Technical Sciences

TECHNOGENIC LOADS AND POLLUTION OF ENVIRONMENTAL ELEMENTS IN THE YASINIA TERRITORIAL COMMUNITY OF ZAKARPATTIA REGION

Oleksandr Tytarenko
Master's student of the Department of Geodesy, Land Management and Geoinformatics, Uzhhorod National University, Ukraine
Mykola Karabiniuk
PhD (Geography), Associate Professor of the Department of Physical Geography and Efficient Environmental Management, Uzhhorod National University, Ukraine

Abstract. The article analyzes the existing anthropogenic impacts on the natural environment and the centers of excessive impact and pollution of environmental elements in the Yasinia territorial community of Zakarpattia region. Examples of the negative impact of intensive forestry and agriculture, the critical load of recreational and tourist activities, etc. are given.
Keywords: technogenic load, territorial community, environment, spatial development, Yasinia territorial community.

Changes in the environment and the development of hazardous processes on the territory of the Yasinia territorial community (TC) determine the general trends of its development, affect the possibilities of spatial planning and the functioning of economic activity. The location of the centers of development of negative processes should be taken into account in the strategic planning of the community, which is also reflected in the financial costs of combating them. Despite the intensive development of natural processes such as landslides, mudflows, floods, etc. on the territory of Yasinia TC, a holistic analysis of threats to community development requires an analysis of negative anthropogenic loads, the experience of which should be taken into account when making project decisions in the future.

Given the geographical location and the level of development of the Yasinia TC, several main activities can be identified that cause the greatest technogenic load, pollution of environmental elements and the concomitant development of other processes. Among them, the most environmentally threatening is long-term forestry, which is characterized mainly by logging using outdated technologies and equipment. The main forest user within the Yasinia TC is the Yasinia Forestry and Hunting Enterprise of the State Enterprise "Forests of Ukraine" with a total area of 29 511.4 hectares. It is formed of six forestries, among which the largest is Lazeshchyna forestry with a total area of 5682 hectares, of which 5 170.9 hectares (91%) are forest land [1].

Forestry on the territory of Yasinia TC is characterized by a high level of intensity, which is associated with the active development of forest areas and systematic annual forest restoration. The use of the community's forest resources is accompanied by the intensive use of exploitation forests, which, depending on the age and ecological condition of the stands, are withdrawn for

logging. For example, in 2020, 29 437 m^3 of timber was cut down on the territory of the Yasinia forestry as a result of harvesting for public use [1]. Another 81 019 m^3 of timber was harvested as a result of forest formation and rehabilitation logging on an area of 1426.5 hectares [1]. As a result of intensive logging, foci of strong anthropogenic pressure were formed on the community's territory, characterized by the further development of a complex of negative processes (Fig. 1).

The reduction of forest areas in the study community contributes to an increase in the rate of rainwater runoff down slopes with the accompanying development of erosion processes, intensive rise in river water levels during heavy rains and the formation of floods, etc. In addition, during the process of logging and transportation of timber, mountain streams are clogged with various wastes, wood fragments, etc. This creates a kind of congestion in water flows with the accumulation of water and waterlogged mass. During periods of intense rainfall, such areas are the main centers of mudflow formation, which systematically occur on the territory of the Yasinia community and originate in areas of logged forest. Heavy machinery and timber are also often driven along the bottoms of streams, causing severe deformation of the channels, disruption of the hydrological regime, destruction of flora and fauna, and intensification of landslide and erosion processes [2, 3].

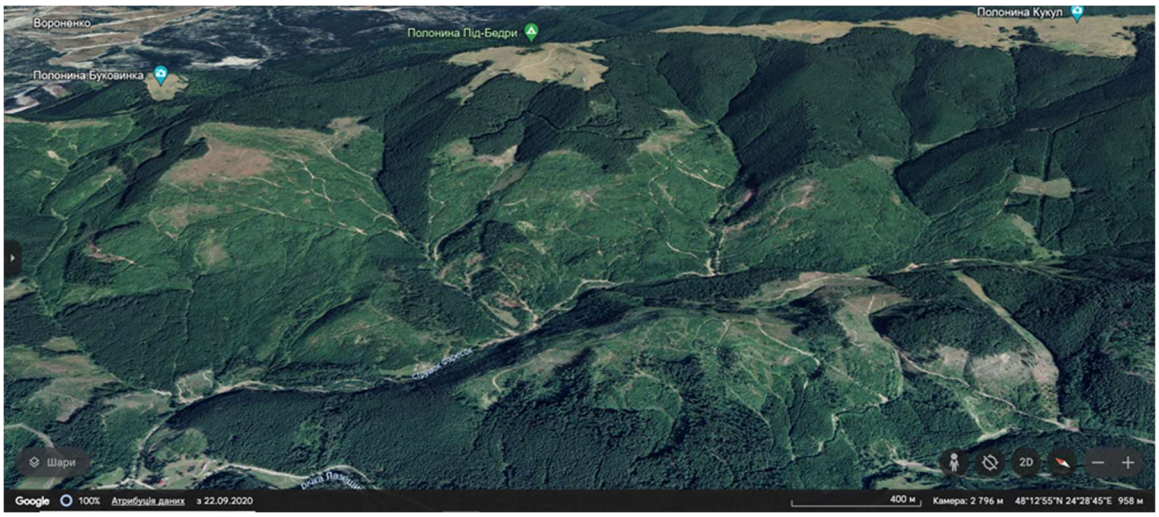

Fig. 1. Results of forest management and development of erosion processes in the upper reaches of the Lazeshchyna River basin within the Yasinia TC («Google Earth»)

Technogenic load and the development of negative natural processes in the territory of Yasinia TC are also influenced by improper agricultural practices in mountainous terrain and excessive load. Due to the mountainous terrain, most of the arable land, pastures and hayfields are located in the valley of the Chorna Tisza River and its main tributaries. Their formation is secondary to the long-term development of the area and the cutting of natural forests. The deprivation of natural vegetation and improper plowing along the slopes composed of soft mudstones in the Yasinia Valley contribute to the development of linear erosion and landslides, mainly during periods of intense summer rains. Related erosion processes and mudflow formation also occur in the highlands of the community in areas of excessive pressure from the pastoral (mountain meadow) economy, which in the past was one of the leading industries in the region. Today, the largest mountain meadows in the community are Shumnieska, Holovcheska, Shysa, Menchul, Tatul, etc.

The illegal extraction of pebbles from the channel of the Chorna Tisza River and its tributaries has a favorable impact on the intensification of erosion processes and landslides in the densely populated coastal areas of Yasinia and other settlements. As a result, the process of bank erosion (lateral erosion) is developing here, accompanied by landslide processes and the loss of

valuable residential and public land. This also leads to an increase in the destructive impact of floods on the coastal areas of villages, increasing the level of danger for the local population.

One of the most environmentally friendly uses of natural resources is organized recreational and tourist activities. It is the main area of potential community development, given the presence of unique natural objects, a set of natural conditions favorable for tourism, and the availability of the necessary primary infrastructure. However, the locations with the highest recreational load also require constant monitoring for the development of negative processes. For example, the intensive development of erosion and degradation of soil and vegetation cover often becomes threatening in areas of excessive use of ski slopes and slopes, improper operation and maintenance. Such processes are intensively manifested at the Drahobrat ski resort. Currently, there are about 70 hotels and 11 ski lifts with a total length of 8 550 meters [5]. The two longest cable cars are 1 500 and 1 200 meters long [5]. The layout of Drahobrat as a settlement remains rather chaotic, and the houses are located in an unplanned manner. They are not isolated, located near streams or even on wet ground.

The greatest anthropogenic pressure on the natural environment and pollution of the Yasinia TC territory is observed directly within the settlements - Yasinia town, Lazeshchyna, Chorna Tisza villages, etc. The highest concentration of air and water pollution is observed here. The settlements of the Yasinia community also lack centralized water supply and sewage, which causes pollution of river waters by domestic wastewater [4, 7]. In the upper reaches of the Lazeshchyna River basin, there is also a solid waste landfill in close proximity to the river, as well as the fact that only 8% of the population living there is provided with household waste collection [8]. As a result, the river banks become dumping grounds for household waste, which flows and accumulates in the lower reaches of the Tisza River during floods. Under the influence of high levels of flood waters, significant coastal areas are also scattered along the riverbed [8].

The Chorna Tisza river valley also has the highest pollution with heavy metals, oil products, etc. Heavy metals are found even in the snow cover [6, 11, 12]. This is the result of the location of the main road infrastructure and the traffic load. The construction of a road and a railway on the banks of the mountainous Chorna Tisza River contributes to the intensification of landslide processes in the area of the Kevelevo village, where the river flows through a narrow valley between the slopes of Chornohora and Svydovets. Their cutting in some places causes a loss of slope stability, which, under the influence of gravity, begins to shift, collapse and fall off towards the riverbed.

Since the establishment of the Yasinia TC, the main task of local authorities has been to find effective management tools and establish a strategy for systemic community development in the economic, social and cultural spheres. The development of the territorial community is closely dependent on the efficient use of natural resources, the establishment of local economy and production. An important aspect of the development of the Yasinia community is to improve its territorial organization and balance the environmental situation.

Today, the administration of Yasinia TC is actively working on developing a common vision of the community's development. The main current document on the economic, social and environmental development of the community is the Strategic Development Plan of Yasinia TC for 2023-2027, which is the main guideline for planning the directions of community development, as well as for determining the criteria for selecting and evaluating individual projects to achieve strategic goals [9]. It was developed at the initiative of the Yasinia Village Council and with the support and assistance of the U-LEAD with Europe Program. This document is the main guideline for planning the directions of community development, as well as for determining the criteria for selecting and evaluating individual projects to achieve strategic goals [9].

A new basic document for the development of the Yasinia TC is currently being formed. In particular, on April 25, 2023, a Working Group was established to formulate a task for the

development of a Comprehensive Plan for the Spatial Development of the Territory of the Yasinia Settlement Territorial Community [10]. Its purpose is to develop master plans for settlements and planning decisions for detailed territory plans [10]. The meeting of the working group considered the issues of approving the materials of the conditions analysis and developing scenarios for the spatial development of Yasinia TC. On August 5, 2023, a Strategic Session was held to formulate a task for the development of a Comprehensive Spatial Development Plan for Yasinia TC for the purpose of public discussion and identification of promising locations for the placement of important development facilities, as well as the identification of priority spatial development solutions. Its main visions by local communities are presented in the form of a map As a result, the main scenario for the development of the community we studied was tourism on the basis of preserving the cultural and environmental self-identification of the region [10]. However, the SWOT-analysis of the Yasinia community revealed that the local population is concerned about the threats of hazardous natural processes, various man-made pressures and environmental pollution.

To ensure the balanced development and safety of the population of Yasinia TC, it is necessary to develop a monitoring system for the manifestations and permanent centers of development of hazardous processes of natural and man-made origin. It should include expeditionary field surveys and routine monitoring observations with modeling elements:

1) conducting a field survey of the largest centers of negative processes;

2) mapping of the development centers based on detailed landscape surveys of the territory;

3) introduce periodic monitoring of process centers (landslides, collapses, mudflows, avalanches, drying out, etc.) outside of settlements;

4) development of a system of routine monitoring of the main centers of landslide and landslide-slide processes within settlements;

5) modeling of the areas of actual and potential spread of hazardous processes in the community.

REFERENCES

1. Branch "Yasinia Forestry and Hunting Range" of the State Enterprise "Forests of Ukraine" / Carpathian Forest Office. URL: https://w.forest.gov.ua/karpat_s_kyy_lisovyy_ofis (date of application: 27.11.2023).

2. Karabiniuk, M. (2019). Landscape differentiation of negative physical-geographical processes in the subalpine and alpine highlands of Chornogora (“Sheshul-Petros” section). *Physical geography and geomorphology*, 3(93), 7-17. https://doi.org/10.17721/phgg.2019.3.01 (in Ukrainian).

3. Karabiniuk, M. M. (2020). *Natural territorial complexes of the subalpine and alpine highlands of the Chornohora massif of the Ukrainian Carpathians*. (Candidate of Sciences’ thesis). Taras Shevchenko National University of Kyiv, Kyiv. (in Ukrainian).

4. Khilchevskyi, V., Leta, V. (2016). Comprehensive assessment of water quality in the Chorna Tisza River. *Hydrology, hydrochemistry and hydroecology*, 3(42), 50-56 (in Ukrainian).

5. Kłapyta, P., Krzemień, K., Goczyca, E., Krzemień, P., Dubis, L. (2019-2020). Geomorphologic effects of human impact across the Svydovets massif in the Eastern Carpathians in Ukraine. *Studia geomorphologica carpatho-balcanica*, 53-54, 85-111.

6. Kravchuk, Ya., Adamenko, O., Adamenko, Ya. (2019). Geomorphological analysis of the relief of promising areas of the Ukrainian Carpathians for recreational needs (on the example of the Chorna Tysa basin). *Problems of Geomorphology and Paleogeography of the Ukrainian Carpathians and adjacent areas*, 2 (10), 18-41 (in Ukrainian).

7. Leta, V. (2023). Chemical state of surface water massifs in the upper Tisza River basin. *Geographical education and science: challenges and progress*: Proceedings of the

International Scientific and Practical Conference dedicated to the 140th anniversary of Geography at Lviv University (Ukraine, Lviv, May 18-20, 2023). Lviv: Prostir-M, 2, 21-24 (in Ukrainian).

8. Leta, V., Pylypovych, O., Mykitchak, T. (2019). Hydro-ecological investigation of the Lazeshchyna River in Transcarpathian region of Ukraine. *Forum Geografic*, 18(2), 115-123.

9. Strategic Plan for the Development of Yasinia Territorial Community for 2023-2027 / Yasinia Territorial Community. URL: https://yasinya-gromada.gov.ua/?page_id=7078 (date of application: 27.11.2023).

10. Yasinia territorial community. URL: https://yasinya-gromada.gov.ua/ (date of application: 27.11.2023).

11. Zhovynskyi, E., Kriuchenko, N., Paparyha, P. (2011). Heavy metals in objects of environment of Svydovets massif of Ukrainian Carpathians. *Geochemistry and ore formation*, 30, 84-89 (in Ukrainian).

12. Zhovynskyi, E., Kriuchenko, N., Paparyha, P. (2011). Snow cover high mountains of Ukrainian Carpathians – indicator of environmental pollution. *Geochemistry and ore formation*, 29, 89-93 (in Ukrainian).