

CLIMATIC CONDITIONS AND METEOROLOGICAL HAZARDS CHARACTERISTIC OF THE NATANEBI RIVER BASIN

* Elizbarashvili M., ** Elizbarashvili E., * Chikhradze N.

* Faculty of Exact and Natural Sciences, Ivane Javakhishvili Tbilisi State University, Tbilisi, Georgia;

** Institute of Hydrometeorology, Georgian Technical University, Tbilisi, Georgia;
mariam.elizbarashvili@tsu.ge

Abstract. The article examines the climatic features and characteristic meteorological hazards of the Natanebi River basin, drawing on relevant databases and field literature. It was revealed that the mountainous zone of the basin is characterized by hurricanes and hail, for which the construction of windbreaks and the use of hail protection nets are recommended. Drought is less typical for the basin. In exceptional cases, soil cultivation and irrigation are preferable.

Keywords: catchment basin, climate change, hazardous natural events, mitigation, and adaptation.

1. Introduction

The article describes the climatic background and expected meteorological hazards of the Natanebi River basin.

The Natanebi River catchment is located in the humid subtropical climatic zone of western Georgia. The river originates on the northern slope of the Meskheta Range, at an altitude of 2,548 m, and flows into the Black Sea near the peak Sakornia and the village of Shekviteli; the river is 60 km long, and the basin area is 657 km² [1]. Due to a vertical layout, the distribution of climatic parameters in the basin area, despite its small size, is characterized by significant variability.

The river basin is home to settlements and agricultural fields, agricultural works are carried out, infrastructure is expanding, and companies extract inert materials in the valley. There are cases where sediment removal exceeds the permissible norm. In some villages located in the river basin, artesian wells have dried up, landslide processes are developing, and ecological problems occur. One of the reasons for the development of negative processes in the basin is the climate, which puts a detailed climatic study of the river basin and assessment of meteorological hazards on the agenda.

2. Method and material

The climatic conditions of the sediment basin and the expected meteorological hazards were analyzed using the observation data of the National Environment Agency, the Climatic Directory [2], the databases of the Institute of Hydrometeorology of the Georgian Technical University, the catalog of natural disasters created at the M. Nodia Institute of Geophysics [3] and other literary sources [4,5,6,7, 8, 9,10,11,12,13].

3. Results and discussion

The duration of sunlight in the basin area is less than 2,000 hours per year. Breeze and monsoon circulation prevail, which determines the diurnal circulation of winds and the dominance of sea winds in the warm period of the year, and the predominance of land winds in the cold period of the year (Table 3.1).

Table 3.1. Wind direction repeatability, % [7]

Station	Wind direction	Month				Year
		I	IV	VII	X	
Ureki	From the sea	23	54	83	40	49
	From land	77	46	17	60	51
Ozurgeti	From the sea	17	60	71	28	63
	From land	83	40	29	72	37

As can be seen from Table 3.1, in the basin area, as in the Kolkheti Plain in general, winds from the sea prevail in spring and summer, and from the land towards the sea in autumn and winter. At the same time, land winds are more pronounced in the cold season of the year in Ozurgeti, which is far from the sea. The average annual wind speed in the basin area is 4 m/sec or less. The number of days with strong winds, when the speed is greater than or equal to 15 m/sec, is 10-20 days per year.

The average annual air temperature in the mouth of the Natanebi River basin and the Kolkheti Plain exceeds 14 degrees, and in the upper reaches it is approximately 4-6°, the average maximum temperature in most of the basin is 36-38°, in the upper reaches it drops to 30°, the average absolute minimum temperature is -4°, -8°, and in the mountains it drops to -10°, -16° [6].

Relative air humidity is high throughout the year and averages 70-80% in January and 75-85% in July [6].

The annual total atmospheric precipitation in the basin area, also, according to the maps of the “Climatic and Agroclimatic Atlas of Georgia” [6], averages 1,800-2,400 mm. During the cold and warm periods of the year, approximately equal precipitation falls within the range of 1,000-1,600 mm. The annual duration of precipitation is more than 1,200 h [6].

The daily maximum of precipitation within the basin is 150-300 mm. During the year, there are more than 160 rainy days on average in the basin [6].

On the Meskheta range, a stable snow cover forms from November 10, which is broken in late March or early April. The snow cover lasts for approximately 100-150 days. Its decadal maximum height in the mountains reaches 200 cm. There is a medium and strong avalanche danger here [6].

Table 3.2 presents the special atmospheric events characteristic of the basin.

Table 3.2. Special atmospheric events characteristic of the Natanebi River basin [3,13]

Settlement	Atmospheric event, number of days				
	Thunderstorm	Hail	Fog	Blizzard	Hurricane
Ureki	37	1,8	9	-	0,02
Nabeghlavi	26	1,0	20	-	-
Bakhmaro	41	2,8	102	30	0,6

As can be seen from Table 3.2, among the special atmospheric phenomena, **thunderstorms** are frequent in the lowlands.

The number of **foggy** days in the mountains exceeds 100 per year. Dense fog is hazardous when visibility is less than 50 m. The frequency of such fogs during the year is quite high in Bakhmaro and is 70.

Blizzards are frequent in mountainous areas. According to Bakhmaro data, the number of blizzard days during the year is 30.

In the lowland zone of the Natanebi River basin and on the sea coast, the number of **hail** days does not exceed 2 per year on average, but hail can occur 4 times. In the mountainous zone of the basin, hail is relatively frequent and occurs on average 3 times per year, although it can occur for 14 days. The hailstorms occurring here are moderate to medium in intensity, affecting mainly areas of 2 to 7 sq. km. In the mountainous zone of the basin, hailstorms can cause significant damage (Table 3.3).

Table 3.3. Different intensities of some characteristics of hailstorms in 2000-2010 [3]

Settlement	Year	Month	Number	Distribution area, sq. km	Effect	Damage, thousands US \$
Anaseuli	2002	09	08	2	Moderate	246
	2005	11	11	2	Moderate	246
Bakhmaro	2000	06	04	7	Average	984
	2002	07	10	2	Moderate	246
	2009	04	30	3	Average	492

The strong impact of hail, when agricultural harvests, crops, and pastures are destroyed, buildings, airplanes, and car bodies are seriously damaged, domestic animals are killed, and the number of human casualties is high, is practically excluded.

A dangerous weather phenomenon is **hurricane winds** when their speed exceeds 32 m/sec. Its recurrence, as can be seen from the table, is not expressed in large numbers, but it can bring catastrophic consequences.

Table 3.4. Some characteristics of hurricanes developed within the Natanebi River basin in recent years (2000-2022) [3]

Settlement	Year	Month	Number	Speed, m/sec	Distribution area, sq. km	Damage, thousands US \$
Anaseuli	2002	06	12	30	900	25
	2002	09	06	35	1,200	25
Bakhmaro	2000	01	18	35	900	28
	2006	03	09	35	1,200	-

One of the dangerous weather phenomena is **drought**, the reliable indicator of which is the sum of the precipitation during the vegetation period. A drought is considered a period when the sum of precipitation during the veget

ation period does not exceed 150 mm. However, such small precipitations are not observed in the basin during the vegetation period, which also confirms that drought is not characteristic of the Natanebi basin [7].

4. Conclusion

It was found that the mountainous zone of the Natanebi River basin is characterized by hurricanes. Hurricanes are expected once every 2.5 years, and their speed reaches 40 m/s. Such hurricanes can cause medium and strong impacts.

In the lowland zone of the Natanebi River basin and on the sea coast, the number of hail days does not exceed 2 on average per year, but hail can occur 4 times. Hail mainly has a moderate and medium impact. A strong impact of hail, when agricultural harvests, crops, and pastures are destroyed, buildings, airplanes, and car bodies are seriously damaged, domestic animals are killed, and the number of human casualties is high, is practically excluded.

Recommendations:

1. To protect against weather disasters, it is desirable to create a special early warning service in the region, which will notify the population about the expected disaster, including hurricane winds and hail.

In addition, it is advisable to build impenetrable windbreaks in the upper and middle reaches of the river basin, consisting of two tiers. Details should be clarified on site in consultation with foresters and environmental protection specialists.

In the mountainous zone of the Natanebi River basin, where hail is relatively common, it is possible to use a hail protection net for agricultural crops. The net should be selected based on the type of culture in consultation with specialists.

2. Drought is not typical for the Natanebi River basin, although it is possible that during the active summer vegetation period, the relatively small amount and uneven distribution of atmospheric precipitation may sometimes not provide the amount of moisture necessary for plants in the soil, without which normal plant development is excluded. In such cases, to preserve the crop, it is preferable to loosen the soil (cultivate) or irrigate, where possible.

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