 1989 - 336 cm (118%).

For the planned development of mountain and ski tourism, it is necessary to assess the regularities of changes in the duration of snow cover in time and space. The regularities of snow cover duration changes were assessed for 3 Georgian ski resorts (Mestia, Gudauri, Bakuriani) between two 30-year periods (Period I 1956–1985 and Period II 1986–2015).

The observation period for solid precipitation at meteorological stations is not long, so this information is not sufficient to determine trends in solid precipitation changes. The presented work was conducted by the method of Professor V. Tsomaia (3), according to which the regularities of changes in the height of the snow cover were determined based on air temperature and atmospheric precipitation data. One of the cardinal factor of modern climatology is the determination of the regularity of the number of snowy days in time and space. The study of this component is especially important for hydropower, turism, recreation, and other sectors of agriculture.

Analysis of long-term observation data on snow cover duration shows that the snow season for the entire period, on average, began on November 30 and ended on March 4. The duration of snow cover in Mestia during the entire observation period reaches 108 days and the trend is positive. The duration of snow cover has almost not changed in the second period compared to the first period.The duration of snow cover in Gudauri during the entire observation period is 162 days, and the snow cover trend is negative. Compared to the previous period, the duration of snow cover has decreased by 19 days. For the observation period in Bakuriani, the snow, on average, started on November 26 and ended on March 28. The duration of the snow cover was 122 days throughout the observation period. The trend of snow cover is negative. During the second period the duration of snow cover reduced by 8% compared to the first one. (Tab.1).

Table 1.

Duration of snow cover characteristics at winter resorts.

Years	Season's beginning	Season's ending	Season's duration days	Season's duration change, %	Season's number
Mestia	**change, %**				
1956-2015	30 November	19 March	108		32
1986-2015	26 November	2 March	95	-17	6
1956-1985	1 November	28 March	111		26
Gudauri					
1956-2015	23 November	5 May	162		19
1986-2915	29 November	3 May	154	-12	16

1956-1985	15 November	7 May	172		46
Bakuriani					
1956-2015	26 November	28 March	122		35
1986-2015	15 November	22 March	118	-8	19
1956-1985	6 November	6 May	127		16

If the snow cover exceeds 30 cm for 100 days over a period of 7-10 years, then the ski area can be considered reliable based on snow condition. In the several mountainous regions of Georgia, it was determined from 1956 to 2015 variation in snow cover height

Throughout the observation period in Bakuriani, the maximum depth of snow cover was recorded in February (61.3 cm), the minimum was recorded - in September (0.1 cm). During the entire observation period, the maximum value of the maximum depth of snow cover was recorded in March 1956 (130 cm). Significant fluctuations in the maximum depth of snow cover in 1986 -2015 compared to 1956 - 1985 are observed in January (increase by 9.0 cm).

For the entire observation period of Gudauri, on average, the maximum depth of snow cover is observed in March (115.1 cm), the minimum - in October (0.7 cm). During the entire observation period, the maximum value of the maximum depth of snow cover was recorded in February 2008 (330 cm). On average, from June to August there is no snow cover in Gudauri. Significant variability of the maximum depth of snow cover in 1986 (330cm). (Tab 2.) is observed only in October (a decrease of 6.6 cm). Accordingly, the trend in this month is negative, although not very significant.

Table 2:

Statistical characteristics of maximum snow cover depth in Gudauri 1956-2015

Month	Mean	Max	St Dev	95%(+/-)	Count
January	81.2	300	77.8	20.0	59
February	99.8	330	86.6	22.3	59
March	115.1	294	94.2	24.2	59
April	91.9	260	80.7	20.8	59
May	37.6	312	57.4	14.8	59
June	0.0	0	0.0	0.0	58
July	0.0	0	0.0	0.0	58
August	0.0	0	0.0	0.0	58
September	0.7	35	4.6	1.2	58
October	6.8	50	12.7	3.3	58
November	26.1	121	30.0	7.8	58
December	55.8	244	56.5	14.5	59

From1956 to 1985 in Bakuriani a noticeable change in the average mean depth of maximum snow cover was observed in January (decrease of 17%), in February (decrease of 19%) and in November (increase of 17%) in 1986-2015. The average maximum depth of snow cover in Gudauri increased in April (18%) and in November

(30%).On average, the maximum depth of snow cover in Mestia is recorded in February (75.8 cm), the minimum - in June (0.1 cm). Over the entire observation period, the highest value was recorded in February 1987 (298 cm). A significant change in the maximum depth of snow cover is observed in the second period compared to the first. In January (increase by 36.0 cm), in February (increase by 53.6 cm) and in March (increase by 28.2 cm). As for the other study points, the maximum depth of snow cover is distributed as follows: In Stepantsminda - (fig,1) the maximum value was recorded in September 1972 (391 cm).On average, only in June is there no snow cover in Stepantsminda. A significant change in the maximum depth of snow cover in the second period compared to the first is observed in January (increase by 12.6 cm), February (increase by 22.0 cm) and October (decrease by 9.5cm).

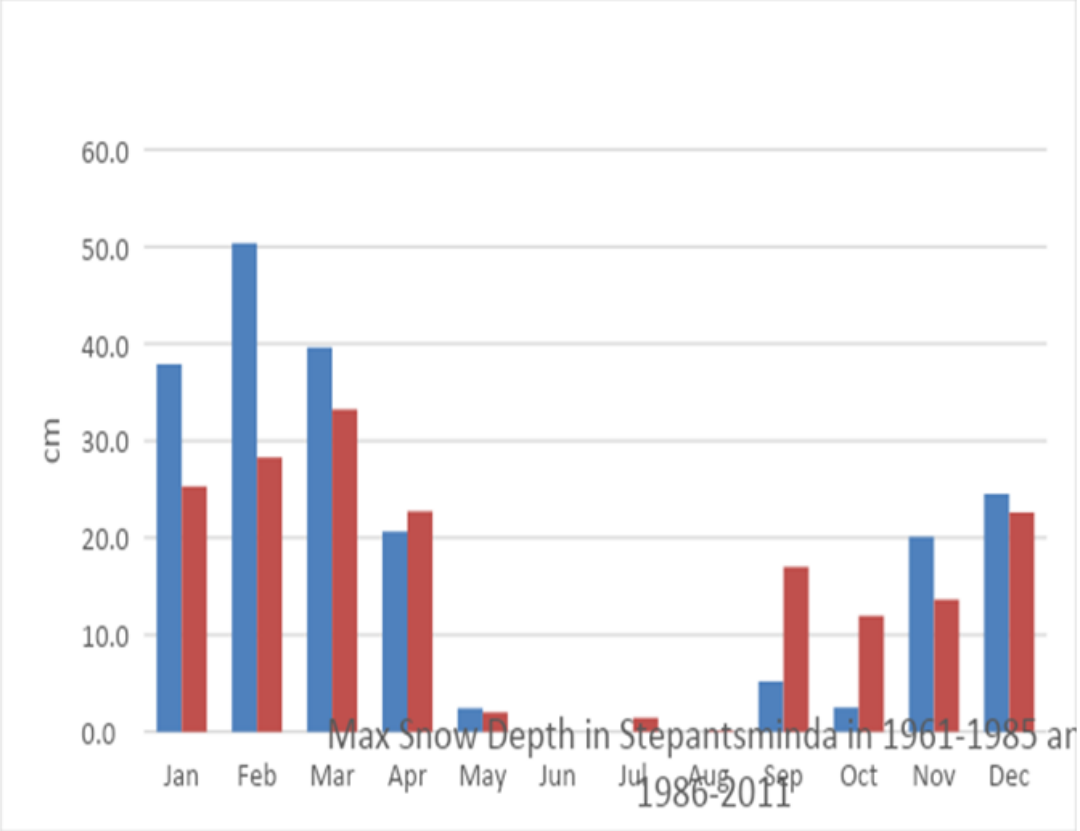

Fig. 1. Characteristics of maximum snow cover depth in Stepantsminda, 1956-2015

During the entire observation period in Goderdzi, the maximum value of snow cover depth was recorded in March 1997 (510 cm). On average, there is no snow cover in July and August. In the second observation period, compared to the first period, a change in the Maximum snow cover depth is observed, with a slight increase in January and February.

During the entire observation period in Goderdzi, the maximum value of snow cover depthwas recorded in March 1997 (510 cm). On average, there is no snow cover in July an August.

In the second observation period, compared to the first one, a change in the maximum snow cover depth is observed, with a slight increase in January and February.

During the entire observation period in Omalo, the highest value of the maximum snow depth was recorded in February 1987 (140 cm). On average, snow cover in Omalo is no longer present in July and August. In the second observation period, compared to the first one, a slight increase in the maximum snow cover depth is observed in January, February and March.

Conclusion

The analysis of the results (number snow covered days and maximum snow cover depth) shows, that the duration of the snow cover directly depends on the physical and climatic conditions of the high-mountain winter resorts and only slightly varies depending on the altitude. This determines the further active development of ski tourism in this zone.

It is recommended to change the locations of ski passes to higher altitudes, or to colder, northern slopes. Promoting/stimulating cooperation with other sectors/industries (transport, meteorological services, insurance, finance, leveling ski slopes to reduce snow depth requirements, and to create artificial snow passes at winter mountain resorts to ensure adequate snow for skiing and sledding;

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ანოტაცია. თემის კვლევის აქტუალურობა ეხება მთის ტურიზმს, რომელსაც განსაკუთრებული ადგილი უჭირავს მსოფლიო ეკონომიკის განვითარებაში. ეს ეკონომიკური სექტორი მნიშვნელოვნად აუმჯობესებს განვითარებულ ქვეყნებში ვაჭრობასა და მომსახურებას, რაც იწვევს სავალუტო შემოსავლების ზრდას და დასაქმებას, ეროვნული ტრადიციების, კულტურული მემკვიდრეობის და, რაც მთავარია, მათი ფინანსური უსაფრთხოების დაცვას.

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