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THE INTERVAL FORECASTING OF THE HOLIDAY CLIMATE INDEX IN TSALKA (GEORGIA) TO 2026-2035

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Abstract. *Based on previously obtained natural data on the variability of monthly values of the Holiday Climate Index (HCI) in Tsalka (Georgia) in 1956-2015, an interval forecast of HCI on 2026-2035 was performed using the AAA version of the exponential smoothing (ETS) algorithm.*

Key Words: *bioclimate, tourism climate index, holiday climate index, interval forecasting*.

Introduction

In recent years, in order to assess the bioclimatic conditions of populated areas in connection with the development of the resort and tourism industry in them, along with various bioclimatic indices, including the very popular Tourism Climate Index (TCI) [1-4], the so-called Holiday Climate Index (HCI) has begun to be used [5]. In Georgia, along with the research of the TCI for various regions, in recent years, research of the HCI has also been launched.

In particular, in work [6] for the first time in Georgia a comparison between Tourism Climate Index and Holiday Climate Index for Tbilisi (capital of Georgia) was made.

In anothet work [7] is performed a detailed analysis of monthly, seasonal and annual HCI values during a 60-year period (1956-2015) for 13 mountainous locations in Georgia (Bakhmaro, Bakuriani, Borjomi, Goderdzi, Gudauri, Khaishi, Khulo, Lentekhi, Mestia, Pasanauri, Shovi, Stepantsminda, and Tianeti) and compared HCIs and TCIs of monthly values for three points in Georgia (Goderdzi, Khulo and Mestia) based on data from 1961 to 2010. The variability data of the HCI in 1986-2015 compared to those in 1956-1985 and the trends of the HCI in 1956-2015 are also presented.

In two other works [8,9] a detailed analysis of data on the long-term average values of the Holiday Climate Index for different settlements in the Kakheti and Kvemo Kartli regions of Georgia are presented. Finally, in work [10] some results of study of variability of the Holiday Climate Index in Tsalka in 1956-2015 are presented.

In connection with climate change, great importance is attached to the issues of long-term forecasting the variability of various bioclimatic indices, including TCI and HCI. For example, in the work [11] assessment of future change of HCI of urban and beach destinations in the Mediterranean is presented. In [12] study of suitability of the climate for tourism in Romania based on the HCI in the near future is carried out.

We have carried out similar work. Using Mestia as an example, the expected changes in the monthly, seasonal and annual HCIs of 2041-2070 and 2071-2100 were assessed. Some results of this work were used in [3, 13].

Detailed information on the variability of the monthly values of the Holiday Climate Index in Tbilisi in 1956-2015 is presented in [14]. It also presents data on the interval forecasts of HCI variability in Tbilisi for the next few decades.

This article is a continuation of studies [3, 13, 14]. In this work based on previously obtained natural data on the variability of monthly values of the Holiday Climate Index (HCI) in Tsalka in 1956-2015 [10], an interval forecast of HCI on 2026-2035 was carried out.

Study area, material and methods

Tsalka (41.60 N°, 44.08 E°, 1458 m, a.s.l.) is a town and municipality center in southern Georgia's Kvemo Kartli region. Tsalka is an important historical, cultural and economic (including tourism) center of Georgia [10, https://www.advantour.com/georgia/tsalka-canyon.htm].

Data on variability of the monthly values of Holiday Climate Index in Tsalka in 1956-2015 in [10] are presented. Based on this data forecasting of HCI on 2026-2035 was performed using the AAA version of the exponential smoothing (ETS) algorithm taking into account the periodicity in the pre-forecast time series [15]. 95%_Low and 95%_Upp – 95% lower and upper forecast level of HCI. In the time series of HCI periodicity was observed only for March (2 years), July (15 years), November (7 years) and December (9 years).

Results

Results in Fig. 1-4 are presented.

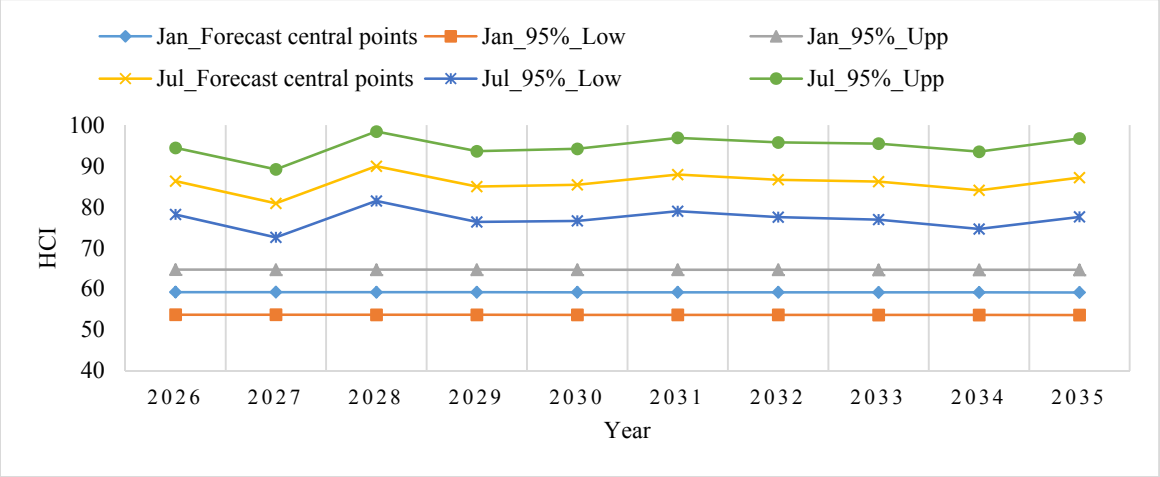

Fig. 1. Example of interval forecast of HCI in Tsalka in 2026-2035 for January and July.

In Fig. 1 example of interval forecast of HCI in Tsalka in 2026-2035 for January and July is presented. As follows from Fig. 1, in the studied period of time in January, the central point of the HCI forecast is 59 (category "Acceptable") with a range of variability from 54 (category "Acceptable") to 65 (category "Good"). In July, possible variations in the central point of the HCI forecast are within 81 (category "Excellent") – 90 (category "Ideal") with a general range of variability from 73 (category "Very Good") to 98 (category "Ideal").

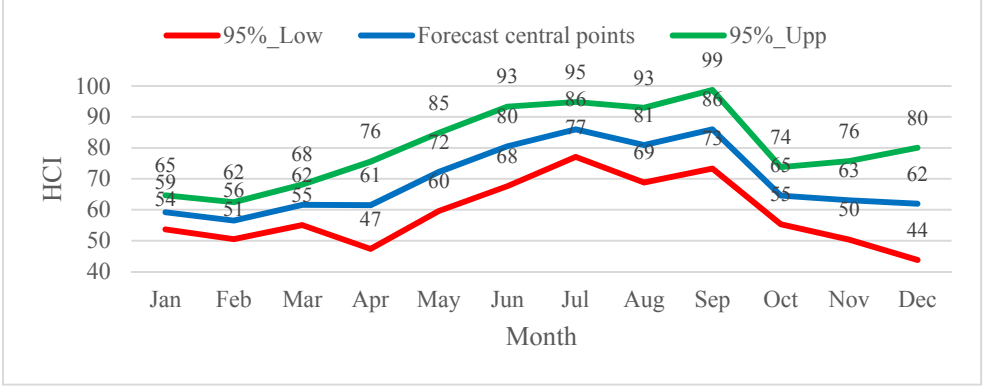

Fig. 2. Monthly average predicted values of HCI in Tsalka in 2026-2035.

In Fig. 2 data on monthly average predicted values of HCI in Tsalka in 2026-2035 are presented. As follows from this Figure the average values of central point of the HCI forecast change from 61 (April, category “Good”) to 86 (July and September, category “Excellent”) with a range of variability from 44 (December, category “Marginal”) to 99 (September, category “Ideal”).

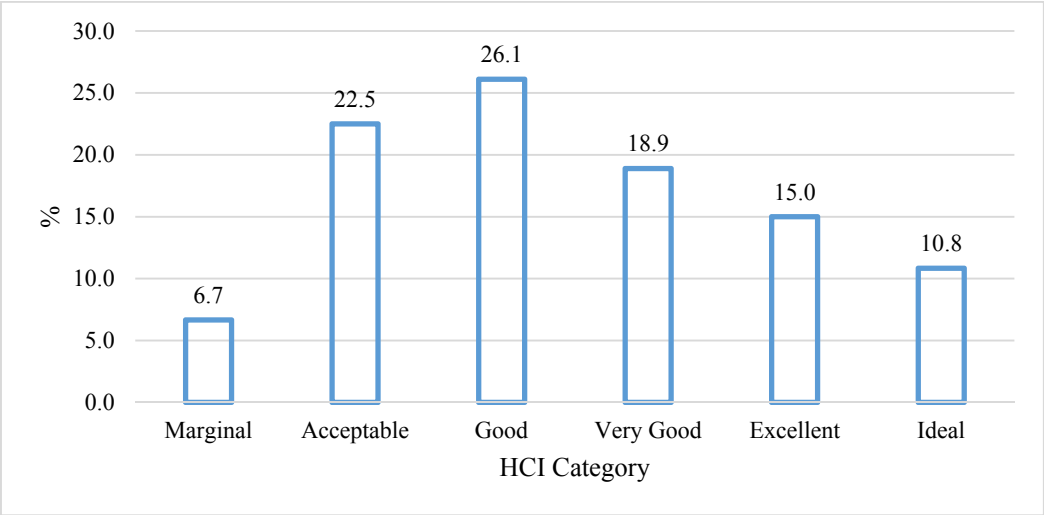

Fig. 3. Expected repetition of category of monthly values of HCI in Tsalka in 2026-2035 (forecast central points and their 95% lower and upper levels).

In Fig. 3 data on expected repetition of category of monthly values of HCI in Tsalka in 2026-2035 is presented. As can be seen from this figure, the highest repetition of HCI values (26.1%) falls on the "Good" category, the lowest (6.7%) – on the “Marginal” category. For comparison, note that in 1986-2015, the highest repetition of HCI values (38.6%) also fell on the “Good” category, while the lowest (0.3%) – on the “Ideal” category [10].

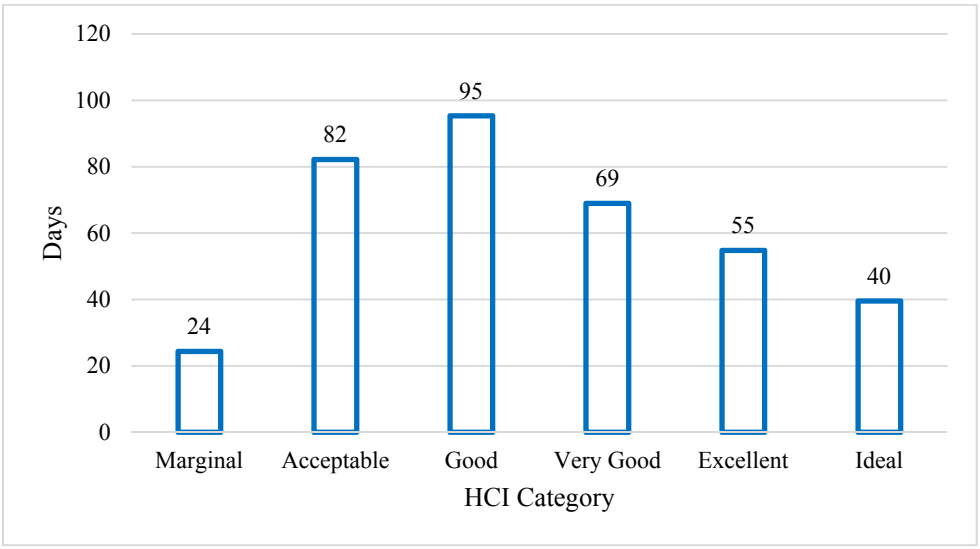

Fig. 4. Expected number of days in year with different category of HCI in Tsalka in 2026-2035 (forecast central points and their 95% lower and upper levels).

Finally, in Fig. 4 data on expected number of days in year with different category of HCI in Tsalka in 2026-2035 is presented. This number of days change from 95 (category “Good”) to 24 (category “Marginal”). On “Ideal” category the possible number of days can reach 40. Note in the period from 1986 to 2015 in the “Good” category was 140 days per year, and in the “Ideal” category – 1 day per year [10].

Conclusion

In the future, it is planned to continue similar studies for different regions of Georgia using various methods of short-term and long-term forecasting of the variability of the HCI and other bioclimatic indices, taking into account climate change. As data on the components of the HCI are accumulated, it is also planned to test the specified method of forecasting the HCI by comparing the calculated and actual data on this index for the period after 2016.

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