

UDC 330:38

JEL Classification O51, Q34, R11

Liubov Zharova
Anastasiia Kinash
Glib Buriak

Problems of Assessing the Consequences of Modern Military Man-Made Disasters

Environmental terrorism is currently becoming one of the tools of war. In modern realities, no country can be immune from such actions, therefore it is urgent to refine the existing methods and approaches for describing, systematizing, and assessing the consequences of environmental disasters associated with war and conflicts. Under the conditions of wars and active hostilities, the assessment and recording of the consequences is possible under the guarantee of the safety of the observers, therefore, all available materials, including photographs of the territory, should be used for this purpose. In the above study, we tried to systematize the currently known consequences of undermining the Kakhovka dam. Attention was also drawn to the complexity of such consequences, which makes it difficult to assess them in the short and long term.

Keywords: war consequences, reconstruction, Ukraine, macroeconomics, sustainability, environmental costs, disasters

DOI 10.37659/2663-5070-2023-10-22-29

Introduction

In the modern world, the pressure on the country can be economic, social, and ecological. The concepts of environmental blackmail [1] and environmental terrorism [2] appeared. The assessment of the consequences of such actions is complex and multi-layered; in addition, it cannot clearly outline the consequences and their economic expression immediately after the event. Currently, there are no full-fledged methods in Ukraine and the world that would allow us to assess the consequences of environmental

disasters quickly and accurately. In the country, such plans are worked out in practice with a limitation – human life and safety are an undeniable priority, therefore, the assessment of consequences is conducted using all possible sources of information and access to the territory. Within the framework of the proposed study, we tried to outline approaches to the systematization of the consequences of environmental disasters for their further assessment.

Background

Russian troops seized Kakhovka hydroelectric power plant (HPP) on February 24, 2022, and later mined it. On the night of June 6, 2023, the Russian occupiers blew up the station, which the Operational Command "South" reported. The station, with a more than 300 MW capacity, was built in the mid-1950s. The Kakhovska HPP raises the water level in the Dnieper to 16 m and creates the Kakhovsky Reservoir, from which the Kakhovsky Canal, the North Crimean Canal, and the Dnipro-Kryvyi Rih Canal begin.

The organized undermining of a dam, which is an object of critical social infrastructure, violates the Geneva Convention, in particular, the

First Additional Protocol to the Geneva Conventions relating to the Protection of Victims of International Armed Conflicts of June 8, 1977, which established a list of objects that are not can be targets of attack [3].

Currently, we can imagine the scale of the disaster (Fig. 1), but the estimation of the consequences will take time; for now, it is only the early assessments. Consequences are generally divided into short-, medium- and long-term. We are dealing with the short- and middle-term effects directly now. We are talking about the flooding of settlements, the desertification of territories, and the death of people and numerous animals. As of June 20, 2023, it was possible to establish the whereabouts of 202 residents of the Kher-

THE RUSSIANS BLEW UP THE KAHOVKA HPP

TOP
LEAD

On June 6, 2023, the Russians blew up the Kakhovskaya HPP with a water volume of 18 million m³. The hydroelectric power station is necessary for electricity production and water supply to the south of Ukraine.

Consequences of blowing up the Kahovka HPP

- **Hundreds of thousands** of people will be affected
- **Water supply will stop** in a part of the southern regions
- **More than 80 settlements** are at risk of flooding
- There will not be enough water for **cooling at the Zaporizhzhia NPP**

Consequences of blowing up for the Kherson region

- 4.8 m**
Wave height
- 5 km**
Filling width
- 24.4 km/h**
Wave speed
- 14 hours**
Time of uninterrupted rise of the water level
- 3 days**
Duration of flooding



Source: Ukrainian Research Institute of Water Management and Environmental Problems.

 t.me/uawarinformgraphics

Fig. 1. Scale of flooding

son region. 109 people are still missing due to the dam explosion, and the National Police are searching for them and investigating cases.

Results of research

Before the Russian blowing up of the Kakhovska Hydroelectric Power Plant, the area of the reservoir of the same name was 2.155 km². Drainage of the Kakhovsky Reservoir took place through the loss of large of water during June 6–18, 2023, the maximum flow volumes of which reached 30–40 thousand m³ per second. As of June 13, the depth of the Kakhovsky reservoir has decreased by 4–5 meters. 2 channels were distinguished: the main one runs along the right bank of the reservoir, i.e. near the city of Nikopol; the second channel passes near the town of Energodar. Nevertheless, the connection of the cooling reservoir of the Zaporizhzhya NPP was interrupted.

Thus, the formation of several disconnected reservoirs with a total area of less than a third of the reservoir (655.9 km²) as of June 18, 2023, with a tendency to reduce the water surface area, the impossibility of the reservoir to fulfill its functions, the formation of the main channel of the Dnipro River within the territory of the reservoir gives reason to say that the Kakhovsky reservoir ceased to exist 13 days after the Russian terrorist attack [4].

Today, Ukrainian society is actively involved in rescue operations and fixing the situation. If we talk about the consequences of the disaster, they are presently only being recorded for particular industries or spheres. However, the problem is much more complex and complicated because it is impossible to single out purely ecological, socio-cultural, or economic consequences as they are interconnected and give a synergistic effect that strengthens the negative impacts of the event. For now, we will try to systematize the known facts based on official sources, but the final assessment need time (also because some consequences are postponed in time).

Socio-cultural issues

In this part, we tried to place the consequences that will affect social and cultural life not only now but also in the long term. First of all, it should be noted that currently, there is no exact number of victims of this tragedy (data on the

injured and dead in the territory under the control of the Russian troops may never be made public). However, it is already clear that about 80 settlements will be flooding. Oleksandr Tolokonnikov, the spokesman for the Kherson regional military administration, said on the air of Radio Svoboda that about 16.000 people are being evacuated on the right bank of the Kherson region due to the threat of flooding [5].

People lose their homes, families, and jobs and are forced to flee before the rising water, trying to save the most valuable – documents and animals. The problem of resettlement, assistance, and opportunities for household organization and employment is just beginning to gain momentum. After all, in addition to the physical destruction of property, many of these people have lost the opportunity to resume business or find regular work due to the destruction of agricultural territories, vineyards, etc.

Once again, Ukrainians will lose part of their history, including family history – letters, photographs, memorabilia, everything that establishes a connection between generations and simplifies the preservation of one's story.

Once again, people will be forced to seek help and experience traumatic events. A large part of three regions (oblast) will remain without water supply: Kherson, Mykolaiv, and Zaporizhzhia. This will lead to the need to change the usual way of life and master new skills currently associated with disinfection, economical consumption, and water storage for domestic needs. These skills that Ukrainians used to experience now – the rule of two walls to be safe in case of bombing, charged phones and power banks, "home generators," and water sanitizing systems - are not part of a relaxed, peaceful life but a traumatic experience that will change the behavior of several generations.

The heritage of Ukraine is also flooding. In particular, the house museum of the outstanding artist Pelageya (Polina) Raiko, located in Oleshki town, was underwater. In 2008, the artist Vyacheslav Mashnytskyi created the Kherson Regional Charitable Fund named after Polina Raiko to preserve the Raiko house. (During the occupation of Kherson Oblast, Vyacheslav Mashnytsky went missing). The artist's creative legacy is the entire building, which is currently protected by the Law of Ukraine, "On the Protection of Cultural Heritage" [6].

As a result of the flooding of the Kherson region after the destruction of the Kakhovska HPP, 48 objects of the nature reserve fund will be entirely or partially affected, experts of the Ukrainian environmental protection group reported. According to their calculations, the total area of flooded protected areas may exceed 120.000 hectares. Another 22 territories of the nature reserve fund in the flood zone are being created. Note that the Black Sea Biosphere Reserve territory has been protected since 1927, and it is part of the worldwide network of UNESCO biosphere reserves [7].

Environmental risks and losses

The direct impact on the environment and the population is also related to water pollution. According to the Ministry of Health [8], many substances could be dangerous to health at the bottom of the Kakhovska HPP. Chemicals, causative agents of infectious diseases from cemeteries, latrines, and landfills, can end up in wells and open water bodies on the territory flooded as a result of the detonation of the hydroelectric power plant. Specialists of the Center for Disease Control and Prevention (CDC) constantly work on the ground and take water samples from reservoirs and wells, etc.

Separately, there is a risk of potentially dangerous substances entering the water from industrial enterprises affected by the explosion. The National Security and Defense Council of Ukraine has already reported that at least 150 tons of engine oil got into the Dnipro, and the still risk of further leakage is more than 300 tons [9].

Another issue is the pollution of the Dnipro River's waters. The primary pollution is caused by the washing away of garbage, agrochemicals, and other hazardous materials, as well as the flooding and disabling of wastewater treatment systems and sewage systems. The secondary is caused by the disturbance of sediment layers, where pollutants have accumulated for decades. Moreover, the death of cattle, livestock, domestic animals, and animals in zoos, the corpses of which in hot weather, will contaminate water and soil, pollute the air, and pose a danger of spreading infectious diseases.

Wildlife areas will be affected seriously due to the disruption of habitats and the potential loss of animals inhabiting the terrestrial regions

that will be flooded. There are significant risks to rodent populations, including endemic species and those listed in the Red Book of Ukraine [10].

The negative consequences of the devastation of aquatic bioresources will continue for several years in a row, even if the bed of the Kakhovsky Reservoir is filled shortly. Since the quantitative and qualitative composition of fish populations is renewed, restoring the bottom coenoses of the feed base takes a long time.

Another point to mention is the change in the microclimate of the area due to changes in the surface area of the water reservoir, violation of the water balance, and increased open land areas. Also, the issue is the inability to regulate water levels during waterlogging and floods, leading to the risk of re-flooding areas dependent on regulation by the Kakhovka HPP.

Desalination of the sea is also one of the possible consequences of the disaster. The release of such a large amount of river water can temporarily desalinate certain areas of the Black Sea. However, considering that we are talking about the water area of the Dnipro-Buzka estuary, which has been filled with the waters of the Dnipro and the Southern Bug for thousands of years, this impact is unlikely to have catastrophic consequences.

Economic and technogenic threats

The explosion of the Kakhovska HPP dam will have severe consequences for Ukraine in several sectors at once – energy, logistics, industry, and agriculture – the Center for Economic Strategy (CES) reports [11]. Some of the estimates are tied to the water level in the reservoir, which may reach a critical level shortly. Global markets have already reacted to the dam's collapse. According to the results of the auctions on June 6, wheat quotations on the Chicago Board of Trade (CBOT) rose to the maximum in the last three weeks – \$230.6 per ton (+\$1.3) [12].

As a result of the destruction of the dam, the lowering of the water level in the Kakhovsky Reservoir may pose a potential threat to the temporarily occupied Zaporizhzhya Nuclear Power Plant (NPP). Water from the Kakhovsky reservoir is necessary for the plant to replenish turbine capacitors and safety systems [11]. As of June 7, the situation at Zaporizhzhya NPP was stable. Some reactors are under repair, some are in cold

idle, and one reactor is in hot shutdown. As of June 21, the IAEA warned about the threat of nuclear fuel melting at the ZNPP [13]. Energoatom stated that it monitors the situation and follows the actions of the occupiers at the ZNPP together with other international organizations present at the plant, particularly the IAEA [14].

According to the first estimate of the National Bank, due to the destruction of the Kakhovska HPP, the negative contribution to the change in the real GDP of Ukraine will be 0.2% [15].

In the short term, the impact will be limited. It will be caused primarily by the negative effects of reducing water consumption on the industrial activity of the southeastern region, in particular, the work of a number of metallurgical enterprises, agricultural enterprises, and the food industry. The largest metallurgical plant in Ukraine, ArcelorMittal Kryvyi Rih, faced a shortage of technical water, which led to a reduction in production. The enterprise now operates at 15–20% of pre-war capacity. Before the Kakhovska HPP disaster, this figure was 35–40%. Upstream of the Dnieper, Nikopol also has ferroalloy and pipe works that require access to water. In the short term, metallurgy is the most affected industry [16].

In addition, the latter will be affected by a decrease in the harvest of sunflowers and vegetables grown in the Kherson region, Zaporizhzhia, and Dnipropetrovsk regions. During the briefing representative of the National Bank of Ukraine, S. Nikolaychuk [17], mentioned that several crops are at risk of drying out: about 20% of eggplants, as well as cucumbers, watermelons, tomatoes, peppers, and, to a lesser extent, carrots. He added that about 10–14% of the total vegetable harvest is at risk, but the NBU's estimates of actual losses are much lower – about 5%.

Damages to state property of reclamation systems and canals as a result of the explosion of the Kakhovska HPP reached \$4–5 billion, but the exact data will be determined after the de-occupation of the territories, the press service of the Ministry of Agricultural Policy and Food reported.

The National Bank emphasized that the economic risks are most concentrated in reducing its potential. These are the risks of reduced agricultural productivity, loss of irrigation systems, as well as loss of property and production facilities in flooded areas, deterioration of expecta-

tations, and the possible increase in migration, including abroad.

So far, core inflation has eased to 15.6% y/y in May from 16.9% y/y in April, but we will feel the effects of the dam blow up in the coming months. According to the first estimates of the National Bank, Ukraine will face an increase in the trade deficit in goods in the next two years. Current estimates put losses at \$0.4 billion in 2023 and \$0.7 billion in 2024.

According to forecasts of ICU specialist V. Vavryshchuk, the tragedy may cost the economy more than \$10 billion in the future [16].

The Ministry of Agriculture underlines that the Kakhovsky reservoir was the source of irrigation for 94% of systems in Kherson, 74% – in Zaporizhzhia, and 30% – in Dnipropetrovsk regions. The Kakhovsky reservoir was a source of power for 584,000 hectares of land, which was supplied with water for irrigation. In particular, the Kakhovsky main canal served 326,000 hectares, the North Crimean – 39,700 hectares of agricultural land. In addition, a number of systems in the Zaporizhzhia, Kherson, and Dnipropetrovsk regions carried out separate water intake from the Kakhovsky reservoir for a total irrigation area of 218.3 thousand hectares [17]. In 2021 on these territories were grown about 4 million tons of grain and oil crops worth about 1.5 billion dollars. According to preliminary estimates, more than 100,000 tons of crops were lost on the right bank [18].

According to the Ministry for Communities, Territories and Infrastructure Development of Ukraine (Ministry of Infrastructure) [19], in Kherson Oblast, commissions have begun an inspection of housing damaged or destroyed as a result of the explosion of the Kakhovska HPP. On the initiative of the Ministry, the Government of Ukraine allocated more than 980 million hryvnias for the reconstruction of housing flooded as a result of Russians undermining the Kakhovska HPP. For damaged housing, financial assistance can be obtained using the eRecovery service through the Diya application.

As a result of the destruction of the Kakhovska HPP, losses to the fishing industry from the death of only adults may reach 95 thousand tons or about 4 billion UAH. According to preliminary calculations, losses from the death of all biological resources will amount to UAH 10.5 billion.

The possible negative consequences for the export infrastructure are also worth noting because elevators and port terminals were located on the Dnieper. The scale of these destructions can be discussed in more detail later.

Conclusion

We want to emphasize that the given systematization of consequences and assessment of losses and damages will change and be supplemented as new information is received (Fig. 2). Currently, it is known that the reservoir was activated to the "dead point" on June 10–11. And on June 18, the Kakhovsky reservoir, the second largest in Ukraine, ceased to exist.

In addition to its stabilizing role in the power system, the reservoir of the Kakhovska HPP provided water to many people and enterprises. Around were formed ecosystems with unique properties and species and were the heritage

of the whole world. All this has now been destroyed.

Commissioning of the Zaporizhska NPP is possible only after restoring access to water resources, particularly after the reconstruction of the Kakhovsky Reservoir. As a result, the power plant will be disconnected from the Ukrainian grid, and Ukraine will lose 6 GW of nuclear power (43% of Ukraine's total nuclear generation capacity).

According to Ukrhydroenergo, \$800 million to \$1 billion is needed to build a new station. In addition to the station, building a bridge and a railway crossing will be necessary. According to preliminary estimates, the duration of construction may reach five years.

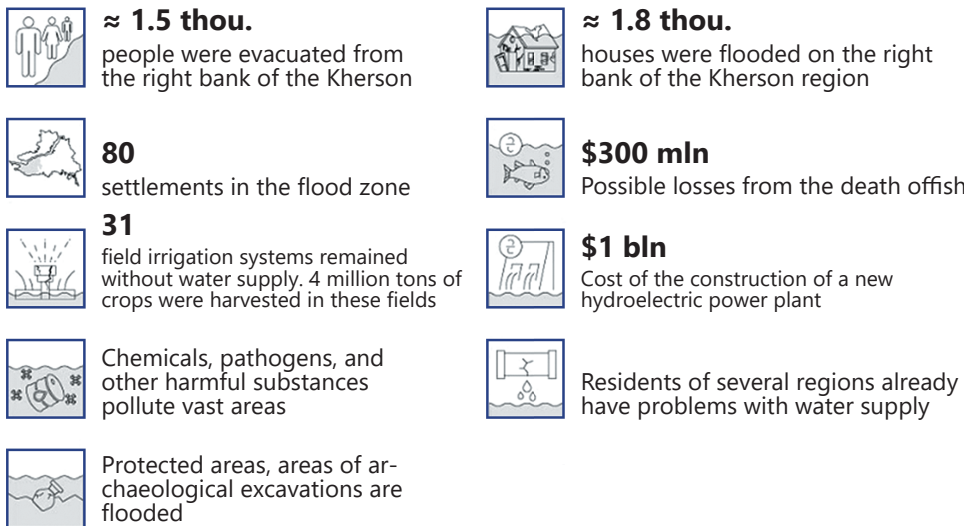
However, for now, the most important thing is to save people and animals and prevent a disaster due to water pollution. An essential element is carefully recording facts for calculating damages and losses. As for development and re-

CONSEQUENCES OF THE BLAST ON KAKHOVKA DAM

TOP
LEAD

Information about the consequences is incomplete because the water has yet to recede, and Ukraine does not have access to the occupied territories. In particular, obtaining data on the consequences for the occupied part of the Kherson region is impossible. However, it is already possible to make preliminary conclusions and forecasts.

Consequences of blowing up the Kherson region



Sources: Ukrainian Pravda. Ministry of Agrarian Policy and Food of Ukraine

 t.me/uawarinfographics

■ Fig. 2. Consequences of blowing up the Kakhovka dam

construction plans, they can be developed when the situation finally stabilizes.

Most of the economic impacts will have a long-term nature and will already be reflected in the GDP growth rate, inflation, and the decrease in the country's export potential at the end of the year.

But what is currently apparent is that these losses will be significant not only for Ukraine but also for the world community because the issues of nuclear safety, cultural heritage, and biodiversity are not limited to the borders of one region or country.

References:

1. Bullard, R. (2019). Environmental blackmail in minority communities. In B. Bryant & P. Mohai (Eds.), *Race and the incidence of environmental hazards: A time for discourse* (pp. 82–95). Routledge.
2. Chishti, M. Z., Ahmed, Z., Murshed, M., Namkambe, H. H., & Ulucak, R. (2021). The asymmetric associations between foreign direct investment inflows, terrorism, CO2 emissions, and economic growth: A tale of two shocks. *Environmental Science and Pollution Research*, 28, 69253–69271.
3. Ukrhydroenergo. (2023, June 8). Ukrhydroenerho dodatkovy proinformuvaly YeSPL pro ruynuvannya Kakhovskoi HES [Ukrhydroenergo additionally informed the European Court on Human Rights about the destruction of the Kakhovska HPP] [Press release]. https://uhe.gov.ua/media_tsentr/novyny/ukrgidroenergo-dodatkovy-proinformuvalo-espl-pro-ruynuvannya-kakhovskoi-ges
4. National Academy of Sciences of Ukraine. (2023, June 12). Druhe za ploshcheiu v Ukraini Kakhovske vodoshkovyshche faktychno perestalo isnuvaty [The Kakhovka Reservoir, the second largest in Ukraine, has virtually ceased to exist] [Press release]. <https://www.nas.gov.ua/UA/Messages/Pages/View.aspx?MessageID=10239&fbclid=IwAR0gZ-J4y2HXX6Zt2FhEFWM2PFhtW6BnMtMlgQLFfQp-kaGKHqRCs943uwHE>
5. Yankovskyi, O., & Badiuk, O. (2023, June 6). "Voda pokryla budynky": Yak ruynatsiia HES na Khersonshchyni vplyne na ekolohiiu ta khid viiny? ["Water covered the houses": How will the destruction of the hydroelectric power plant in the Kherson region affect the environment and the course of the war?]. *Radio Svoboda: Novyny Pryazovia*. <https://www.radiosvoboda.org/a/novyny-pryazovya-kakhovska-hes-ekolohiya-kontrnastup-zsu/32447037.html>
6. Blahodiinyi fond im. Poliny Raiko [Polina Raiko Charitable Foundation]. (n.d.). Raiko. Kherson Regional Charitable Foundation named after Polina Rayko. Retrieved from https://polinaraiko.com/raiko/?fbclid=IwAR2jTl3go_qieayqJkE0u0Uj9gHX_NFeyiOQQgT5lRh1oAEs5liO5jscxN4
7. Ukrainian Nature Conservation Group. (2023, June 7). Yakymy ye naslidky rosiiskoho teraktu na Kakhovskii HES dlia dykoi pryrody? [What are the consequences of the Russian terrorist attack on the Kakhovska hydroelectric power plant to wildlife?]. UNCG. <https://uncg.org.ua/iakymy-ie-naslidky-rosijskoho-teraktu-na-kakhovskij-hes-dlia-dykoi-pryrody/>
8. Ministry of Health of Ukraine. (2023, June 7). Na dni Kakhovskoi HES mohlo buty bahato nebezpechnykh dlia zdorovia rechovyn [There could be a lot of harmful substances at the bottom of the Kakhovska HPP]. Facebook. <https://www.facebook.com/moz.ukr/posts/pfbid0VtQK7ztmP384rDm8ce-4hGUY1cpidmvXtMKYarGw6QG33eWHbfHn8zx-21rejYE55I>
9. Presidential Office of Ukraine. (2023, June 6). President of Ukraine held an emergency meeting of the National Security and Defense Council on the situation at the Kakhovka HPP. Official website of the President of Ukraine. <https://www.president.gov.ua/en/news/prezident-ukrayini-proviv-ekstrene-zasidannya-radi-nacionaln-83417>
10. EPL. (2023, June 6). Destruction of the Kakhovka HPP: Preliminary conclusions and possible consequences. ICO "Environment-People-Law". <http://epl.org.ua/en/announces/pidryv-kahovskoyi-ges-poperedni-vysnovky-i-mozhlyvi-naslidky/>
11. Centre for Economic Strategy. (2023, June 8). Economic consequences of the dam destruction at the Kakhovka HPP [Press release]. <https://ces.org.ua/en/economic-consequences-kakhovkahps-destruction/>
12. Orliuk, M. (2023, June 7). Pidryv Kakhovskoi HES vplynuv na svitovi tsiny na pshehytsiu [The undermining of the Kakhovka hydroelectric power station affected world wheat prices]. *Biznes Censor*. <https://biz.censor.net/news/3423189/pidryv-kahovskoyi-ges-vplynuv-na-svitovi-tsiny-na-pshehytsiu>
13. International Atomic Energy Agency. (2023, June 21). Update 167 – IAEA Director General statement on situation in Ukraine [Press release]. https://www.iaea.org/newscenter/pressreleases/update-167-iaea-director-general-statement-on-situation-in-ukraine?fbclid=IwAR1Ex-rET-03wYg99bYGXzGlp8A4drds_R9pEKp9z_aPh-va4UFS-kjJbTaZA
14. Orel, I. (2023, June 6). "Kakhovske vodoshkovyshche spustoshytsia do nulovo vidmitky za chotyry doby": Blitsinterviu z kerivnykom "Ukrhydroenerho" Ihorem Syrotoi pro naslidky znyshchennia Kakhovskoi HES ["The Kakhovka reservoir will be empty to zero in four days": A blitz interview with

- Ukrhydroenergo CEO Ihor Syrota on the consequences of the destruction of the Kakhovka HPP]. Forbes Ukraine. <https://forbes.ua/war-in-ukraine/kakhovske-vodoskhovishche-spustoshitsya-do-nulovoi-vidmitki-za-4-dobi-blitsintervyu-z-kerivnikom-ukrgidroenergo-igorem-sirotou-pro-naslidki-znishchennya-kakhovskoi-ges-06062023-14033>
15. Ekonomichna Pravda. (2023, June 21). Naslidky ruinuвання Kakhovskoi HES dlia VVP Ukrainy pidrahuvaly v NBU [National Bank of Ukraine calculates consequences of Kakhovka HPP destruction for Ukraine's GDP]. Ekonomichna Pravda. <https://www.epravda.com.ua/news/2023/06/21/701417/>
 16. Kalashnyk, P. (2023, June 15). Efekt z upovilnenoiu diiei: Katastrofa na Kakhovskii HES ne zavadyt ekonomichnomu zrostanniu, ale vplyne na inflatsiiu: Yak trahediia poznachytsia na VVP, tsinakh i derzhbiudzheti [A delayed effect: The Kakhovka hydroelectric power plant disaster will not hinder economic growth, but will affect inflation: How the tragedy will affect GDP, prices and the state budget]. Forbes Ukraine. <https://forbes.ua/money/efekt-z-upovilnenoyu-dieyu-katastrofa-na-kakhovskiy-ges-ne-zavadit-ekonomichnomu-zrostanniu-ale-vpline-na-inflyatsiyu-yak-tragediya-vpline-na-vvp-tsini-ta-derzhbyudzheth-15062023-14216>
 17. Ministry of Agrarian Policy and Food of Ukraine. (2023, June 6). Znyshchennia rosiianamy Kakhovskoi HES zavdalo znachnykh zbytkiv silskomu hospodarstvu Ukrainy [Significant damage to the agriculture of Ukraine was caused by the destruction of the Kakhovska HPP by the Russians]. Official website of the Ministry of Agrarian Policy and Food of Ukraine. <https://minagro.gov.ua/news/znishchennya-rosiyanami-kahovskoyi-ges-zavdalo-znachnih-zbitkiv-silskomu-gospodarstvu-ukrayini>
 18. Ministry of Agrarian Policy and Food of Ukraine. (2023, June 8). Zemli, yaki zatopleni, potrebuiut povnoi ahroekolohichnoi otsinky, – Taras Vysotskyi [Taras Vysotskyi, First Deputy Minister: "Flooded lands require full agroecological assessment"]. Official website of the Ministry of Agrarian Policy and Food of Ukraine. <https://minagro.gov.ua/news/zemli-yaki-zatopleni-potrebuyut-povnoyi-agroekologichnoyi-ocinki-taras-visockij>
 19. Ministry for Communities, Territories and Infrastructure Development of Ukraine. (2023, June 21). Minvidnovlennia: Na Khersonshchyni komisii rozpochaly obstezhennia zhytla, poshkodzenoho abo zruinovanoho vnaslidok pidryvu Kakhovskoi HES [Ministry for Restoration: In the Kherson region, committees have started to inspect housing damaged or destroyed as a result of the Kakhovka HPP explosion]. Facebook. <https://shorturl.at/jCHQ6>

Жарова Л. В., Кінаш А. В., Буряк Г. С.

Проблеми оцінки наслідків сучасних військових техногенних катастроф

Екологічний тероризм наразі стає одним з інструментів ведення війни. У сучасних реаліях жодна країна не може бути застрахована від таких дій, тому актуальним є вдосконалення існуючих методів і підходів до опису, систематизації та оцінки наслідків екологічних катастроф, пов'язаних з війнами і конфліктами. В умовах військових конфліктів та активних бойових дій оцінка та фіксація наслідків можлива за умови гарантування безпеки спостерігачів, відтак для реалізації цієї мети слід використовувати усі наявні матеріали, в тому числі знімки місцевості. У даному дослідженні ми спробували систематизувати відомі на сьогоднішній день наслідки підриву греблі Каховської гідроелектростанції. Автори також підкреслюють комплексність подібних наслідків, що ускладнює їхню оцінку в короткостроковій і довгостроковій перспективі.

Ключові слова: наслідки війни, відбудова, Україна, макроекономіка, сталий розвиток, екологічні витрати, катастрофи