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**IMPROVING PUBLIC ALERT AND EVACUATION SYSTEMS IN EMERGENCY SITUATIONS (CASE STUDY OF THE DEHQONABAD POTASH PLANT)****Olimjonov Elyor Shukhratjonovich**  
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**Abstract:** The article presents a scientific analysis of the challenges in improving public alert and evacuation systems during emergencies, using the Dehqonabad Potash Plant - a hazardous industrial facility - as a case study. Key components such as hazard inventory, impact assessment, and transparent communication with the public are examined in detail. Practical recommendations are developed based on modern early warning technologies, evacuation planning, and international best practices. The findings are of significant relevance for enhancing the safety of communities living near hazardous industrial sites in the Republic of Uzbekistan.

**Keywords:** emergency situations, public alert systems, evacuation system, hazardous industrial facilities, Dehqonabad Potash Plant, early warning system, impact assessment, public safety.

**СОВЕРШЕНСТВОВАНИЕ СИСТЕМ ОПОВЕЩЕНИЯ И ЭВАКУАЦИИ НАСЕЛЕНИЯ ПРИ ЧРЕЗВЫЧАЙНЫХ СИТУАЦИЯХ (НА ПРИМЕРЕ ДЕХКАНАБАДСКОГО КАЛИЙНОГО ЗАВОДА)****Олимжонов Эльёр Шухратжонович**  
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**Аннотация:** В статье проводится научный анализ проблем совершенствования систем оповещения и эвакуации населения при чрезвычайных ситуациях на примере калийного завода в Дехканабаде - опасного промышленного объекта. Подробно рассматриваются ключевые компоненты: инвентаризация опасностей, анализ последствий чрезвычайных ситуаций и обеспечение открытого информационного взаимодействия с населением. На основе современных систем оповещения, планов эвакуации и международного опыта разработаны практические рекомендации. Результаты исследования имеют актуальное значение для повышения уровня безопасности населения, проживающего вблизи опасных промышленных объектов в Республике Узбекистан.

**Ключевые слова:** чрезвычайные ситуации, оповещение населения, система эвакуации, опасные промышленные объекты, Дехканабадский калийный завод, система предупреждения, анализ последствий, безопасность населения.

**"FAVQULODDA VAZIYATLARDA AHOLINI XABARDOR QILISH VA EVAKUATSIYA QILISH TIZIMLARINI TAKOMILLASHTIRISH (DEHQONOBOD KALIY ZAVODI MISOLIDA)"****Olimjonov Elyor Shuxratjon o‘g‘li**  
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**Annotatsiya:** Maqolada Dehqonobod kaliy zavodi kabi xavfli sanoat obyekti atrofida yashovchi aholini favqulodda vaziyatlarda samarali xabardor qilish hamda evakuatsiya qilish tizimlarini takomillashtirish masalalari ilmiy tahlil qilinadi. Xavflarning inventarizatsiyasi, ta'sir tahlili hamda aholi bilan ochiq axborot almashinuvi kabi asosiy komponentlar batafsil ko‘rib chiqilgan. Zamonaviy ogohlantirish vositalari, evakuatsiya rejaları hamda xalqaro tajriba asosida amaliy takliflar ishlab chiqilgan. Tadqiqot natijalari O‘zbekiston Respublikasida xavfli sanoat obyektlari

yaqinidagi aholi xavfsizligini ta'minlash tizimlarini takomillashtirish uchun dolzarb ahamiyatga ega.

**Kalit soʻzlar:** favqulodda vaziyatlar, aholini xabardor qilish, evakuatsiya tizimi, xavfli sanoat obyektlari, Dehqonobod kaliy zavodi, oqohlantirish tizimi, ta'sir tahlili, aholi xavfsizligi.

**Introduction:** In the Republic of Uzbekistan, industrial facilities must also be under constant surveillance. For example, the potash plant in the city of Dehqanabad in the Kashkadarya region is one of the largest in the country. Although its products - potassium salts (for example, carnallite, sylvinit) - are widely used as fertilizers in agriculture, the plant is a potential object in the event of a fire during production, due to the hygienic conditions and the complexity of the technological processes. The population around the plant, especially within a radius of 3–5 km, is under surveillance, which requires thousands of people to quickly respond and create effective evacuation systems.

Although currently there are systems for the protection and evacuation of the population in enterprises, their materials do not meet modern requirements. For example, traffic (mainly by siren or radio), in exchange for information, is not sufficient for the population. From this, if regular monitoring of the use of assistance is not carried out, how can one respond to a dangerous disease. When a real, real FV occurs, time is lost, which costs human life.

International experience shows that modern weapons systems (Early Warning Systems - EW) are not only based on technical weapons, but also on effective communication with the population, a clear and organized program. For example, in countries such as Japan, the USA, and Germany, innovations such as GPS-based mobile applications, automatic SMS messages, and rapid information dissemination via social networks are being used to safely evacuate the population around dangerous objects.

In this context, the evacuation of the population around the Dehqanabad potash mine and the creation and improvement of production systems for the production of potash are considered as a scientific and practical problem. The goal of this is to develop a proposal for the plant, to eliminate the disadvantages of current systems and to introduce modern and efficient production, to organize the production of the population through the introduction of production.

The practical significance of the article is to propose universal solutions that are possible not only around Dekhkanabad, but also around other hazardous industrial facilities throughout Uzbekistan. At the same time, the research will help in the implementation of regulatory documents such as the Law of the Republic of Uzbekistan "On the Protection of the Population in the Event of Emergency" and "Rules for the Evacuation of the Population in Emergency Situations".

**Theoretical foundations and literature review:** The protection and preservation of the population in emergencies is part of the physical effort in modern human conditions. This process is not based solely on technical or documentary evidence, but requires the integration of extensive theoretical knowledge, international experience and practical systems. Therefore, in order to deepen this area, it is necessary to first create a theoretical foundation for the protection of the population around the problem situation, and then analyze the industries, the necessary for world and national experience.

An emergency is understood as a situation in which a natural, man-made or other dangerous event occurs that poses a threat to human life, health, the environment and material resources, disrupts social mobility. Such events occur by chance and can have a wide range of safety. Among the most common types of them, natural disasters - separately, floods, landslides - and man-made situations - uncontrolled release of external phenomena, explosions, fires - separately. Man-made disasters, such as industrial accidents, industrial damage, can be used by the population around industrial facilities.

Hazardous industrial facilities are those that use or store large amounts of toxic, flammable, explosive or radioactive materials in the course of their production. Their needs can cause

environmental damage. At the international level, such facilities are subject to strict control in accordance with the Seveso Directive, the ILO Convention and other international documents. This document is intended to provide facilities with a convenient, safe environment. The population should not only be aware of the risks, but also be trained on how to act in the event of a hazardous event.

The population prevention system is a mechanism for providing the population with rapid, accurate, understandable and reliable information before, during or after a situation occurs. It is not modern, it can only give a signal, but also the entire power grid - the basis for distributing and ensuring access to the population. The production system proposed by the International Emergency Strategy consists of the main components: power generation, energy and power, information dissemination and response. The reception of these systems depends on how people process information, the level of trust in it and how they know how to act.

In general, the emergency preparedness system around the Dehqanabad Potash Plant, although currently existing mainly in official documents, is not sufficiently effective in practice. The risks have not been fully identified, their impact has not been scientifically assessed, and the population has not been informed of the risks. Therefore, the reconstruction of these systems in accordance with modern requirements and based on a population-centered approach is an urgent task not only scientifically, but also socially.

A detailed analysis of the current state of emergency preparedness of the population around the Dehqanabad Potash Plant, which has not yet been officially published, but is summarized on the basis of open sources, local information, FVVB data, and informal questionnaires, is presented. The questionnaires were compiled on the basis of informal conversations among citizens living in the city of Dehqanabad and nearby villages (e.g., Yangiabad, Qoratepa, Chashma) in 2024–2025, discussions with local public organizations, and interviews with teachers, doctors, and representatives of housing authorities.

Table-1

**Emergency preparedness of residents living around the Dehqanabad Potash Plant: current status based on questionnaires**

Pointer	Number of respondents to the survey	Percentage indicator	Analyses
Knowing that a factory is a dangerous facility	218	68.1%	Most residents know that the factory is dangerous, but do not have a clear understanding of the nature of the danger (chemical, explosive).
Know what signal to give in the event of an emergency	94	29.4%	Only about one-third recognized the alarm system (siren, radio); most responded that they “did not hear any alarms.”
Be informed about evacuation routes	67	20.9%	5/6 of the population has not received official information about evacuation routes or meeting places.
Knowing what to do in an emergency	82	25.6%	While many people think they need to "stay home" or "protect themselves," they lack the practical skills.
Participation in an evacuation alert or drill in the last year	38	11.9%	Less than 12% of the population has participated in practical emergency drills.
Receiving emergency messages via mobile	51	15.9%	A large part of the population did not use the alert system via SMS or push

phone			notifications.
Received safety information from the factory or local authorities	103	32.2%	Less than a third of citizens regularly receive information from official sources; information is spread mainly by "hearsay."

The surveys were conducted in April-May 2025 among residents of Dehqanabad city and 3 villages around the plant. The sample size is 320 people, aged 26-60 years. This table reflects the level of emergency preparedness (ED) of the population living around the Dehqanabad potash plant. The data was collected based on questionnaires covering 320 citizens and shows the following main aspects:

General awareness of the population about the dangerous object.

– Most (68%) know that the factory is dangerous, but they do not have sufficient understanding of the exact nature of the danger (e.g., which chemicals, what consequences).

Ineffectiveness of the warning system

– Only 29.4% of the population admits to using an emergency signal (siren, radio).

– More than 84% of citizens were not warned via modern mobile messaging (SMS, apps).

Practically non-existent evacuation system

– Only 20.9% know about evacuation routes or meeting places.

- This dramatically increases the likelihood of chaos, loss of time, and endangerment of human life in an emergency.

Virtually no practical training

– Only 11.9% of citizens participated in an evacuation drill in the last year.

– 74.4% of the population does not know exactly what to do when an emergency occurs.

Weakness of official information exchange

– Only 32.2% of the population received safety information from the factory or authorities.

– Information is often spread through unreliable sources (hearsay, social media).

**Table-2**

**Emergency preparedness of the population around the Dehqanabad Potash Plant - current status (based on questionnaires)**

Evaluation criteria	Current status	Basis (based on questionnaires)
Risk awareness	Very low	The majority of citizens surveyed do not have a clear understanding of what hazardous substances are used at the plant. Some know that "potassium fertilizer is produced," but cannot report on the acids or dust emissions generated during the processing process.
Knowing the warning system	De facto no	The population does not know how the warning will be implemented. It is also unclear whether there is a siren. Many people commented that there is no warning system via mobile messages, radio or social media.
Knowing evacuation routes and meeting points	Not enough	Some people in the city center assume they need to go to "school or the stadium," but no one has been able to provide any clear information about the official map or designated routes. Almost all rural residents are unaware of evacuation routes.
emergency preparedness	Almost none	Almost all families surveyed do not have a special emergency reserve (respirator, water, medicine, plastic wrap). Most believe that "we will prepare when necessary."
Participate in	Did not	There have been no public evacuations in the past few

exercises	happen in practice	years. Although some schools have had "fire alarms," they are not related to chemical hazards.
Trust and participation	Low	The public expects companies or authorities to provide open information about the risks, but there is little trust in this. "If it's dangerous, why don't they tell us anything?" is a common question.

The table provides a general idea of the emergency preparedness of the population living around the Dehqanabad Potash Plant. The main idea reflected in it is that the population, despite living near a dangerous industrial facility - a potash plant, has almost no idea what to do in the event of an emergency.

The table primarily shows the population's awareness of the risks. While most citizens have a general idea of what is produced at a factory, they do not have a clear understanding of what hazardous substances are involved in the production process, what effects they have, or what hazardous events can occur.

The second part provides information about the warning system. The population does not know what signal is given in the event of an emergency, through which means information is transmitted. It is noted that the warning system through mobile communications, social networks or special signaling devices does not exist or is not perceived by the population.

Third, there is a lack of awareness among the population about evacuation routes and assembly points. Urban or rural residents do not know where to go in an emergency, which roads to use. Official evacuation maps or designated routes are not available to the population.

Fourth, the level of personal preparedness is indicated. The population has not stocked up on household items that may be needed for an emergency - for example, a respirator, water, medicine, plastic wrap. Many do not think about emergencies or have the idea that "we will be prepared if necessary."

Fifth, information is provided about participation in evacuation drills. In recent years, no emergency drills involving the population have been conducted. Although there were fire alarms in some schools, they were not related to chemical hazards.

Finally, the table also provides information on the level of trust and attitude of the population towards organizations. Citizens do not trust the security system due to insufficient information provided by state organizations or enterprises. "If it is dangerous, why does it not tell us anything?" - is a common question.

Currently, the population living around the Dehqanabad potash plant is largely unprepared for an emergency. There is no information about the danger, the warning system is not working, evacuation routes are unclear, and personal preparation is almost non-existent. This situation could seriously endanger human life in the event of a real emergency.

Therefore, establishing an integrated system between the plant, local authorities, the FVVB, and public organizations, introducing open information exchange, conducting regular exercises, and actively involving the population are proposed as urgent measures.

#### **Dekhkanabad Potash Plant - Analysis as a Loss Object:**

Dekhkanabad Potash Plant is a large chemical industrial enterprise in the Kashkadarya region of the Republic of Uzbekistan, mainly engaged in the production of potash fertilizers, which are widely used in agriculture. The plant is part of the Navoiazot Joint-Stock Company and is one of the strategically important facilities in the field of mineral fertilizer production in the country. However, due to this industrial activity, it should also be considered a hazardous industrial facility.

The main hazard of the plant is associated with auxiliary chemicals formed during the processing of potassium salts (carnallite, sylvinite) and technological reagents used in production. As a result of these processes, acidic solutions, toxic gaseous mixtures, dust emissions and mixtures that pollute water flows may appear. In particular, substances such as sulfuric acid and chloride solutions have a serious impact on the respiratory tract, skin and eyes. If such substances leak

uncontrolled from storage tanks or pipelines, they have the property of rapidly spreading into the environment.

The area where the plant is located - the city of Dehqanabad and its surrounding villages - is a relatively densely populated area. The distance from the city center to the plant does not exceed a few kilometers, which further increases the need for rapid evacuation in the event of an emergency. There are also social facilities in the area, such as schools, kindergartens, and medical institutions, which are likely to be at risk.

Even if the plant is technologically advanced, the emergency response systems are not effective enough for the population. For example, there may be automatic warning systems on the plant premises, but they are only designed to alert the company's employees, and there is no alarm mechanism for the outside population. In addition, the infrastructure around the plant, such as a network of sensors to monitor the spread of chemical clouds, real-time information systems, or special evacuation routes for the population, is not sufficiently developed.

According to existing regulatory documents, hazardous industrial facilities are required to conduct a risk inventory, conduct an impact analysis, and organize open information exchange with the population. However, in practice, such systems for the Dehqanabad Potash Plant either do not exist at all or are only indicated as "existing" in official documents. The population does not have accurate, timely, and understandable information about the plant's risks.

However, the plant may also be exposed to natural hazards, such as earthquakes, droughts, or strong winds. Such external factors could disrupt production processes and cause emergencies. However, there is no public information about the plant's resilience to natural hazards and the safety systems in place to address them.

In conclusion, the Dehqanabad Potash Plant is technologically advanced, but there is no reliable evidence that sufficient measures have been taken to ensure the safety of the population. Although it is considered a potentially dangerous facility, the population living around it is not prepared for an emergency, is not aware of the danger, does not know the evacuation routes and does not trust the warning system. Therefore, it is necessary to re-evaluate the plant not only from the point of view of production, but also from the point of view of civil safety.

Based on this analysis, the conclusion is that the implementation of a modern, integrated, and population-centered emergency warning and evacuation system around the Dehqanabad Potash Plant is not only a scientific but also a socially relevant task.

**Table-3**

**Dehqanabad Potash Plant - Analysis as a Hazardous Industrial Facility**

<b>Direction of analysis</b>	<b>Accurate information</b>	<b>Source basis</b>
Type of enterprise and production characteristics	Potash fertilizers (mainly carnallite and sylvinitite) are produced. The processing process produces sulfuric acid, chloride solutions, and dusty mixtures.	Open data of JSC "Navoiyazot"; data of the Agency for Ecological Balance Preservation of the Republic of Uzbekistan (2023–2024).
Hazardous Material	Sulfuric acid, chloride solutions, chemical dust, gaseous mixtures. They have a toxic effect on the respiratory tract, skin, and eyes.	Hazardous substances register (internal company documents); ILO classification of hazardous substances.
Geographic location	In the Dehqanabad district of Kashkadarya region. 3–5 km from the city center. Nearby are settlements such as Yangiabad, Koratepa, and Chashma.	State Statistics Committee of the Republic of Uzbekistan; local government maps.
Population density (around	Hundreds of thousands of people live within a 5 km radius of the plant. The	State statistical data (2024); Dehqanabad district administration.

the plant)	city's population is over 50,000; including villages, the total number is around 150-200,000.	
Existing warning system	There are sirens only on the premises of the enterprise. There is no mobile messaging, social media, or special alarm system for outsiders.	MCHQ Kashkadarya regional administration; interviews with residents (2023–2024).
Evacuation infrastructure	There are official evacuation routes and assembly points, but they are not open to the public. Road maps have not been distributed. There is no information about the readiness of vehicles.	Local government documents; survey results.
Emergency planning	There is a general provincial-level emergency plan, but no specific impact analysis or hazard maps have been developed for the plant.	MCHQ regional administration; representatives of the enterprise security department.
Information exchange with the population	There is no dedicated emergency section on the plant's website. There is no regular information provided through local radio, newspapers, or social media.	Open source analysis; population survey.
Exercises and preparation	No evacuation drills involving the public have been conducted in the last 5 years. There are only internal alarms for the company's employees.	MCHQ data; interviews with staff at local schools and medical facilities.
Possible consequences of dangerous events	The spread of chemicals can cause respiratory diseases, skin lesions, environmental pollution, and poisoning of water sources.	ILO and WHO risk assessment standards; ecological expertise conclusions.

The information in the table is summarized based on open sources, official information provided by government organizations, local government documents, and informal surveys conducted in the city of Dehqanabad and surrounding villages in 2023–2024. The population survey was conducted through interviews with more than 120 citizens living in settlements such as Dehqanabad, Yangiabad, and Koratepa.

**Table-4**

**Emergency preparedness level of Dehqanabad Potash Plant**

Directions of preparation	Current status	Shortcomings	Source (base)
Internal emergency systems	The plant is equipped with automatic sensors, emergency stop systems, fire safety equipment, and sirens. Emergency instructions have been developed for employees.	The systems are intended only for the enterprise territory and employees; they are not integrated for the external population.	Security Department of Navoiyazot JSC; MCHQ inspection conclusions (2024).
Warning system	an alarm system on the premises of the enterprise .	The population cannot receive timely information	Population survey (120+ people);

	There are no mobile messages, social networks, radios or special signaling devices for outsiders.	when an emergency occurs.	MCHQ regional office.
Evacuation plans	There is a general regional evacuation plan. Separate evacuation routes and assembly points for the plant have been officially designated, but they have not been distributed to the population.	The plans are practically unknown to the population; the roads are not marked; the readiness of transport is uncertain.	Documents from the Dehqanabad district administration; interviews with representatives of the school and housing departments.
Exercises and alarms	Internal fire drills are conducted only for employees of the enterprise. No evacuation drills involving the public have been conducted in the last 5 years.	Preparation is ineffective if the population does not know in practice how to act in an emergency.	MCHQ data; interviews with local citizens.
Information exchange with the population	There is no separate section on the plant's website for emergencies. There is no regular information provided through local media. Brochures and maps have not been distributed.	The population is not sufficiently informed about the risks; there is little trust.	Open source analysis; population survey.
Hazardous Substances Control	A register of hazardous substances is kept for internal use at the enterprise. Storage containers and pipes are under technical control.	The register is not open to the public; the impact zone is not calculated; external hazards (earthquake, wind) are not taken into account.	Environmental audit conclusions; comparative analysis with ILO standards.
Measures for special needs groups	There are no separate evacuation plans or assistance mechanisms for people with disabilities, senior citizens, or children.	In an emergency, vulnerable groups are at risk.	Interviews with staff from local medical facilities and schools.

Based on the table below, although the Dehqanabad Potash Plant has a certain level of preparedness in the field of internal production safety, external preparedness - that is, ensuring the safety of the population - is practically undeveloped. The warning system does not cover the population, evacuation plans do not exist in practice, there is no information exchange, and exercises are not conducted. As a result, the plant is assessed as having a low level of preparedness for emergencies, especially in terms of population safety.

**Table-5**

**Emergency preparedness level of Dehqanabad Potash Plant (in percent)**

Training direction	Readiness level %	Note
Internal production safety	70%	The factory has automatic barrier systems, sensors, and fire safety equipment. Instructions and drills are conducted for employees. However, external hazards

		(earthquakes, floods) are not taken into account.
Warning system (for the population)	15%	There is almost no mobile messaging, social media, radio, or special alarm system for outsiders. Residents are not even aware of the existence of sirens.
Evacuation plans (for the population)	20%	There are official plans, but they have not been distributed to the population, routes have not been defined, and transport readiness is uncertain.
Open information exchange with the public	10%	There is no regular information on emergencies on the factory website or in local media. There are no brochures or maps.
Exercises and training (with public involvement)	5%	There has been no evacuation drill with the participation of the population in the last 5 years. There are only internal drills for the company's employees.
Measures for special needs groups	0%	There are no separate plans, assistance mechanisms, or evacuation facilities for people with disabilities, senior citizens, or children.
Hazardous Substances Control and Exposure Analysis	25%	A register of substances exists, but is not open to the public. A chemical cloud dispersion model and hazard zone maps have not been developed.

The overall level of preparedness is determined not by the arithmetic average of all directions, but by an analytical assessment that prioritizes the most important components from the point of view of public safety (warning, evacuation, information, exercises). Therefore, even if internal preparedness is high, the overall level of preparedness is considered low due to the low external preparedness.

### Conclusion

The Dekhkanabad Potash Plant, as a strategically important chemical industry enterprise of Uzbekistan, requires special attention not only from an economic point of view, but also from an emergency perspective. The analysis shows that although the plant has a certain level of preparedness in the field of internal production safety, external preparedness - that is, ensuring the safety of the population living in the vicinity - has serious shortcomings.

With the development of modern industry, humanity has faced new economic opportunities as well as new risks. In particular, chemical production enterprises - including the Dehqanabad Potash Plant - although economically profitable, remain a source of constant threat to public health, the environment, and social stability as potentially dangerous facilities. Therefore, effective protection of the population living around such facilities in emergency situations is a complex but urgent task, not only technically, but also socially, legally, and organizationally.

The study conducted a thorough analysis of the level of emergency preparedness at the Dehqanabad Potash Plant. The analysis shows that the plant has a somewhat systematic approach to internal production safety: there are automatic sensors, emergency shutdown systems, fire safety equipment, and alarm drills for employees. However, external preparedness - that is, ensuring the safety of the population living around the plant - is practically undeveloped.

Currently, the population does not have sufficient information about what hazardous substances are used at the plant, what their effects are, what signal to give in the event of an emergency, and where to evacuate. The warning system covers only the territory of the enterprise, and there are no mobile messages, social networks, radio or special signaling devices for the external population. Although evacuation plans officially exist, they are not known to the population in practice, routes are not marked, and transport readiness is uncertain. At the same time, regular evacuation drills are not conducted, special measures are not taken for groups with special needs (disabled people, senior citizens, children), and a de facto system of open information exchange with the population does not exist.

**List of used literature:**

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