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Certain aspects of risk influence assessment of the river basin

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SUMMARY

The work is to assess certain aspects of hydrogeological conditions and the regime of the Dniester River, the development of elements of methods for assessing the risks of flooding of the river basin. It is established that the causes of catastrophic floods are both natural factors and economic activity.

Natural factors include: changing hydrometeorological (synoptic) situation and morphological structure of mountain riverbeds (uneven runoff distribution over time; high water content of rivers before floods; geological and orographic and hydrogeological conditions).

Factors of economic activity that have a significant impact on the formation of flood runoff include: plowing and deforestation of watersheds without the use of anti-erosion measures, violation of the technology of cultural and technical works, which accelerates surface runoff; violation of the management regime in water protection zones and coastal water protection strips of rivers; construction in areas of possible flooding and floodplains

Introduction. Flooding is a dangerous natural phenomenon that can cause significant damage to human life and health, economic infrastructure and cultural heritage, and the environment. It cannot be prevented, but it is possible to reduce the risks of negative consequences. The purpose of the work is to assess the hydrogeological conditions and hydrogeochemical regime of the Dniester river basin, to assess the factors that cause floods.

To achieve this goal, the following tasks were identified: to collect and analyze literature sources and stock materials of the research problem; to get acquainted with modern methods of estimation of the factors causing dangerous processes; to conduct a geochemical assessment of the Dniester river basin.
The methods used in the work are analytical (analysis of literature sources and stock materials) and experimental (selection and analysis of water quality in the Dniester river basin).

The scientific novelty of the work is that an in-depth analysis of methods for assessing the natural and man-made safety of aquatic ecosystems on the example of the Dniester river basin, analysis of both natural and man-made factors that cause a dangerous situation and taking into account the influence of exogenous geological processes (Fedechko et al., 2019).

The obtained research results can be used as a component of ecological monitoring for the purpose of complex assessment of ecological and hydrogeological condition of water bodies.

Presentation of the main research material. The basin of the Dniester River can be divided into three characteristic areas, each of which has its own peculiarities regarding relief, climate, soils, vegetation and hydrological properties. Accordingly, each of the districts has different from other landscape view (Vyshnevskyi, 1964).

The geological structure of the Dniester basin is complex and diverse: mountain arrays, hills, lowlands, karst, etc. The river-bed on separate areas drains breeds of various ages and genesis. The diverse and lithologic composition of the banks of the river on its various sites – from the output of native crystalline breeds to the loess-like deposits, clays and limestones.

The territory of the basin is divided into two parts - platform and geosynclinal. In structural terms, it is within the southwestern part of the Eastern European platform and Carpathian mountain structures (Kyryliuk, 2001).

From the hydrogeological point of view, the territory of the Dniester basin belongs to the Hydrogeological province of the Carpathian folded region, the hydrogeological province of the folded region of the Ukrainian crystalline shield, the Volyno-Podilsky artesian basin and the Black Sea artesian basin (Khashchak, 2012).

The main feature of the soil cover of the study area, as well as Ukraine in general, is a clear zonation in the distribution of soils of different types, due to the impact on the processes of soil formation of climatic factors.

A characteristic feature of the Dniester, which distinguishes this river between other large rivers of Ukraine, is flood mode. There are no regularities in the fluctuation of the level of the Dniester at any of its points. Throughout the year on the Dniester, the level is characterized by almost continuous alternation of floods with short-standing periods of relatively low levels. At the same time, the highest water level can be not only in spring but also in summer and even in winter.

The implementation of the provisions of the Flooding Directive began with the preparation of a number of normative documents, which were developed on its basis. Such documents are the Methods of preliminary assessment of flood risks (Adamenko and Kryzhanivskyi, 2009). Methods for developing flood hazard and risk maps (Adamenko et al., 2009) and the Procedure for developing a flood risk management plan (Adamenko and Paliychuk, 2010). Currently, these are the current normative legal acts of Ukraine, which regulate the policy in the field of flood risk assessment and management.

The development of method for the preliminary assessment of flood risks is provided by the provisions of Article 107^1 of the Water Code of Ukraine. The application of this method ensures the implementation of the first stage of preparation of a flood risk management plan, namely, a preliminary assessment of flood risks.
The preliminary flood risk assessment is based on the assessment and analysis of past floods that have caused significant damage to objects of damage and the probability of recurrence remains high or

significant floods, the recurrence of which can cause significant negative consequences. Guided by these postulates and taking into account the provisions of the Flooding Directive, a method of preliminary flood risk assessment has been developed (Adamenko and Kryzhanivskyi, 2009).
Under objects of defeat, according to (Adamenko et al., 2009), understand the health and lives of people, environment, economics, cultural heritage. Flooding can be caused by sources of various origins.
Types of flood sources. According to the provisions of the Flooding Methods differ in the types of sources of their origin (Table 1).

Table 1 *Expected types of floods (flood sources) included in the preliminary flood risk assessment*

Source of flooding (letter symbol) - designation in GIS	Description
River (R) - A11	Flooding of the territory by waters from a natural or artificial water body. This source includes flooding, caused by the waters of rivers, lakes and artificial watercourses, as well as flooding caused by congestion.
Precipitation (P) - A12	Flooding of the territory caused directly by atmospheric precipitation falling on the surface of the earth or flowing over it. This source includes wastewater discharged from the built-up area the territory in which they were formed as a result of fallout precipitation, and other surface runoff formed due to excess rainwater or snowmelt.
Groundwater (P) - A13	Flooding of the territory by the waters rising from under the earth surface, to a level above the earth's surface.
Sea (S) - A14	Flooding of the territory by inland waters. It the source includes flooding (including severe disturbance seas and marine runoff phenomena).
Artificial structures (A) - A15	Flooding of the territory with water due to its overflow through artificial ones structures that retain water or as a result of an accident on them.
Others (O) - A16	Flooding of areas through other sources may include in itself other tidal waves, tsunamis.
No data (ND) - A17	No data on the source of the flood.

Identify significant flooding that has occurred in the past (Figure 1). The definition of significant floods that have occurred in the past is based on the criterion of significance of events that have occurred in the past, and a description of their consequences, mechanism and characteristics of flooding (Table 2).

Table 2 *The mechanism of flooding by significant floods in the past*

Mechanism - designation in GIS	Description
Exceeding marks channel-floodplain corridor - A21	Flooding of the territory floodplain corridor
Exceeding marks protective A22	Flooding of the territory due to exceeding the protective marks structures (flood protection structures)
Destruction of protective buildings - A23	Flooding of the territory due to inefficiency of natural or artificial protective infrastructure. This flooding mechanism can include rupture or collapse of flood defenses or holding structure, or failure of pumping equipment or gate
Congestion culvert corridor - A24	Flooding of the territory due to natural or artificial blockage or restriction of a culvert or system. This the flooding mechanism may include clogging / clogging sewer systems or cross-section of the channel, due to the presence of bridges or pipelines, or caused by ice or landslides.
Others - A25	Flooding of the territory through other mechanisms, for example, flood phenomena.
No data - A26	There is no data on the mechanism of flooding

Figure 1 *Floods that occurred in the past near the Dniester river basin*

Conclusion. Consequently, the causes of catastrophic floods are both natural factors and economic activity. Natural factors include: changing hydrometeorological (synoptic) situation and morphological structure of mountain riverbeds (uneven runoff distribution over time - 3-4 months of spring and summer account for about 70% of annual river runoff); high water content of rivers before floods; geological-orographic and hydrogeological conditions that lead to the formation of collapses and mudflow in the mountains and adjacent areas; a significant amount of precipitation above normal, significant intensity and duration, causing saturation of the soil with moisture and reducing its water absorption capacity and water permeability; large slopes and insufficient bandwidth of riverbeds; high water flow rate due to the significant steepness of the slopes, the close occurrence of waterproof rocks; high energy potential of mountain relief, which gradually increases due to the modern lifting of the mountains; insufficient regulation of the river network; low stability of some parts of mountain massifs due to seismic activity of the subsoil and their uneven tension in some tectonic zones and nodes in combination with active erosion processes (Maniuk et al., 2020); features of hydrogeological conditions, which reduce the clutch of individual parts of the blocks of rocks in the conditions of active influence of gravitational forces.

Factors of economic activity that have a significant impact on the formation of flood runoff include: plowing and deforestation of watersheds without the use of anti-erosion measures, violation of the technology of execution of cultural and technical works, which accelerates the surface runoff; violation of the management regime in water protection zones and coastal water protection strips of rivers; building in zones of possible flooding and river floodplains; arrangement of roads, bridges without taking into account the requirements of building codes in terms of drainage and flood protection; conducting forestry activities under the condition of insufficiently developed rational scientifically substantiated technology.

Therefore, it is necessary to develop operational measures to improve the ecological and hydrogeological condition of the rivers basin, especially for their flooding.

References

Adamenko, O. and Kryzhanivskyi E. [2009] On the possibilities of predicting and preventing the catastrophic consequences of floods on the rivers of the Carpathian region. *Materials of the 5th scientific-practical conference*, 17-20. (in Ukraine).

Adamenko, O., Adamenko, Ya. and Abduragimova, E. et al. [2009] Program of complex flood protection of the Dniester river valley within Prykarpattia. *Materials of the 5th scientific-practical conference*, 20-23. (in Ukraine).

Adamenko, O. and Paliychuk, O. [2010] Causes of catastrophic floods and protection against them in the Carpathian region. *Materials of the international conference "Sustainable development of the Carpathians and other mountainous regions of Ukraine"*, 151-154. (in Ukraine)

Fedechko, A., Popliuiko, A., Medvid, M., Ihnatiuk, O. and Bronitska, N. [2019] Development of the computer data bank concept of neotectonic and exogenous processes to monitor eco-logical state of the environment (by the example of the carpathian fold belt). *Monitoring 2019 Conference – Monitoring of Geological Processes and Ecological Condition of the Environment, 2019.* [online] https://www.scopus.com.

Khashchak, M. [2012] From the history of geoecological research at the Dniester flood test site. *Ecological safety and balanced resource use*, 2 (6), 119-122. (in Ukraine).

Kyryliuk, M. [2001] Water balance and quality of water resources of the Ukrainian Carpathians, Chernivtsi, 246 p. (in Ukraine).

Maniuk, V.M., Dubei, N.V., Mykhailiv, I.R. and Boiko, A.P. [2020] On the study of geological characteristics of underground Gas storage objects. *19th International Conference on Geoinformatics – Theoretical and Applied Aspects 2020*. [online] https://www.scopus.com.

Vyshnevskyi, P.V. [1964] Showers and storm drain in Ukraine, Kiev, 144 p. (in Ukraine).