Global climate change and risk analysis of tourist destinations in the regions of Georgia

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Abstract.
Tourism is considered the largest industry in the world, and the environment is central to its development. Climate change has a significant impact on tourism destinations. The relevance, methodological and practical importance of the problems posed in the article, the presence of unresolved issues led to the selection of the research topic, the determination of the research goal and tasks. The subject of our research is climate change risk assessment on the tourist regions of Georgia. The environment is the basis of the tourist product, therefore the profitability of tourism depends on the attractiveness of tourist destinations. Due to the close relationship between environment and climate, tourism is considered a climate-sensitive economic sector. Climate change is likely to lead to a shift in destination. There is a need to reduce the risks from the impacts already caused by climate change.

Keywords:
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Introduction. Climate change is one of the most important challenges for sustainable development with long-term consequences. The problem of mankind, which has a long history, its roots appear in the 70s of the 19th century and is associated with the name of climatologist V. Kiopen (1873), who at that time determined a 10°C fold drop in temperature for the whole earth. V. Willett (1950) estimated the trend of planetary temperature change for the period 1880-1930, and obtained an increase of 0.5°C in the average planetary temperature and increasing the temperature of the winter months by 10°C M. Budiko (1971) determined that warming began at the end of the 19th century, which reached a weak maximum at the end of the same century.

The current phenomenon of climate change has become a reference since the 70s of the last century, when the trend of a sharp increase in the global average annual temperature and frequent climatic disasters were noticed. Today, it is already scientifically proven that climate change is really happening on a global scale and is manifested in the rise of the average temperature and, in connection with it, in the frequency of precipitation, which is reflected in many, extremely negative ways in the form of extreme events.

It should be noted that during the last 150 years, climate change has been occurring at a rapid pace due to the unprecedented rapid accumulation of greenhouse gas concentrations in the atmosphere. Rapid climate change leaves us with little time to prepare for the expected change and mitigate its negative impacts.

Today, the field of tourism is considered the largest industry in the world, and the environment occupies a central place in its development. As more attention will be paid to the environment in the future, priorities that are economically efficient but ecologically undesirable will remain unfulfilled. The environment is the basis of the tourism product, so the profitability of tourism depends on the attractiveness of the tourist destinations that tourists want to see.

Aim of research. The aim of the paper is to analyze the risks related to climate change, which is based on the assessment of emerging problems at regional tourist
Methodology. Qualitative research methods, analysis of quality textual information, processing of theoretical material of a scientific nature, logical, economic analysis – which means processing of analytical material presented in open sources, evaluation of tourist places. A wide range of practical and theoretical material, special and fundamental works, as well as a global network were used in the research process. Conclusion and recommendations are based on qualitative analysis.

Literature review. The study of the bibliographic material surrounding the issue we studied reveals that there are separate works on climate change in the field of tourism, by Georgian and foreign researchers: E. Elizbarashvili, S. Khorava, L. Kartvelishvili, L. Kochlamazashvili, Ts. Davituliani, the problem of the impact of climate change on the tourist regions of Georgia is discussed from an interesting point of view. Foreign researchers: Jesse Gourevitch, Carolyn Kousky, KouskyYanjun, Olufemi Adedeji, Okocha Reuben, Piers M. Forster, Christopher J. Smith, Tristram Walsh, F. Lamb, Robin Lamboll, Mathias Hauser, Aurélien Ribes, Debbie Rosen, Nathan Gillett, Matthew D. Palmer, Joeri Rogelj, Karina Schuckmann, I. Seneviratne, Blair Trewin, Xuebin Zhang, Myles Allen, Robbie, Alex Borger, Tim Boyer, A. Broersma, Lijing Cheng, Frank Dentener, Pierre Friedlingstein, José M. Gutiérrez, Johannes Gütschow, Bradley Hall, Ishii, Stuart Jenkins, Xin Lan, June-Yi Lee, Colin Morice, Christopher Kadow, John Kennedy, Rachel Killick, Jan C. Minx, Vaishali Naik, Glen P. Peters, Anna Pirani, etc.

Discussion and Results. Tackling climate change is one of the goals of sustainable development and an important priority of the United Nations Development Program (UNDP). That is why UNDP's Rapid Development Laboratory has chosen the study of issues related to climate change and the search for solutions as one of its leading areas of activity. According to the UNDP research, the awareness of the population of Georgia regarding climate change is quite high, 97% of respondents have heard about climate change, and 91% believe that climate change is a real and dangerous process. The majority of
respondents (up to 60%) think that climate change is a more important challenge than international terrorism or armed conflicts [1].

Climate change can have a significant impact on tourism activity by changing one of its important resources - the natural environment. For example, changes in precipitation can lead to floods or droughts (leading to desertification, or water scarcity); Increasing seawater temperatures can damage coral ecosystems; Storm surges can cause shore erosion and excess salinity can affect coastal ecosystems. Tourism is an active user of resources such as water, energy, food, rich biodiversity and pristine natural areas. Tourism in mountainous regions is affected by changes in snowfall conditions, and tourist sites in flood and drought areas are not protected from environmental impacts. Climate change also affects health, the safety of tourists and local communities [2].

The study-analysis of the results of global climate change in Georgia has revealed significant changes in climatic parameters (average annual, maximum and minimum temperatures, average annual rainfall totals and rainfall regime) from the beginning of the 20th century to the present day. Against the general background of modern global warming, the temperature is increasing in eastern Georgia, while it is decreasing mainly in the west. The highest rates of average annual temperature increase are observed in the regions, on the Kartli and Kakheti ridges. The highest rate of temperature increase in these areas exceeds 0.0050. There are separate warming centers on the Black Sea coast [3].

As the head of the Adventure Tourism Association, Johnny Kapanadze notes, "The most striking thing is the rapid melting of glaciers. There is a high risk of river flooding. Frequent occurrences of forest fires are also important and noteworthy. There are fewer water resources, which significantly affects adventure tourism. The same in the Caucasus, we have quite big problems. Earlier, when we used to get drinking water from one or the other source, now these sources have dried up. It is a big problem mainly in August and September. High temperatures are also difficult to bear for adventure tourism. It's safe to say that many people are already wondering if
it's worth going and traveling in light of climate change. Often, nature is no longer so attractive. Such problems have arisen that would have been less 15–20 years ago. The natural geographical attraction is slowly losing its charm. For example, the natural monuments of Samegrelo. Water levels in waterfalls and canyons reach historic lows. Naturally, this will have a negative impact on Georgian tourism” [4].

Sea coasts everywhere, one can say all over the world, show special sensitivity to the harmful effects of climate change, and the Black Sea coast of Georgia is no exception in this respect. Here, along the entire length of the coastline, the sea level is falling compared to the land, storms are becoming more frequent and stronger, river discharges are increasing in the sea, and sea surface temperatures are changing over the years. The situation of the river is particularly acute. in Delta of Rion, St. near Poti, where we have a double problem, on the one hand, the invasion of the sea and the seizure of land, and, on the other hand, the invasion of the river into the sea and the introduction of debris into the sea. [5]. The Black Sea coastal zone is currently the most vulnerable ecosystem in Georgia to climate change, and modeled projections paint an even more dire picture by 2100.

The humid subtropical climate of the coastal zone is formed mainly as a result of the interaction of humid air masses invading from the Black Sea with the southern slopes of the Caucasus and the western slopes of the Meskheti ridge. The mode of air movement has a significant influence on the local circulation, which is formed by uneven heating of land and sea. Such a circulation is created by breezes, monsoons (with a change characteristic of the Black Sea) and mountain-valley winds. (as a result of uneven heating and cooling of sea and land, thermal winds-breezes and mountain-bar winds arise). The activation of sea breezes begins at the end of April and ends at the end of August. At an altitude of 700–800 m, sea breezes are observed only in the middle of summer. It should be noted that currently high buildings in Batumi are an obstacle to the action of breezes [6].

The Black Sea strip is of special importance for the economy of the country, the cities of Batumi, Poti and Sukhumi
with their ports, Supsi and Kulev marine oil terminals, Batumi airport and many other settlements are located here, which form the core of the economic and tourist-recreational economy of the country. In this strip, there is a highly developed coastal infrastructure with a frequent network of railways and roads, almost 60% of which follow the coast. Changes in marine ecosystem parameters caused by climate change will seriously affect the infrastructure as well.

Against the background of the current global warming, four main threats have been identified for the Black Sea ecosystem: an increase in the rate of eustasy (sea level rise relative to the land); increase in intensity and frequency of storm surges (storms), and change in the seasons of occurrence; Activation of sedimentation in deltas of glacially fed rivers (threats only the Rion delta and its middle) and changing the thermal characteristics of the sea. In addition to these four indicators directly related to the marine ecosystem, the change in air temperature and the increase in the probability of heat waves during the tourist season are important here.

There are 4 main categories of climate change impacts, which in turn affect the competitiveness and status of tourist destinations. 1. Direct climate impacts Climate is a key resource for tourism as it determines a number of tourism activities in destinations. Climate also plays a leading role in the seasonality of tourism demand and significantly determines the volume of operating costs, including those such as heating and cooling, food and water supplies, and insurance costs. 2. Indirect impact on environmental changes. As environmental sustainability is a critical resource for tourism, climate-induced environmental changes will have a wide-ranging impact on tourism, both internationally and regionally. Changes in water availability, loss of biodiversity, landscape In the loss of aesthetics, changes in agricultural production, increasing natural hazards, coastal erosion and floods, will affect tourism in different ways. 3. Policy to mitigate the impact on tourist mobility. National and international policies related to the reduction of greenhouse gas emissions are also reflected in the movement of tourist flows. This will lead to an increase in transport costs and may contribute to a change in attitudes towards the
environment, forcing tourists to change their travel patterns. 4. Indirect impact of social changes. Climate change threatens the country's future economic growth and political stability [7].

The Government of Georgia has developed a 2030 climate change strategy. Achieving the 13th goal of sustainable development involves the integration of measures against climate change into national policies, strategies and plans. The measures outlined in the Climate Change Action Plan directly contribute to mainstreaming climate change issues into national policy documents. The link between climate change measures and other areas of development is clearly presented in the sectoral mitigation measures already assessed.

The long-term vision of the Climate Strategy and Action Plan is to reduce total greenhouse gas emissions by 35% compared to 1990 levels for all major sectors of the economy relevant to climate change mitigation by 2030. This vision derives from the updated Nationally Determined Contribution (NDC) document prepared by Georgia to be submitted to the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) in 2021. [8].

Conclusion and recommendations. In order for the country not to face a disaster every time it rains, it is necessary to have a proper environmental policy. Due to climate change, the humidity has increased, in one day one place can receive a whole year's worth of precipitation, then it can be followed by a long drought, which has a negative effect on the environment. In addition, the temperature difference between day and night is quite large, which also has a negative effect on nature, although there are also external causes, i.e. human factors. Deforestation has a particularly severe impact. In such a situation, it is necessary to take preliminary measures. Monitoring should be carried out every year to determine how much water can be carried by this or that river, whether the ravines are running out, etc. According to the observation materials of experts, it is confirmed that the sea level on the coast of Adjara has increased significantly in recent years. In order to maintain the stability of the sea shores, it is necessary to know, monitor and evaluate the hydrological regime of the Black Sea in order to predict the
Regardless of the magnitude of the impacts caused by climate change, all businesses and destinations involved in tourism will need to adapt to climate change in order to minimize its associated risks and take advantage of new opportunities for economic, social and environmental sustainability. Due to the close connection between environment and climate, tourism is considered a climate-sensitive economic sector. Climate change is likely to lead to regional shifts in destinations and tourists, requiring adaptation by all actors in the tourism industry. Tourism will not be able to cope with the challenges of climate change on its own, but it can act within the framework of the international agenda for sustainable development.

It is necessary to stop the process of global warming in order to prevent a further increase in temperature, and on the other hand, it is necessary to reduce the risks arising from the impacts already caused by climate change. To solve this phenomenon, the following approaches are prioritized: In the direction of mitigation, priority is given to: increasing energy efficiency, expanding renewable energy production (at the expense of solar, wind, geothermal, etc. energy), encouraging fuel-efficient transport, protecting and expanding forest cover, climate goals. Encouraging customized innovative technologies and services. In the direction of adaptation, priority is given to: implementing measures to reduce losses and damages caused by extreme weather, introducing resource-saving (e.g. water and soil) technologies and approaches, studying the impact of climate change on mountain ecosystems, glaciers, mountain economies and the living standards of the population in order to better manage these systems, adaptation measures. Implementation for the most vulnerable winter (mountainous) and summer (coastal) resorts, conservation of endemic, red-listed species and local varieties important for food and agriculture and protection of forest cover [9].

The country's environmental protection policy should be aimed at a long-term period in order to ensure the sustainable development of tourism, which many, especially developing countries, ignore for financial gain. In some tourist areas, there are practically no nature protection services and...
normative acts are weak. For the sustainable development of tourism, it is necessary to maintain an ecologically clean environment and take into account the climatic conditions of the given region. Despite the efforts of the world community, it has not yet been possible to stabilize the concentration of greenhouse gases in the Earth's atmosphere at a safe level. Nor did the commitments made by the countries that joined the Framework Convention on Climate Change to the Convention and later to the Kyoto Protocol have not brought the desired results. Moreover, on a global scale, the level of greenhouse gas emissions has increased since the adoption of the Convention, especially in the last decade.

Due to the global nature of the climate change phenomenon, it is necessary to unite the efforts of mankind to stop it. Climate change is an existential challenge facing all of humanity and our plans for the future.

Solving the problem of climate change requires two parallel approaches - on the one hand, it is necessary to stop the global warming process in order to prevent further increase in temperature, and on the other hand, it is necessary to reduce or completely neutralize the risks arising from the effects already caused by climate change.

References: