

POLLUTION OF THE RIPARIAN ENVIRONMENT BY THE TAZLAUL SĂRAT UPSTREAM RIVER

POLUAREA MEDIULUI RIVERAN PE CURSUL SUPERIOR AL RÂULUI TAZLĂUL SĂRAT

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Abstract. *The paper presents an analysis of the pollution phenomenon in the Tazlăul Sărat River basin. The studies and researches were carried out on the upper course of the river, in the area of Zemeș locality, where there are a series of wells for oil extraction. The floods have morphologically altered the minor river bed, which has influenced the stability of the banks and river basins. Crude oil pipelines are located in the river bank. Field research has analyzed the river sector between "Toderăș" and "Canton of Maxim", which administratively belongs to the commune of Zemeș, Bacău County. The flood of June 2016 had an excessive impact on the stability of oil pipelines, a situation that caused the scrapping and suspension of the pipeline.*

Key words: degradation, flood, impact, oil, pipeline

Rezumat. *Lucrarea prezintă o analiză a fenomenului de poluare în bazinul hidrografic al râului Tazlăul Sărat. Studiile și cercetările s-au efectuat pe cursul superior al râului, în zona comunei Zemeș, unde sunt o serie de sonde pentru extracția țițeiului. Viiturile au modificat morfologic albia minoră a râului, situație ce a influențat stabilitatea malurilor și a construcțiilor riverane. În malul râului sunt amplasate conductele de transport ale țițeiului. Cercetarea în teren a analizat sectorul de râu cuprins între zonele „Toderăș” și „Cantonul lui Maxim” ce aparține administrativ de comuna Zemeș, jud. Bacău. Viitura din iunie 2016 a afectat excesiv stabilitatea conductelor pentru țiței, situație ce a determinat deplasarea decopertarea și suspendarea acestora.*

Cuvinte cheie: conducte, degradare, impact, petrol, viitură

INTRODUCTION

The rivers in Romania have a hydrological regime characterized by the high frequency of the floods. In the last 15 years floods have been reported with maximum flows at intervals of two years and even annually. An example in this case is the river basin of Siret, where the frequency of floods over the last 20 years is extremely high (Avram, 2016, Vamanu and Olariu, 2003).

Natural and anthropic hydrological risk factors influence the morphology of the bed, the stability of the bed and bed constructions, and the habitat existing in the

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minor and major river bed. Disastrous floods have caused significant degradation of the social and economic objectives of the coastal area. At the same time, these floods have caused significant degradation of the riparian environment (Avram, 2016).

A special situation is the hydrographical basin of the Tazlăul Sărat River, where the effect of the floods materialized through important degradations of the riparian environment. On the upper course of Tazlău Sarat there is a strong influence of anthropogenic risk factors (Luca, 2016). The aim of the paper is to highlight the effect of anthropogenic risk factors, intensified by the natural risk factors on the local riparian environment and along the upper course of the Tazlăul Sărat River.

MATERIAL AND METHOD

The studies and researches were carried out on the upper sector of the Tazlăul Sărat River located in the Troțuș River Basin (fig. 1). The research material consists of hydrological, hydraulic, topographic, geotechnical, climatic, pollution studies, etc. The data used in the research come from the following sources: technical expertise in the field of regulation of rivers and shore defense constructions, A.B.A Siret Bacau Synthesis Reports, projects for riverside and riverine works, etc.

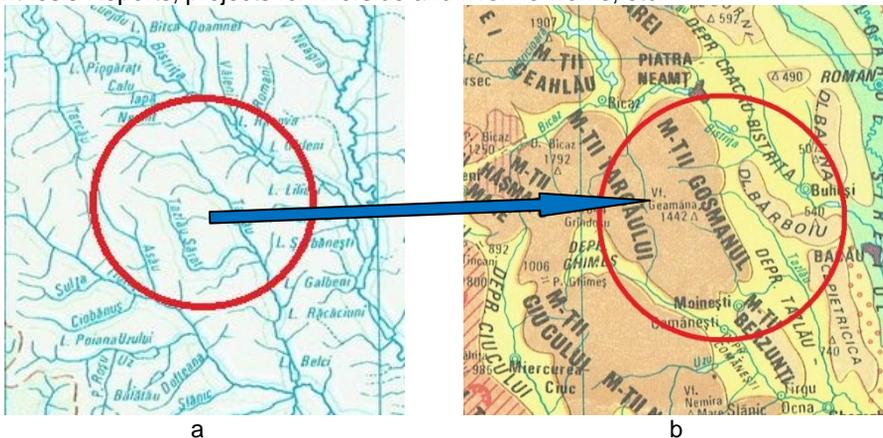


Fig. 1 Geophysical characteristics in the study area: a - hydrographical network; b - relief areas

Part of the data comes from field research conducted by authors on the analyzed river sector (Luca, 2016). Studies and research are conducted over different periods of time.

The theoretical and experimental research was carried out in the following areas:

1. Researching hydrological and hydraulic parameters on the surface of the river basin and the river sector considered in the study.
2. Investigation of the phenomenon of pollution on the studied river sector. The parameters analyzed were: pollution sources, pollutant types, pollution areas, etc.
3. Researching the natural and anthropic risk parameters influencing the pollution phenomenon.

Primary data has been processed using the statistical, hydrological and hydraulic calculation programs applicable to the case study.

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RESULTS AND DISCUSSIONS

The Tazlăul Sărat River, a tributary of Tazlău near the village of Tescani, has a length of 42 km and a surface of the 211 km² river basin (Ujvari, 1972). The historical flow is 284 m³ / s, being registered in 2005 (fig.1).

The commune of Zemeș is located geologically in the external area of the flysch zone, where two tectonic units were separated: the Tarcău cloth and the marginal unit (the margins of the margins) and the Zemeș scabbard. In the Paleogland area, oil and natural gas are exploited. Oil accumulations are generally present in the Lucăcești sandstone, the Kliwa sandstone and the transition horizon. The oil and gas fields are grouped by productive units (about five units) in the Zemeș - Moinești area (Luca, 2016).

From the analysis of the state of the environment in the research area, for the "soil and water" environmental factors, a special situation arises for a potentially vulnerable area of the Tazlăul Sărat catchment area. This is the "Zemeș - Moinești Petroleum Area" where environmental parameters are affected by the operation of the wells and the damage from the oil installations. The main sources of pollution in the study area are:

a - transport of alluvial and wood waste is intense and polluting the riparian environment;

b - artificial sources of oil exploitation (drilling and storage extraction wells, technological fluid transport pipelines).

The pollution phenomena are represented in this area by the following:

- soil pollution with hydrocarbons in the well location area (fig. 2.a);

- hydrocarbon pollution in the location of the oil and technological fluid pipelines.

Oil pipelines have a high risk of pollution through the degradation state and the actions taken by the site (Drever, 1997). The anthropic risk factors represented by the lack of repair and maintenance work lead to corrosion, cracking, breakage and breakage of pipes (fig. 2.b). The data presented by APM Bacau in the annual reports show the environmental pollution situations in the city area of Zemeș - Moinești.

The research area located on the upper course of the Tazlăul Sărat River is influenced by a series of natural and anthropogenic risks. The most important natural hazard is of hydrological nature and is presented by "hydrological risk". This is represented by the floods on the Tazlăul Sărat River, whose influence influences the morphology of the riverbed and the configuration of the riparian area. Another natural risk, with a special influence on human communities, is the risk of landslides. The presence of landslides influences the initiation of pollution in the location of oil wells and pipes.

Out of the anthropogenic risks, there are three outliers that significantly influence the living conditions of the human community as well as environmental quality parameters. The three anthropic risks are:

- the anthropic risk associated with the maintenance and repair of the hydro-technical works on the river Tazlăul Sărat and its tributary network;



Fig. 2 Sources of soil and water pollution in the Tazlăul Salat river basin: a - oil extraction wells; b - pipelines for the transport of technological products (photo oct 2016).

- the anthropic risk represented by the action of the constructions and the oil exploitation installations in the Zemeș - Moinești area;
- the anthropic risk represented by the absence of work to regulate the surface runoff and depth of groundwater, a situation that favours landslides.

The research carried out in the area of Bolătău locality, Zemeș commune, in the Tazlăul Sărat riverbed and in the riparian area, revealed the way of the floods in the river degradation. In this area, the river features a meandering bed, and at the contact with the DC 180A communal road a short length of defence was executed.



Fig. 3 The degradation of the oil transport pipelines in the Bolătău area after the flood in June 2016 on the Tazlăul Salat River: a - upward view of the pipeline position; b - downstream view (shoreline at DC180A with pipe stripping, photo oct 2016).

The river develops a large hydraulic energy in the curve area, especially in times of flood, which generates a high-value hydrodynamic force acting on shoreline and shoreline construction. The unprotected bank of the river was eroded on a length of 80 m and on a depth of 0.5-5.0 m in the bank and further on the road (fig. 3).

Oil pipelines and technological fluids (eg reservoir water) are located on the bank of the river. The erosion of the bank at floods, as well as the flow with medium flow in the bedrock, led to the pipe stripping, suspension and corrosion under the influence of climatic factors (fig. 4). Field analysis did not reveal the presence of shoreline protection along the length of the road.



Fig. 4 Details on the dismantling and suspension of oil pipelines located on the DC 180A limit and on the Tazlăul Sărat river bank, in the area of Bolătău locality, after the flood of June 2016: a - details on the state of the pipelines; b - pipeline movement (photo Oct 2016).

The natural risk factor, of the hydraulic type, represented by the erosion speed of the bed, has been acted on by the erosion of the bed and the lowering of the slope of the tallow under the shore foundation. In this way, the water penetrated behind the shore defence, eroded the bank and the road, uncovering the oil transport pipes (fig.5).

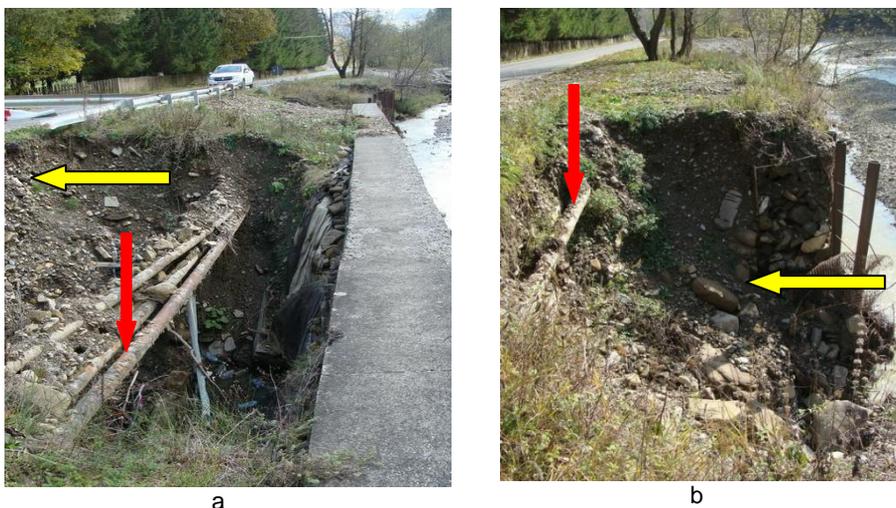


Fig. 5 Degradation of the oil transport pipelines in the area of Zemeș locality after the flood in June 2016 on the Tazlăul Sărat River: a - general view of the state of the pipelines behind the shore defence at the DC 180A limit; b - erosion of shore defence and pipe stripping (Oct. 2016).

The main anthropic risk is the absence of shoreline maintenance; it causes the degradation of the oil and technological fluid pipelines. This risk is accentuated by its overlap with the hydrological risk given by the floods on the Tazlăul Sărat River (Drever, 1997). The data presented in the environmental reports show the presence of oil pollution phenomena and technological fluids in the Zemeș area, as well as in the Moinești area (APM Bacau).

The oil exploitations in the Tazlăul Sărat River basin influence the balance of the pollutants on the Trotuș River. The oil activity in the Moinești area affects the Tazlăul Sărat, Tazlău and Trotuș watercourses, as well as the groundwater in the area, through the accidental spills of oil products and salty waters. The Tazlăul Sărat River has frequent accidental pollution with petroleum products, in most cases due to the rupture of transport pipelines. Some of the oil pipelines have an out-of-service life.

CONCLUSIONS

1. The territory of the Tazlăul Sărat River Basin is influenced by natural and anthropogenic risk factors such as floods, landslides and damages from oil pipelines from the Zemeș - Moinești site.

2. During the last 25 years there has been a series of damage to oil pipelines, which has caused pollution of the Tazlăul Sarat's land and river bed.

3. The floods produced in the years 2010-2016 on the Tazlăul Salat River have eroded the bank of the river in the area of the locality, which led to the worsening of the stability of the oil transport pipelines and creating favourable conditions for pollution of the river.

4. Anthropic risk factors increase the impact of natural risk factors in the degradation of oil pipelines located on the banks of the Tazlăul Sărat river.

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