ATMOSPHERIC RISKS IN THE DANUBE CLUSTER

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Abstract:
Due to its position in Romania, the Danube Cluster is exposed to climate risks with a major impact on the environment. The article describes how each phenomenon manifests itself, as well as how they affect the population. The author analyzed the main climatic parameters, temperature, precipitation from meteorological stations in the area in order to identify the main atmospheric risks. The main atmospheric risks that appear in the Danube Cluster area are: drought, desertification, lightning and thunder, hail, frost and floods. The existing atmospheric risks at the level of the analyzed area and not only constitute a major problem on the natural environment with repercussions on the population and human activities.

Keywords: *atmospheric risk, environmental impact, Danube Cluster, population.*

JEL Classification: *Q53, Q,54, Q56*

1. Introduction

Each scientific paper focused on the analysis of a geographical area, regardless of the degree to which it is achieved, implies the existence of useful results for the population included in the area or region studied. In this paper I would like to present the conceptual delimitations of the notion of risk, the main atmospheric risks existing in the Clisura area as well as the way in which they affect the population and the development of economic activities.

2. Risk - conceptual clarifications

Natural hazards are understood as usually extreme events that go beyond the immediate capacity to counteract and adapt to human society. They are possible, probable events, and when they occur they are called disasters (see fig. no. 1).

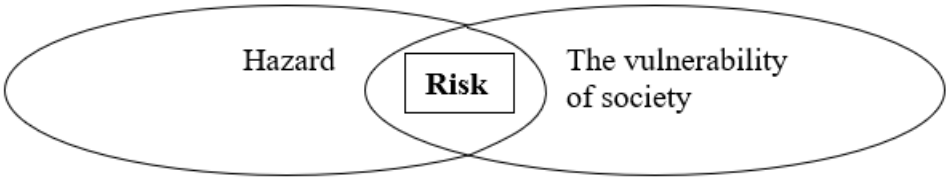

Fig. no. 1: Risk notion scheme

By definition, natural risk cannot be understood outside of man's relationship with certain events that he cannot control, involving at the same time the initiative and freedom of decision of the human being.

White in 1974 stated that natural risk involves "the study of the interaction between man and the environment, governed, on the one hand, by natural legitimacy and, on the other hand, by the continuous capacity of the sociosphere to adapt to environmental changes."

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3. Atmospheric risks in the Danube Cluster area

The location of Clisura in the southwestern part of Romania means that this region is exposed to atmospheric risks with a pronounced impact on the environment.

Thermal hazards are caused by the general circulation of the atmosphere, solar radiation and the active underlying surface. During the cold season, the risks are generated by the penetration of cold air masses coming from Russia and Scandinavia and which cause a sudden drop in temperature. Depending on the duration, intensity and when they occur in early autumn or late spring can create devastating effects, especially on vegetation and crops.

In the summer season, the penetration of continental-tropical air masses from North Africa lead to a massive warming of the atmosphere that favors the installation of prolonged droughts, and their frequency and intensity can cause desertification in certain areas.

In terms of rainfall risks, they are caused by the activity of tropical cyclones in the Mediterranean Sea that can occur throughout the year.

The main atmospheric risks that appear in the Danube Gorge area are: drought, desertification, lightning and thunder, hail, frost and floods.

Drought is a long-lasting phenomenon in the Clisura region that is characterized in summer by long periods with very low rainfall (fig. no. 2). It has the effects of reducing river flows, especially the Danube, water reserves in the soil, the production of moisture in the air, drying of vegetation and crops.

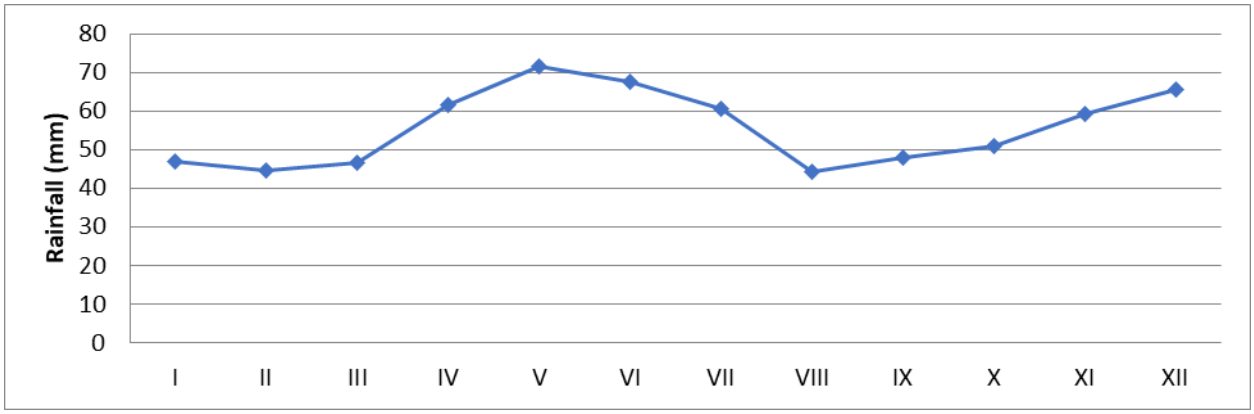

Fig. no. 2: Average monthly amount of precipitation (mm) during 1961-2017 at Orșova station

Following the analysis of the graph, it can be seen that the least rainy month is August due to the large advection of hot air. This phenomenon has increased more recently due to global climate change affecting the Danube Gorge.

Desertification in the Clisure area involves land degradation as a result of prolonged droughts. This phenomenon is also intensified by the anthropogenic pressure on the environment exerted by overcrowding, improper land use, deforestation, overgrazing and pollution. Fortunately, the Danube Gorge is affected in very small parts by this natural hazard.

Lightning falls into the category of electrometeors that are characterized by electrical discharges into the atmosphere. They occur in the warm season and take on the potential for hazard when they lead to wildfires.

Hail is a climatic risk phenomenon that occurs during the warm period of the year. It usually occurs in association with torrential rains, lightning and has major repercussions on the environment. On average, this phenomenon has a recurrence of 4 days a year (Romania. The environment and the Transportation Electrical Network, Geographical Atlas, 2002).

Frozen. The average date of the first frost is represented by the first part of November, and of the last frost, in spring, at the beginning of April. The duration of the frost-free interval is 200-220 days.

The area in which the Danube Gorge is included is included in the southwestern climatic region that benefits from the influence of warmer air masses coming from the Mediterranean Sea and the Adriatic Sea. This has an effect on the milder nature of the climate, with warmer and rainier winters, and quite dry summers. The average multiannual temperatures exceed 11˚C, the amplitudes amount to about 25˚C, and the precipitation regime is between 600-700 mm / year. The warm air that acts in the perimeter of Clisurii is called austru with influence on some plants of Mediterranean origin that grow very well in these conditions.

Floods are surplus water that exceeds the carrying capacity of the minor riverbed and as a result flows into the major riverbed covering areas of land that are usually not affected by increases in medium or low levels.

Floods can occur for two reasons:

a) Natural causes: the possibility of heavy rainfall, the sudden melting of snow and ice, the rate of evaporation of rainwater, the position of the river basin, its surface and shape, the altitude and degree of fragmentation of the relief, the type and density of the river network, permeability substrate, width and depth of the minor bed;

b) Anthropic causes such as the modification of the natural morphohydrographic features of the rivers through: regularizations, dams and slopes, excessive deforestation within the river basins, defective exploitation of large water discharges at some accumulations without correlation with downstream developments, accidents and damage to hydrographic works.

At the level of the Danube Gorge, floods can occur on the Crivița brook, which is irregular, so heavy rains cause changes in the riverbed through streams and deposits, worsening the water flow and at minimum flows. The changes of the riverbed affect the agricultural lands of the commune. At the same time, at high flows along the Danube in the area of Eșelnița commune, the banks are eroded in the absence of their consolidation.

The Valea Satului brook from Dubova commune has a torrential character, and at floods it has a very high flow, affecting the lands and houses located in its riverbed area. There is also the possibility of flooding, on the Danube, in the seafront of Dubova Bay. The Tișovița brook produces floods on its route, affecting the localities of Baia Nouă and Eibenthal.

The level of the Danube reaches in Orșova the highest value on its entire lower course - 9.57 meters. Downstream of Gura Văii, due to the widening of the river meadow, the level of the Danube decreases, thus reaching the Citadel at an altitude of 8.56 meters (Mihăilescu, V., 1969).

The Danube flow is formed in its middle basin, before entering the territory of our country, where it receives a number of important tributaries including Drava, Sava, Tisa and Morava. The average multiannual flow of the Danube at Orșova station shows important fluctuations (fig. no. 3).

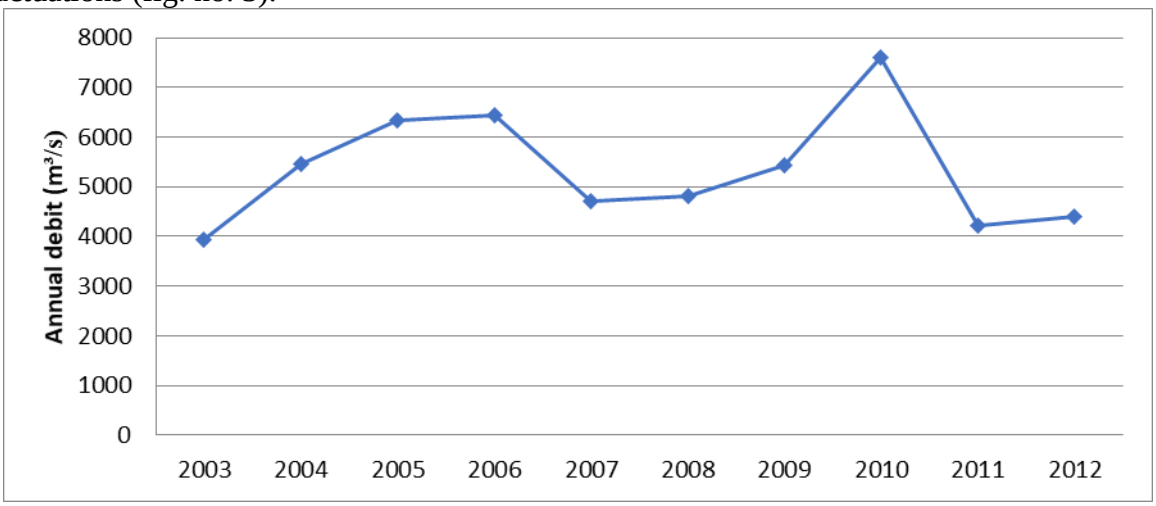

Fig. no. 3. The average multiannual debit of the Danube at Orșova station in the period 2003-2012

In the last 10 years (2003-2012), the Danube has recorded a variable flow correlated with the annual amount of rainfall. In the rainier years such as 2005, 2006 and 2010, the Danube flow was increased by values of 6338 m³ / s, 6442 m³ / s, respectively 7595 m³ / s, compared to the average multiannual value of 5400 m³ / s. At the opposite pole, the Danube registered much lower values below the multiannual average in 2003, 2011 with a flow of 3932 m³ / s, respectively 4211 m³ / s.

The average monthly flow analyzed in the period 2010-2019 varies depending on the periods with high waters (floods) and low waters, characteristic of the southern pericarpatic drainage regime (fig. no. 4). The period with high waters is recorded in spring (March-May) due to the significant amounts of rainfall, correlated with the melting of snow. In the last 10 years, the highest average monthly flow was recorded in April with a value of 7989 m³ / s.

The period with low water is recorded in autumn (September-November) due to the low runoff recorded during the summer (high temperatures, low rainfall, high evapotranspiration). The month with the lowest flow in the last 10 years was October (3589 m³ / s).

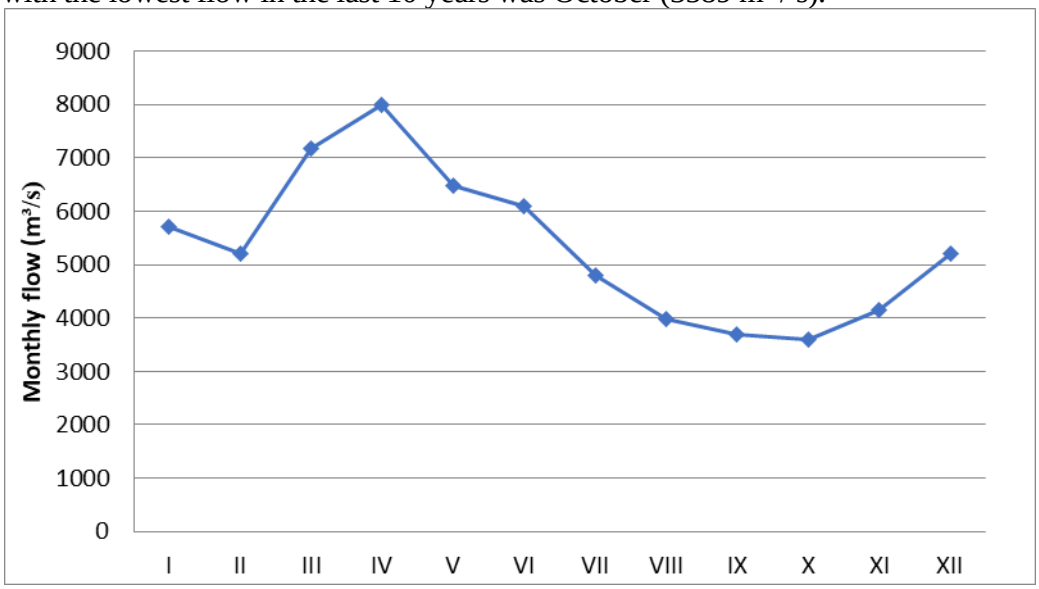

Fig. no. 4. The average monthly flow of the Danube at Orșova station in the period 2010-2019

The average flow rate of Danube waters near Orșova is about 4m / s, and the average multiannual value of suspended alluvium has variations between 430 and 2480 kg / s (Geography of Romania vol. V, 2005).

The construction of the Iron Gates I artificial dam influenced the processes and dynamics of the Danube riverbed upstream of Gura Văii locality. Through the construction of this lake the riverbed of the Danube was straightened.

In 2006 in Eșelnița, the Danube flooded much of the village, causing significant damage, destroying households and even leading to loss of life. These were repeated in 2016, but had a less destructive character.

4. Conclusions

The existing atmospheric risks at the level of the analyzed area and not only constitute a major problem on the natural environment with repercussions on the population and human activities. I sought to highlight the problem of balance, so variable in space and time, between natural and social factors.

The natural environment offers conditions for the development of settlements, but also for tourism. The studied area has an extraordinary tourist potential, represented both by the

numerous and valuable natural objectives, and by the anthropic ones, all together making this part of Romania, one of the regions with the highest tourist potential.

The climate is favorable due to the fact that the area is positioned in the South-West part of the country in the way of sub-Mediterranean air masses that give the studied area a mild climate, with shorter periods of manifestation of atmospheric risk phenomena.

5. References

1. Barkemeyer, R., Preuss, L., H., D., Tsang, S., (2011), Sustainable development What Happened to the Development in Sustainable Development? Business Guidelines Two Decades After Brundtland ", Editura Ltd and ERP Environment

2. Bogdan, Octavia, Niculescu, Elena, (1999), Climate risks in Romania, Liga Internationala Publishing House, Bucharest

3. Ciulache, S., (2004), Meteorology and climatology, University Publishing House, Bucharest

4. Costache, N., (1996), Biogeographic Regioning of Romania, University of Bucharest Publishing House, Bucharest

5. Cucu, V., Popova-Cucu, Ana, (1980), Mehedinți County, Publishing House of the Academy of the Socialist Republic of Romania, Bucharest

6. Dragotă, Carmen-Sofia, Bălteanu, D. (1998), The impact of excess atmospheric precipitation and wind on land use in Romania, Annals of the "Ștefan Cel Mare" University, Suceava, Geography-Geology Section, year VII / 1998, p .201- 204

7. Dragotă, Carmen-Sofia, (2006), Excessive precipitations in Romania, Romanian Academy Publishing House, Bucharest

8. Dumbrăveanu, D., (2004), Iron Gates Tourist Area - Geographical Analysis, University Publishing House, Bucharest

9. Dumitrescu, C., I., (2005), Sustainable development and the natural environment, Bren Publishing House, Bucharest

10. Marinica I., (2006), Risk climatic phenomena in Oltenia, MIM Autograph Publishing House, Craiova

11. Mihailescu, V., (1969), Geography of the Romanian Danube Valley, Publishing House of the Academy of the Socialist Republic, Romania, Bucharest

12. Szabo, Z., K., (2011), Analisys of research on sustainable development the goals of sustainable development, practical and theoretical framework in EU and Romania, vol 14, Petru Maior University of Târgu- Mureș

13. ***, (1970), Monograph of the Iron Gates area. Hydrological Study of the Danube and its tributaries, Publishing House of the Academy of the Socialist Republic of Romania, Bucharest

14. ***, (1960), Climatological Atlas of the Socialist Republic of Romania, Academy Publishing House, Bucharest

15. ***, (2002), Romania. The Environment and The Electric Transportation Network. Geographical Atlas, Romanian Academy Publishing House, Bucharest

16. ***, (2005), Geography of Romania, vol. V, Romanian Academy Publishing House, Bucharest

17. ***, Agency for Environmental Protection - Mehedinți County

18. ***, Statistics Commission - Mehedinți County

19. ***, Forestry Inspectorate - Mehedinți County