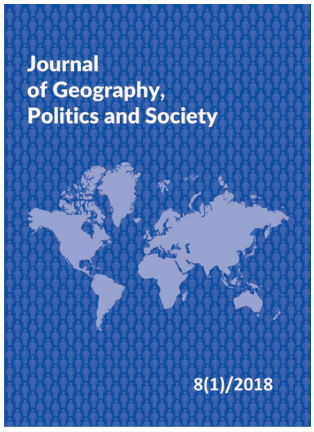

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DONBAS AS AN ECOLOGICAL DISASTER AREA: TECHNOGENIC CHALLENGES AND THREATS

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Abstract
In recent years the territory of Ukraine and its regions has been under the negative influence of a number of technogenically dangerous factors. Among the latter, to determine the level of safety it is common practice to analyze the number of potentially dangerous objects, their spatial location, distribution by types of activity and hazards, etc. The article presents the latest challenges and threats in the system of anthropogenic safety of Ukraine, including: non-compliance of the regulatory system, lack of adequate risk assessment methods, sharp extension of causal relationships and strengthening of the role of synergistic risks, etc. Attention is focused on new risks and threats caused by political instability in the territory of separate regions of Ukraine, including the ATO zone, and a structure for their further analysis and assessment is suggested.

Key words
technogenic threats and risks, potentially dangerous objects, ATO zone, Donbass.

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1. Introduction

The level of environmental and natural and technogenic safety of the territory determines the state of protection of the individual, society, and state from the adverse effects of the environment caused by natural, technogenic and anthropogenic factors. The current ecological situation in Ukraine as a whole can be characterized as extremely tense. Manifestations of ecological danger for the health and life of people in different regions of the state, due to the negative influence of technogenic and dangerous natural processes have recently increased. The depreciation of many industries is approaching a critical point. At the same time it seems important that the enterprises in question already dispose of a certain sense for innovation requirements (Steiner et al., 2006). That does not necessarily mean that these enterprises already show a high investment share in R&D, but it is imperative that they are at least open and sensitive

for innovation necessities. These enterprises can be seen at the threshold of own innovation activities, needing a final external incentive to start specific innovation projects. To that effect these enterprises show a high potential for mobilization with regard to the pre-competitive level of activities.

At the same time, at the beginning of the XXIst century long-term system challenges (From Rio to Rio…, 2012), which reflected both world trends and internal institutional barriers of development, arose in the area of guaranteeing the environmental safety of Ukraine and its regions . The major ones include (Bryzhan, Hryhoryeva, 2014; Hannigan, 2006; Dunlap, Jones, 2002;): the non-compliance of the regulatory system of safety management with the pace of development of the technosphere; the need to develop risk assessment methods; the increase in traffic flows and their complications; global climate changes; complication of causal relationships; the strengthening of the role of synergistic risks; the transformation of information space; the rise of new threats and risks.

2. Research results analysis

Threats associated with the hostilities in the territory of Ukraine since the beginning of 2014 (ATO zone) have been added to the traditional challenges in the field of environmental safety, which affected the state of natural and anthropogenic and environmental safety. It is rather difficult to quantify the losses in Luhansk and Donetsk oblasts in hostilities. As a result of bombardment almost every day there is a new destruction of residential, infrastructure and industrial objects. Accordingly, a preliminary estimate of losses will be relative, and these are only the *direct economic losses* as a result of:

- destruction of the housing and communal fund;
- deterioration of the transport infrastructure (roads, railways, airports, power lines, pipelines and product pipelines);
- destruction of the industrial objects (some of which are physically destroyed or not recoverable due to the peculiarities of technological processes);
- flooding of the mines because of direct actions or economic inactivity.

According to the State Register of the potentially dangerous objects (PDO), in the territories of the ATO zone there were over 3 thousand PDO in Donetsk and about 1.5 thousand in Luhansk oblasts (Державний реєстр…, /no data/). Their number in recent years has dramatically increased, mainly due to fire and explosive objects, having reached the index of 114 objects/1000 km^2 of territory in Donetsk and 46 objects/1000 km^2 of territory in Luhansk oblasts. Since 2010 the data on the distribution of PDO by the type of activity (gas stations, industrial enterprises, railway stations, bridges, overpasses, tunnels, mines) and types of hazards (fire and explosion hazard, chemical, radiation, biological hazards) in the official publications of the State Emergency Service of Ukraine have not been fixed.

As of the end of 2016, 5 thousand residential houses, 4.7 thousand energy supply systems, 220 educational institutions, 132 industrial facilities, 45 health facilities were completely destroyed (Аналітичний огляд стану …, 2016). The Ministry of Temporarily Occupied Territories and internally displaced persons has estimated the direct losses as a result of the destruction of social and communal infrastructure at 20 billion hryvnias (without losses from the destruction of private property); of economic potential – at 80; job losses – at 50 for large enterprises and up to 80–90% for small and medium enterprises (Подолання наслідків конфлікту, /no data/).

The deterioration of many industries in the territory of the ATO zone is 60–80% (Статистичний щорічник України, 2015; Основні засоби України, 2015). The local enterprises produced low-competitive products for a relatively narrow segment of the market, a significant part of which was exported to Russia. Most of the production facilities are low-tech, medium-low-tech and medium-high-tech.

A significant proportion of fixed assets fell to the archaic ones: 12.2% in Donetsk and 13.5% in Luhansk region. The critically low cost of high-tech equipment confirms the technical and technological underdevelopment of the analyzed territories. The production capacities of the enterprises in the ATO zone were characterized by high power intensity which increases the cost of production and reduces its qualitative characteristics.

It should be noted that for a long time investments in Donbas region were distributed unequally: 2/3 was directed at low-tech and medium-low-tech industries (Хвесик et al., 2013).

State economic losses due to the cessation of business in the ATO zone can be estimated by the loss of GRP, industrial production, export share, etc. For instance, Donetsk and Luhansk regions occupied 9% of the territory of Ukraine, amounted to 16% of Ukrainian GDP, 25% of industrial production, and 25% of domestic exports (Статистичний щорічник України, 2015). The amount of subsidies of the state mines is about 1% of GDP. In turn, the area covered by the military conflict occupies about 3% of the territory of Ukraine and constitutes 8–10% of GDP and

about 15% of industrial production. The most important industrial resources that combine the ATO zone with the rest of Ukraine's industry are coal (stone and coke) and iron ore. The rapid drop in industrial production in these areas in comparison with other regions negatively affected the indices of industrial production in Ukraine as a whole.

The estimation of *indirect losses* is rather relative, as it can be expressed only by calculating the lost profit. Thus, in the area of hostilities due to the termination of economic activity, losses will be generated through such channels (Обиход, 2016):

- losses of agricultural lands and forest plantations due to changes in the relief, the destruction of the fertile soil layer, pollution of land with infrastructure debris and chemical substances as a result of bombardment;
- losses due to the termination of any economic and financial activity in the suffered areas;
- losses caused by violation of production chains and export vectors;
- losses because of the loss of investment attractiveness of the territory.

3. Summary

With a view to identifying technogenic risks, threats and losses for Ukraine, taking into consideration international experience, in the latest political, economic, social and environmental realities it is proposed to structure work directions by three institutions – human resources, socio-economic infrastructure, natural environment (Обиход, 2016):

- *indicators of human resources losses* – increase in unemployment and the number of offenses as a result of emergencies;
- *indicators of infrastructure losses* – losses from the loss or decommissioning of social infrastructure objects, damage to the housing stock, and its physical deterioration, increase in demand and prices for individual goods and services, loss of additional taxes, losses from non-production of products, total losses as a result of destruction and damage to fixed assets of production and non-production purposes;
- *losses from environmental pollution, which are determined by major recipients* – the coefficient of territorial socio-economic features, which depends on the number of inhabitants in emergency zone, the economic, recreational and environmental significance of the territory, a general assessment of the socio-economic consequences of emergencies taking into account the necessary changes and additions to the existing order in value terms, etc.

Finally, it should be noted that the environmental problems in Donbass have accumulated for a long period, and the negative changes in its environment during the last two years have approached irreversible ones.

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