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## WAYS TO IMPROVE THE EFFICIENCY OF LOGISTICS FOR DRINKING WATER SUPPLY TO MILITARY PERSONNEL IN FIELD CONDITIONS

*Based on the analysis of factors that affect logistics processes, existing risks and organizational and technical capabilities to carry out appropriate measures, actual ways to increase the efficiency of logistics of drinking water supply to military personnel in the field are identified, the expected nature of the impact of these ways is shown. It is concluded that in terms of the level and mechanisms of influence on logistics processes, the measures that should be carried out within the framework of certain ways go beyond the competence of only the logistics forces of military units and require the powers of the logistics management bodies of higher levels. Emphasis was placed on increasing the efficiency of drinking water delivery in the first lane of logistics support during the performance of assigned tasks by units of the National Guard of Ukraine as part of the Defense Forces of Ukraine.*

**Keywords:** logistics of drinking water supply, efficiency, ways to increase efficiency, water delivery, robotic complexes.

**Statement of the problem.** Provision of drinking water to military personnel in the field requires constant attention during the performance of logistical tasks: determination of needs, organization of extraction (supply), creation and maintenance of drinking water reserves, their separation, organization of transportation. An important task is sanitary and hygienic control of water quality. Reducing the quality of drinking water supply sources in the field requires effective solutions from logistics management bodies. water supply in Ukraine [1], trends towards deterioration of the environmental situation, significant pollution of natural water sources [2], increase in the cost of drinking water production and supply of drinking water to consumers [3], it becomes obvious that the severity of problems related to the provision of military personnel with high-quality drinking water is likely to increase in the coming years. intensive anthropogenic activity, environmental troubles, climate change. The problems of providing the population with drinking water are increasingly raised on the European continent [4].

Special challenges are associated with the war, as the enemy has destroyed and continues to destroy critical infrastructure facilities, including water supply facilities and networks. Such facilities were significantly damaged and destroyed in all frontline regions of Ukraine. According to the World Bank, at the end of 2024, the total amount

of damage caused by hostilities to the water supply and sanitation sector is estimated at USD 4.6 billion [1]. Significant changes in the nature of the battlefield led to the complication of the processes of obtaining and storing drinking water supplies in the first lane of logistics support, its delivery (delivery) to military personnel performing tasks directly on the contact line. These problems have a significant impact on the logistical aspects of drinking water supply to military personnel in the field, as they have an impact on the availability and delivery of water, its quality indicators, the cost of purchase, own production, storage, transportation. The result of this impact is a decrease in the efficiency and quality of drinking water supply.

Therefore, in recent years, there have been tendencies to complicate the processes of providing military personnel in the field with drinking water, as well as to reduce the efficiency of these processes. Changing these trends requires comprehensive solutions. To find them, it is important to identify the factors that contribute to the aggravation of problematic issues, and find ways to solve them in the current conditions and under the existing trends in the development of the situation. Significant adjustments to the priorities regarding the areas of improving the efficiency of the logistics of drinking water supply in the field are made by hostilities. All this requires additional research in order to find

opportunities and ways to organize effective water supply to military personnel.

**Analysis of recent research and publications.**

Much attention is traditionally paid to the issues of providing consumers with drinking water in Ukraine, state monitoring is carried out in the areas of drinking water, water supply and sewerage [1, 5, 6]. Given the complexity of the problem of drinking water supply, various aspects of it are studied [2, 7, 8], in particular logistical [9, 10, 11]. A significant place in the publications is given to the organization of the provision of drinking water to the Defense Forces of Ukraine during the performance of their assigned tasks. This area of water supply has both specific aspects due to the peculiarities of military affairs and general ones inherent in centralized water supply. The article [9] provides an analysis of the current state of drinking water supply to military units of the National Guard of Ukraine (NGU), reveals the directions of its further development. Studies of the quality of drinking water, in particular the one supplied centrally for the needs of military personnel, do not lose their relevance [7, 12]. The monograph [13] presents the results of toxicological and hygienic analysis of water taken from the well of the water treatment plant in the western region of the country, which is used for the needs of the National Guard of Ukraine. Taking into account the objective indicators of the quality of purified water, the authors of this work propose relevant ways of its additional mineralization in order to improve quality indicators and implement safe water supply in the field.

One of the most acute logistical problems at the moment is the delivery of drinking water to the areas of hostilities. In this context, scientists pay great attention to the study of combat experience, the search for ways to adapt the current system of logistics support to new conditions. The authors of the article [14] note a number of shortcomings of the existing system of delivery of material and technical means (MTM): slow response to changes in the situation, low level of provision of vehicles, weak interaction between combat units and logistics links. Some authors investigate the use of unmanned aerial vehicles (UAVs) for logistical purposes [15]. The possibilities of creating MTM support systems for military units (subdivisions) using UAVs for the delivery of goods are studied, while covering different lanes of logistics support [16, 17]. Such systems will contribute to the growth of the efficiency of the delivery of resources and are relevant, first of all, for the branches of the

military, which are armed with weapons, military and special equipment (WMSE) critical for the defense of the country and need to quickly restore their operability in case of damage. Problematic issues of storage of MTM in the field, improvement of field warehouses are considered in [18, 19]. At the same time, not enough attention has been paid to the study of the efficiency of drinking water supply logistics as its complex property, which covers various logistics processes and determines the final results of activities.

**The purpose of the article** is to determine current ways to increase the efficiency of logistics of drinking water supply to military personnel in the field.

**Summary of the main material.** In general, efficiency is usually understood as the ratio of the result obtained to the costs that were necessary to achieve it, as well as the degree of achievement of the set goals [20]. Specifying the concept of "efficiency" in relation to drinking water supply in the field, we will aim at logistical support, since drinking water is one of the most important types of material means that are constantly needed by military personnel to ensure their life, without which it is impossible to conduct hostilities or perform other tasks for their intended purpose. According to [21], the goal is defined as maintaining the combat readiness and combat capability of units of a military unit by timely and fully meeting the needs for weapons, military and special equipment, material and technical means, services and creating favorable conditions for them to perform their tasks. The goal of logistics support is achieved by the timely, with minimal costs, supply of WMSE, MTM and services of appropriate quality and quantity necessary for a particular consumer at a certain place and time [21].

On the basis of the above, we will consider the efficiency of logistics of drinking water supply in the field as a complex property of the process of providing military personnel with drinking water, which reflects its effectiveness, efficiency and cost (economy). This article does not aim to quantify efficiency and its increase in the implementation of specific measures, and therefore does not introduce performance indicators. As for qualitative indicators as directions for improving the efficiency of processes, it is possible to analyze any purposeful rational measures that will have a positive impact on the final results of work, the speed of their receipt (efficiency) and the total costs caused by their implementation. Exposure usually occurs according to several characteristics at the same time. These characteristics can contradict

each other: the improvement of some characteristics can cause the deterioration of others. Thus, an increase in the quality of water leads, as a rule, to an increase in its cost. It follows that when evaluating the effectiveness of specific logistics measures, it is necessary to introduce performance indicators that are sensitive to changes in all these characteristics, as well as appropriate decision-making criteria for the choice of effective options for action. Considering ways to increase efficiency in the general case, it is enough to be based on qualitative assessments and take into account measures that have a significant (tangible) positive impact on one or more of the specified performance characteristics.

At present, the option of using bottled water is being implemented as the main option for providing the servicemen of the National Guard of Ukraine with drinking water in the field [9, 22]. It determines to a large extent the organization of the logistics of drinking water supply. A set of organizational and technical measures aimed at timely, safe and uninterrupted provision of military personnel with drinking water in the areas of

performing assigned tasks is an integral part of the logistical support of military units.

In the course of research, it has been established that the opportunities and internal reserves for increasing the efficiency of drinking water supply logistics in the field are associated with various types of logistics: procurement, production, warehousing, transport. At the same time, in terms of the level and mechanisms of influence on logistics processes, the relevant measures go beyond the competence of only the logistics forces of military units. A significant share of them is related to centralized provision, and therefore logistics at the operational and strategic levels.

The choice of these ways is based on the results of the analysis of factors that significantly affect the processes of drinking water supply, risks characteristic of the logistics processes of drinking water supply at this time, and problematic issues that need to be addressed. The directions of development of the logistics of drinking water supply of the NGU, considered earlier in [9] (Table 1), are taken into account.

Table 1 – Factors that determine ways to increase the efficiency of drinking water supply to military personnel in the field

Generalized factors of influence	Risks of drinking water supply	Issues to be addressed
1. Hostilities on the territory of Ukraine	Destruction of the infrastructure of the water supply and sewerage sector	Poor quality of water supplied by some suppliers under the terms of contracts concluded following tenders for the purchase of drinking water
	Fire damage to stationary warehouses, means of transportation, and other logistics infrastructure facilities in the first lane of logistics support	Difficulties in Maintaining Proper Storage Conditions for Bottled Drinking Water Stocks in the Field
	Contamination (poisoning) of drinking water sources	Quality Control
	Spoilage of bottled drinking water due to difficulties in maintaining proper storage conditions for its stocks in areas of hostilities	Ensuring proper storage conditions in field warehouses (points of issue)
2. Development of the enemy's WMSE	Increasing the enemy's combat capabilities to detect and destroy logistics infrastructure facilities, causing losses of MTM, vehicles, positions	Increasing the survivability of logistics infrastructure elements
	Fire control of logistics routes by the enemy	Equipping logistics forces with ground and air robotic systems
	Improving the tactics of the enemy's actions	Taking into account when planning logistics support and implementation of the plan's measures
	Increase in the efficiency of actions	

End Table 1

Generalized factors of influence	Risks of drinking water supply	Issues to be addressed
3. Deterioration of the environmental situation	Decrease in the quality of drinking water used for water intake	Improvement of technological processes for the production of drinking water
	Rising cost of drinking water production	
4. Using bottled water	Ingestion of microplastics and chemicals into the bodies of military personnel, especially if the bottles are exposed to heat or sunlight	Poor quality bottles for bottling drinking water
	Violation of bottled water storage conditions	Improvement of warehouse facilities
	Environmental damage due to the accumulation of plastic containers	Removal of empty containers (bottles), their disposal
	Unmasking positions	Improving camouflage measures

The analysis allows us to conclude that it is necessary and organizational and technical capabilities to take measures to improve the efficiency of drinking water supply logistics in such areas.

1. Improving the quality of drinking water due to the improvement of technological schemes of water treatment using osmosis, namely the addition of a mineralization link.

2. Improving the storage conditions of bottled water in the field, taking into account external conditions that affect the quality of drinking water: temperature, solar exposure, shelf life.

3. Development of effective ways and means of delivering water to positions in areas of active hostilities (in the first lane of logistics support).

4. Search for ways to improve containers (volume, nature and properties of packaging

material, safety) for water bottling, taking into account logistical features and conditions of stay of personnel.

The above directions determine the vector of development of this area of logistics and current ways to increase its efficiency. A survey conducted among specialists in logistics support of the National Guard of Ukraine showed that these directions and ways are positively assessed by practitioners. The use of the method of pair comparisons during the survey made it possible not only to make sure that the paths are relevant, but also to determine their priority. The differences in the values of the weight factors provided by experts are insignificant. The summarized results of the survey are presented in Table 2.

Table 2 – Results of a survey of practitioners on ways to increase the efficiency of logistics of drinking water supply in the field, conducted using the method of paired comparisons

Ways to Improve the efficiency of drinking water supply logistics	Weight, %
1. Improving the quality of drinking water due to its mineralization	18.1
2. Improving the storage conditions of bottled water in the field	27.1
3. Delivery of water to the positions in the first lane of logistics support	29.8
4. Improvement of containers for bottling water	25.0

Obviously, the priority of the implementation of state defense tasks had a significant impact on the assessments provided by specialists. The war raises the most pressing issues that require prompt intervention and solution, being at the same time a kind of catalyst for the processes of development and improvement. Taking into account the situation that is developing in the first lane of logistics support, and primarily in the areas of hostilities, preference (weight factor of 29.8%) is given to the improvement of transport logistics,

development of the possibilities of delivering drinking water to the forefront. In addition, as a priority way (weight factor 27.1%) there is an improvement in the conditions for storing bottled water in the field, its protection from the influence of natural factors, such as solar radiation, high temperature, etc. The influence of such factors leads to a decrease in water quality or even to its deterioration. Especially dangerous is the violation of storage conditions for water bottled in bottles made of polyethylene terephthalate (PET bottles).

A weight factor of 25% is given to measures to improve the quality of containers used for bottling, storage and transportation of water. This seemingly insignificant aspect of the logistics of drinking water supply is of great practical importance. Due to poor-quality containers, the quality of water decreases, an unpleasant odor, taste (bitterness, salinity, astringency), visible impurities or even turbidity appear in it. For example, PET bottles can release chemicals such as antimony and bisphenol-A that are dangerous to human health if they are reused or exposed to high temperatures. As a result of the use of low-quality and inconvenient bottles (bottles), water losses are possible in cases of its movement, pouring into another container or drinking directly from the bottle.

The lowest priority (weight factor of 18.1%) is currently given by experts to measures to improve water quality. However, this in no way reduces the importance of conducting relevant research and work. Most likely, this indicates a fairly high quality of bottled drinking water, which is produced and purchased for the needs of the National Guard of Ukraine. In addition, minor deviations in drinking water quality indicators from the standard values do not appear as quickly as shortcomings in other areas. Investments in the quality of drinking water, ensuring its compliance with sanitary and hygienic standards are investments in the health of military personnel, and, accordingly, in increasing the combat capability of the National Guard of Ukraine due to this factor of influence.

Let's analyze in more detail the possibilities of improving the efficiency of drinking water supply logistics as a priority by carrying out organizational and technical measures to deliver it to combat positions. Currently, the most significant factors affecting the effectiveness of providing military personnel with drinking water in the field are due to the war. Hostilities are a source of numerous risks for the logistics of drinking water supply, the most significant of which were shown in Table 1. In modern warfare, the nature of the battlefield and the operating environment has changed dramatically [23, 24, 25]. Obviously, these changes significantly affect the processes of logistical support of military units (units), in particular the organization of drinking water supply to units that perform tasks in the areas of hostilities and are in difficult conditions. At the same time, logistics forces must ensure the successful completion of tasks in any situation that may arise. The conditions of the situation for the system of logistical support of military units are formed mainly by the

environment external to it and do not depend on it. It follows that changes in the nature of the battlefield and the operating environment necessitate the introduction of appropriate changes in the logistics support system of the military unit. There is a need for certain transformations, since in the new conditions it becomes impossible to apply traditional (old) approaches to the processes of logistics, in particular logistics, which were used earlier. At least, their effectiveness has decreased significantly. Combat experience convinces that flexibility, innovation, speed of adaptation to new conditions and the will to fight have become determining factors [23].

The most significant changes in the nature of the battlefield and the operating environment in terms of logistics support are due to the enemy's massive use of unmanned aerial systems for reconnaissance and strike purposes. Such systems allow him to keep under his control the areas where tasks are performed. Experts note that the modern battlefield is "transparent": the zone within a radius of 5–10 km (and beyond) from the line of contact is under the constant control of drones with thermal imagers and high-resolution cameras [25]. This significantly increases the vulnerability of the rear of the first lane of logistics support and requires the use of such technical equipment that would ensure the compliance of the composition, structure, technical equipment of logistics units with the nature and conditions for performing functional tasks for the organization of logistics support of units of a military unit. To achieve this compliance in the conditions of modern high-tech warfare, in addition to the available means that are available to equip logistics units, it is critically important to have:

1) electronic warfare means – to counter unmanned aerial vehicles, protect logistics forces and means from high-precision weapons, covert control and covert actions;

2) unmanned ground systems (robotic systems, or UGS for simpler) and UAVs – for the delivery of MTM to the front lines and positions, as well as for performing other logistical tasks.

Regarding the organizational issue, appropriate changes should be made to the staffs and timesheets of military units.

The most complex and risky process is the delivery of MTM to units. The possibility of using UGS contributes to the reduction of delivery risks. The nomenclature of modern samples contains a wide range of logistics systems. Most of them are multifunctional platforms with an electric power plant, which can perform various logistics tasks, in

particular, carry out the transportation of materiel to hard-to-reach places in a difficult tactical situation, off-road, bad weather conditions. According to tactical and technical characteristics (TTC), the payload of various samples ranges from 50 to 500 kg, the average speed under normal conditions will be 10–12 km/h, the range is from 8 to 50 km [26]. The use of logistics UGS makes it possible to increase the efficiency and efficiency of the delivery of resources, in particular bottled drinking water, to their destinations, as well as significantly reduce the risks (threats) to the lives of military personnel.

For the quick delivery of bottled drinking water to the front lines, the only option is often the use of UAVs. Such means do not depend on the road infrastructure and its condition, they can be used both during the day and at night, in a fairly wide range of climatic and weather conditions. They are effective for prompt point delivery of materiel to a few units, raid groups, military personnel who are in difficult conditions, operate in isolation from the main forces and support points. The cargo is delivered by dropping at a certain point, that is, without landing the UAV on the ground. Multi-purpose and strike UAVs, for example, MAGURA UA, Vampire, Heavy Shot, have shown high

efficiency in the performance of logistics tasks. In fact, these and some similar drones have become universal in terms of functional purpose. Other UAVs can also be used to deliver drinking water, including light UAVs of the Mavic type. However, they allow you to deliver no more than one bottle of water, which makes their use advisable only in critical situations when there are no other options.

During the delivery of cargo by the dumping method, the risks of unmasking positions, damage to drones are reduced, but there are risks of destruction (breaking) of containers, for example, plastic bottles from water hammer at the moment of contact with the ground, and the loss of part of the cargo, in our case, drinking water. Accordingly, it is necessary to study the feasibility of developing (procurement) purely logistics UAVs, developing dropping systems and packaging facilities that would ensure the possibility of delivering cargo without damaging it at the time of contact with the ground, as well as changing the containers used for bottling water to be more resistant to mechanical shocks and safer for the health of military personnel.

The basic characteristics of some UAVs, which provide general information on their capabilities as logistics facilities, are shown in Table 3.

Table 3 – Tactical and technical characteristics of UAVs that can be involved in the performance of logistics tasks (according to official Websites [27, 28, 29])

Tactical and technical characteristics of the UAV	UAV type by design		
	MAGURA UA	Vampire	Heavy Shot
	Strike unmanned aerial vehicle, quadcopter	Strike unmanned aerial vehicle, hexacopter	Heavy multi-purpose (strike-transport) FPV drone, quadcopter
Target load weight, kg	Up to 15	Up to 15	Up to 40
Maximum flight range, km	Up to 25	Up to 50	–
Tactical radius, km	8–12	–	Up to 20
Communication range	–	Up to 10 km	Can be controlled remotely "from anywhere in the world" via secure communication channels (GPS)
Maximum / cruising speed, km/h	62 / 58	Up to 80 km/h (no load), up to 40 km/h (with full load)	Up to 90

End Table 3

Tactical and technical characteristics of the UAV	UAV type by design		
	MAGURA UA	Vampire	Heavy Shot
	Strike unmanned aerial vehicle, quadcopter	Strike unmanned aerial vehicle, hexacopter	Heavy multi-purpose (strike-transport) FPV drone, quadcopter
Possibility of work in electronic warfare conditions (stability of control channels)	Communication to control the drone is carried out using a PPRF device (which constantly changes the frequency of data transmission) and a directional antenna. In the absence of GPS for route guidance, the flight takes place by analog video with orientation on the ground and using a directional antenna	Communication to control the drone is carried out with the help of as radio frequencies, and GPS. In case of loss of connection, it moves towards its restoration or complete battery discharge	It has protection against electronic warfare. Navigation is via GPS. There are autopilot and return functions to the base
Flight time with load, min	Up to 25	Up to 25	Up to 40

In general, the task of improving the efficiency of logistics of drinking water supply for military personnel in the field is related to the management of material flows that are formed and move from the place of production (extraction) or purchase of drinking water to the end consumer and related financial flows. Management of material flows and their financial support are carried out by logistics bodies of various structural levels of the National

Guard of Ukraine in accordance with the distribution of functions and powers. The key components of the material flow management system are production, procurement, warehouse and transport logistics. It is in their totality that it is possible to implement ways to increase efficiency and carry out appropriate organizational and technical measures. The efficiency of drinking water supply logistics is presented in Table 4.

Table 4 – Generalized results of research on ways to increase the efficiency of logistics of drinking water supply to military personnel in the field

Components of military logistics	The main content of organizational and technical measures to improve the efficiency of drinking water supply	Expected result	Expected impact on performance		
			P1	O2	E3
1. Procurement logistics	Improving the quality of processing of the customer's tender documentation and studying the tender proposals submitted by bidders regarding the subject of procurement or its part (lot) in order to ensure the proper quality of drinking water, including the quality of bottles supplied to military units under concluded contracts. Incoming quality control of the delivered goods	Elimination of cases of purchase of bottled drinking water of inappropriate quality	↑	–	↑

End Table 4

Components of military logistics	The main content of organizational and technical measures to improve the efficiency of drinking water supply	Expected result	Expected impact on performance		
			P1	O2	E3
2. Production logistics	Mineralization of water before bottling at water filtration and bottling stations of military units of the National Guard of Ukraine	Improving water quality, improving the health of military personnel	↑	–	↑
	Changing the material (PET) of the preforms from which drinking water bottles are made to a safer one				
	Expansion of the volumetric range of bottles for bottling drinking water at filtration and bottling stations	Simplification of water distribution, delivery, transfer processes	↑	↑	–
3. Warehouse logistics	Dispersion of bottled drinking water stocks	Reducing the risks of destruction of drinking water supplies	↑	–	↓
	Arrangement of rolling stock				
	Improvement of drinking water storage conditions in the field	Avoiding cases of spoilage (decrease in quality) of water during storage	↑	–	↓
4. Transport logistics	Use of logistics NQF and aerial drones to deliver water to forward positions and units operating in isolation from the main forces and supply points	Reducing the risks of damage to personnel. Increasing the efficiency of delivery in the conditions of the modern battlefield	↑	↑	↓

*Note:* P – effectiveness (quantitative and qualitative aspects); O – efficiency; E – economy.

*Symbols:* "↑" – promotion; "↓" – decrease; "–" – no significant changes.

It is expected that the implementation of organizational and technical measures indicated in Table 4 will contribute to the increase in the efficiency of logistics of drinking water supply to military personnel in the field. All measures are aimed at improving the effectiveness of logistics in its quantitative and/or qualitative aspects. Effectiveness is the degree of implementation of logistics plans in terms of providing drinking water [all units and servicemen have the necessary (standardized) supply of high-quality drinking water].

The use of UGSs and UAVs helps to increase the efficiency of delivery of drinking water to units (servicemen) in the first lane of logistics support in the conditions of a modern battlefield. It is advisable to move forward with the further development of this technology. Increasing the efficiency of drinking water deliveries can also be facilitated by expanding the volume range of containers (bottles) into which drinking water is poured during the production process. This is

possible due to a more rational and faster performance of water distribution, packaging and delivery to positions.

Obviously, the implementation of any events requires the involvement of resources, at least labor resources. And from this point of view, any path of development and measures associated with it are costly. However, costs generate a target effect (result) that scales in time and space (operating environment). According to the general theory of economic efficiency, additional capital investments in production logistics will be advisable if they lead to savings on current costs. At the same time, it is quite difficult to answer the question about the nature of the impact of these measures on the cost (economy) of logistics processes. Logistics processes take place in conditions of high military risks. The final effect manifests itself not only in an explicit (direct) form, but also indirectly in the form of saved lives, material values, territories, etc. Warehouse and

transport logistics measures are expected to reduce costs, as their effect is to reduce the risks of loss of drinking water supplies due to fire damage or the impact of undesirable natural factors. Production and procurement types of logistics aimed at improving the quality of drinking water are likely to be more expensive. However, such costs are actually investments in the health of military personnel and the combat capability of troops.

### **Conclusions**

Providing the servicemen of the National Guard of Ukraine with drinking water in the field is currently given great attention. In this area of logistics, over the past few years, a number of decisions have been made and implemented, which made it possible to reduce logistics costs and effectively manage the relevant logistics flows. However, significant changes in the operational environment, primarily due to the war, have significantly complicated the logistics conditions for the military units of the National Guard of Ukraine that perform tasks as part of the Defense Forces of Ukraine, especially in the first lane of logistics support. Obtaining drinking water from natural sources in areas of hostilities is almost impossible. The risks of fire damage to field warehouses, water supply points (water supply), and vehicles have increased significantly. These, as well as global environmental factors, negatively affected the efficiency of drinking water supply logistics in the field.

Efficiency is a complex property of the logistics of drinking water supply, which is formed at all stages of the movement of material flows (drinking water) and their financial support and depends on many internal and external factors. It characterizes the quality of management of the relevant processes. In the conditions of a rapidly changing and unstable external environment, the logistics support system must be adaptive, able to promptly respond to changes in operating conditions, be able to increase its capacity to reliably, fully and timely meet the needs of military units (subdivisions) in drinking water, and perform assigned tasks with high efficiency.

Opportunities to increase the efficiency of drinking water supply to military personnel in the field currently require the logistics management bodies to provide comprehensive solutions and carry out organizational and technical measures for various types of logistics: production, procurement, warehouse, transport. Such measures relate to various aspects of activities and are

expected to increase the effectiveness and efficiency of the processes of providing military personnel with drinking water, reduce the risks of loss of drinking water supplies, personnel, field equipment and transport, as well as optimize costs.

In the complex of organizational and technical solutions aimed at improving the efficiency of logistics, an important role is played by measures to improve the quality of drinking water, which is produced for the needs of NGU, since according to objective indicators it needs additional mineralization. Investments in the quality of drinking water are actually investments in the health of military personnel and the combat capability of units of the National Guard of Ukraine according to the above factor of influence.

In further research, it is advisable to focus on the development of a methodology for quantitative assessment of the efficiency of logistics processes and operations, in particular those related to drinking water supply in the field, as well as on the study of optimality criteria and the search for optimal options for action.

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### **ШЛЯХИ ПІДВИЩЕННЯ ЕФЕКТИВНОСТІ ЛОГІСТИКИ ПИТНОГО ВОДОПОСТАЧАННЯ ВІЙСЬКОВОСЛУЖБОВЦІВ У ПОЛЬОВИХ УМОВАХ**

*Досліджено питання, пов'язані з ефективністю логістики питного водопостачання військовослужбовців Національної гвардії України, які виконують завдання за призначенням у складі Сил оборони. На цей час як основний варіант забезпечення військовослужбовців НГУ питною водою у польових умовах розглядається варіант із використанням бутильованої води. Він дає змогу накопичувати необхідні запаси води, забезпечувати належну її якість, уникати ризикових процесів добування води із природних джерел безпосередньо у районах ведення бойових дій, що в цілому спрощує логістику. Водночас з огляду на зміни характеру поля бою та операційного середовища, у якому здійснюється логістичне забезпечення, значно ускладнилися процеси зберігання бутильованої питної води на польових складах (пунктах), доставляння питної води у першій смузі логістичного забезпечення, особливо до передових позицій. Ці та деякі інші більш глобальні причини знижують ефективність логістики питного водопостачання як комплексної властивості процесу забезпечення військовослужбовців питною водою, що характеризує його результативність, оперативність та економічність. На основі аналізу чинників, які впливають на логістичні процеси, наявних ризиків та організаційно-технічних можливостей щодо проведення відповідних заходів визначено актуальні шляхи підвищення ефективності логістики питного водопостачання військовослужбовців у польових умовах, показано очікуваний характер впливу цих шляхів.*

*Зроблено висновок, що за рівнем і механізмами впливу на логістичні процеси заходи, які мають проводитися у рамках визначених шляхів, виходять за межі компетенції лише сил логістики військових частин і потребують повноважень органів управління логістичним забезпеченням вищих рівнів. У статті акцентовано на підвищенні ефективності доставки питної води у першій смузі логістичного забезпечення під час виконання завдань за призначенням підрозділами Національної гвардії України у складі Сил оборони України завдяки використанню наземних роботизованих комплексів та безпілотних літальних апаратів.*

**Ключові слова:** логістика питного водопостачання, ефективність, шляхи підвищення ефективності, доставка води, роботизовані комплекси.

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