# RADIATION ACCIDENT IN THE EMERGENCY PLANNING ZONE OF THE TEMELIN NUCLEAR POWER PLANT AS A RESULT OF A TERRORIST ATTACK

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Abstract: This paper examines the protection of the population within the emergency planning zone of the Temelin Nuclear Power Plant (Temelin NPP), during a model radiological emergency caused by a terrorist attack. Attention is given to the importance of nuclear power for the energy security of the Czech Republic, security treats to critical infrastructure, and the emergency preparedness system. The paper analyses basic protective measures in the event of a radiological accident, particularly public warning, sheltering, evacuation, decontamination, and iodine prophylaxis. The paper includes a model scenario demonstrating the activities of the Integrated Rescue System (IRS) components and the organization of the emergency response under radiological accident conditions. The results confirm the importance of coordinated crisis management, regular preparation of emergency plans, and public education to minimize the consequences of emergency events.

Keywords: civil protection, critical infrastructure, emergency preparedness, radiation accident, Temelin Nuclear Power Plant, terrorism

## 1. Introduction

Nuclear energy represents a significant, stable, and low-emission source of electricity and, at the same time, a key component of the critical infrastructure in the Czech Republic. In the context of increasing demands for energy security, power-grid stability and the decarbonisation of the energy sector, the importance of nuclear power plants is growing not only in terms of electricity production but also from the broader perspective of national security. The current security environment, however, also introduces new asymmetric threats, including terrorism, cyberattacks, and hybrid forms of disruption targeting critical infrastructure.

Nuclear power plants are facilities of high strategic importance, and any disruption to them could have serious security, economic, environmental and psychological consequences. For this reason, it is essential to focus not only on the technical and operational safety of nuclear facilities but also on emergency preparedness systems and the protection of the population in emergency planning zones.

The Temelin NPP is a key component of the Czech energy infrastructure and which contributes to maintaining the stability of the national power grid. In the event of a radiological emergency, it is essential to ensure rapid coordination of the emergency response, effective public communication, and the implementation of protective measures, particularly sheltering, evacuation, decontamination, and the monitoring of the radiological situation.

This paper examines population protection within the emergency planning zone of the Temelin NPP during a model radiological accident caused by a terrorist attack. The objective of the paper is to analyse the principles of emergency preparedness, describe the fundamental protective measures, and, through a model scenario, demonstrate the practical application of radiation-protection principles, the organization of evacuation, and the activities of the Integrated Rescue System (IRS).

### 1.1 The Temelin NPP as a strategic element of the energy infrastructure

The Temelin NPP represents one of the most significant elements of electric power system in the Czech Republic and, at the same time, an important component of national energy security. It is located in the South Bohemian Region, approximately 25 km north of České Budějovice, near the town of Týn nad Vltavou. The power plant site was selected, among other factors, with regard to suitable geographical, technical, and safety conditions. For the purpose of cooling the power plant, the Hněvkovice Reservoir (1, 25) was constructed on the Vltava River.

Construction of the Temelin NPP began in the 1980s as part of the development of Czechoslovak nuclear power. The original design envisaged four units, but following the social and economic changes after 1989, it was decided to complete only two units (12, 21). The first unit was commissioned in 2000, followed by the second unit in 2002 (24, 25).

The plant is equipped with two VVER 1000/V320 pressurized water reactors. Each unit has a capacity of approximately 1,125 MWe, and the total installed capacity of the plant is approximately 2,250 MWe. Annual electricity production is around 15 TWh, which represents a significant share of total electricity production in the Czech Republic (17, 24, 25).

From a technological standpoint, the plant's operation is based on the use of VVER-type energetic reactors, i.e., Water-Water Energetic Reactors (VVER), a type of pressurized water reactor. Their operation is based on the use of water as both a neutron moderator and a coolant in the primary circuit. Although both Czech nuclear power plants use a similar technological design, they differ in output, layout, and certain technical parameters (6, 25).

From an energy policy perspective, the Temelin NPP represents a strategic low-emission source of electricity. Nuclear power is currently regarded in the European Union as a significant and stable source that can contribute to the decarbonisation of the energy sector, the reduction of greenhouse gas emissions, and the strengthening of energy security in member states (13). According to data from the World Nuclear Association, approximately 440 nuclear reactors were in operation worldwide in 2024, and dozens more were under construction (28).

The Czech Republic has long envisaged further development of nuclear power, particularly through the construction of new nuclear units at the Dukovany and Temelin sites. At the same time, the potential deployment of small modular reactors is also being discussed (26, 28). From the perspective of critical infrastructure protection, Temelin is therefore not merely a power generation facility but a strategic asset of fundamental importance for the stability of electric power system in the Czech Republic.

Given the importance of the Temelin Nuclear Power Plant, there is a need for systematic protection against security threats. In addition to technical and operational safety, attention must also be paid to physical protection, cybersecurity, emergency preparedness, and emergency planning (1, 21).

### 1.2 Terrorist attacks on the nuclear power plants as a security treat

Terrorism represents a long-term and serious security threat in the modern world. It does not consist merely of isolated acts of violence, but rather constitutes a complex security phenomenon associated with political, ideological, religious, or social motives. Bonanate states that terrorism is an urgent and evident reality that cannot be eliminated by repressive measures alone, as its essence is linked to the motivation of individuals or groups willing to sacrifice their own lives and the lives of others in the name of an ideal or goal (4).

According to Waisová, terrorism can be characterized as premeditated and politically motivated violence directed against civilian or military targets, individuals, or groups. Its purpose is to intimidate, inflict harm, or kill people in order to achieve political or ideological objectives, with the chosen targets often having symbolic significance (27). Pillar, meanwhile, emphasizes that terrorism should be understood primarily as a specific method of violence rather than merely as a characteristic of certain groups or ideologies (22).

In the field of energy security, terrorist threats are primarily associated with attacks on critical infrastructure. Ivančík and Kelemen note that significant asymmetric security threats include attacks on oil refineries, product pipelines, transmission systems, power plants, nuclear facilities, and the information and communication systems of energy networks (18). From this perspective, energy infrastructure represents an attractive target, as its disruption can have widespread economic, social, and security impacts.

Nuclear power plants represent a specific category of critical infrastructure. They are a key source of electricity and, at the same time, facilities with stringent requirements for security, physical protection, and crisis management. Although nuclear power plants are considered “hard targets” with a high level of protection against unauthorized intrusion or attack, the risk of a targeted attack cannot be entirely ruled out. Terrorist organizations have demonstrated in the past both the intent and the capability to target critical infrastructure assets (14).

From the perspective of security studies, the objectives of terrorist attacks can vary. Bennett notes that the primary aims of terrorist organizations include causing loss of life, damaging or destroying critical infrastructure, disrupting the economy, undermining public confidence in state institutions, or generating a long-term psychological impact on society (3). An attack on a nuclear power plant could thus have not only immediate security consequences but also significant psychological, economic, and political impacts.

The U.S. Department of Homeland Security defines terrorism as an activity dangerous to human life or having the potential to destroy critical infrastructure, with the aim of intimidating the population, influencing government policy through coercion, or shaping government action through destructive acts (16). This definition emphasizes that critical infrastructure, including nuclear facilities, may be a target of attacks aimed at destabilizing society and the state.

From the perspective of nuclear power plant security, it is therefore essential to focus on multi-layered physical protection, technical security measures, access control, detection and monitoring systems, armed protection, cybersecurity, and emergency preparedness. Modern security systems at nuclear power plants are based on a combination of preventive, detection, delay, and response measures.

In the current security environment, cyberattacks against energy infrastructure also pose a significant threat. The digitization and automation of energy facility operations increase operational efficiency while simultaneously creating new vulnerabilities associated with the potential disruption of control and communication systems. The combination of physical and cyber threats can trigger serious cascading effects in critical infrastructure.

The importance of these facilities lies not only in electricity generation, but also in their stabilizing role within the electric power system and in the state’s ability to ensure the continuity of essential services.

### 1.3 Emergency planning zone and protective measures in the event of a radiological emergency

Given the safety significance of nuclear power plants and the potential threats they face, an emergency preparedness system has been established. Nuclear power plants are facilities for which it is necessary to plan not only the prevention of emergency events, but also protective measures in the event that a radiological emergency occurs. The emergency preparedness system in the Czech Republic is based primarily on the Atomic Energy Act, the Act on the Integrated Rescue System, the Crisis Management Act, and related implementing regulations (9, 10, 11).

Emergency preparedness represents a state in which conditions are established within a given territory or organization to manage emergency events through planning, organizational measures, the activities of the Integrated Rescue System, and the population protection system (10). The Integrated Rescue System is a coordinated system of units designed to carry out rescue and recovery operations during emergencies, crisis situations, and accidents (10).

Population protection encompasses a set of organizational, technical, and material measures aimed at protecting people from the effects of hazardous chemical, biological, and radioactive substances. It includes, in particular, means of individual protection for the respiratory tract, eyes, and skin, as well as sheltering, evacuation, and decontamination measures (19).

A radiological emergency is a situation in which established radiation exposure limits are exceeded or may be exceeded and which requires the implementation of measures to protect the population and the environment (9). Depending on their nature and scope, radiological emergencies may be classified as local incidents, incidents involving a limited release of radioactive substances, and radiological accidents that require the activation of protective measures in accordance with the external emergency plan (20).

In the event of a radiological accident, an emergency planning zone is established in the vicinity of nuclear facilities. The Atomic Energy Act defines the emergency planning zone as an area for which measures to protect the population must be prepared in the event of a radiological accident (9). The extent of this zone is determined on the basis of the characteristics of the facility, the quantity of radionuclides, and possible accident scenarios. Further details are specified in Decree No. 359/2016 Coll., which also regulates the requirements for emergency planning and the preparation of protective measures (7).

Basic protective measures within the emergency planning zone include public warning, sheltering, evacuation, iodine prophylaxis, regulation of the movement of persons, and decontamination. Protective measures are a set of procedures intended to protect the population during emergency events (8). Evacuation is an organized relocation of the population from a threatened area to a safe area in accordance with pre-prepared population protection plans (8).

An important element of population protection is sheltering, the purpose of which is to reduce the risk of inhalation or external contamination by radioactive substances. In such cases, the population is advised to close windows and doors, turn off ventilation systems, and limit outdoor activities. In the event of a risk of radioactive iodine release, iodine prophylaxis may be ordered.

An integral part of radiation protection is the monitoring of the radiological situation, in particular the monitoring of dose rate. Dose rate expresses the change in absorbed dose of ionizing radiation per unit of time and is used to assess the intensity of the radiation field (23). In practical radiation protection, units such as μSv/h or mSv/h are commonly used. The magnitude of the dose rate depends on radiation intensity, its energy, and the absorption properties of the surrounding environment (2).

Regional and external emergency plans play a significant role in the emergency preparedness system. The external emergency plan defines specific measures for the protection of the population in the vicinity of a nuclear facility and includes procedures for public warning, evacuation, decontamination, distribution of iodine prophylaxis, and regulation of the movement of people (5). In the case of the Temelin NPP, the emergency preparedness system primarily includes the

Emergency Plan of the South Bohemian Region and the external emergency plan of the plant (15).

Several entities are involved in the preparation and implementation of emergency measures. The operator of the nuclear facility prepares the internal emergency plan and ensures personnel preparedness. Public administration authorities are responsible for external emergency planning and population protection. The State Office for Nuclear Safety exercises supervision over emergency preparedness, and the components of the Integrated Rescue System ensure the practical implementation of protective measures, particularly evacuation, decontamination, and medical assistance (9).

An important component of population protection is public preparedness. Residents within the emergency planning zone must be regularly informed about warning methods, rules of conduct in the event of a radiological accident, and the possibilities for using protective measures. Public preparedness is supported through the distribution of informational materials, training activities, and regular exercises organized by the components of the Integrated Rescue System and public administration authorities (8, 11).

From the perspective of state security, the system of emergency preparedness and population protection represents a key instrument for minimizing the consequences of radiological accidents. Effective coordination among the operator of the nuclear facility, public administration authorities, the components of the Integrated Rescue System, and the population is an essential prerequisite for the successful management of an emergency event and for limiting its impacts on society and the environment. The effectiveness of these measures is subsequently verified through model radiological accident scenarios, which make it possible to assess the preparedness of individual crisis management components as well as the population.

## 2 Methodology

The methodology of this paper is based on the objective of analysing options for the protection of people within the Emergency Planning Zone (EPZ) and applying the principles of radiation protection to a selected model radiological emergency. The methodological approach combines the study of professional literature, legislative documents, emergency plans, and response instructions with subsequent modelling of the radiological situation and evaluation of protective measures.

The following part of the paper is based on the simulation of a model radiological emergency within the EPZ. The model situation is analysed using a scenario-based approach that enables the simulation of the course of a radiological emergency and the assessment of the effectiveness of protective measures. The presented model situation addresses a radiological accident at a nuclear power plant involving the release of radionuclides into the environment. First, the event scenario itself is described, including the location of the incident, the nature of the radiological hazard, the affected persons and equipment, and the anticipated extent of impacts on the surrounding area. Subsequently, the radiological situation is determined, including an assessment of dose rate and the risk of internal or external contamination. For the delineation of individual response zones, limit values specified in emergency plans and response instructions are applied.

The methodology also includes a description of the activities of the responding units, in particular the plant fire brigade, dosimetrists, emergency response units, and other components of the Integrated Rescue System (IRS), where activated. For the described situation, protective measures for both responders and the population are defined, including the use of personal protective equipment, decontamination procedures, and monitoring of the radiological situation.

The final stage of the methodological procedure is the evaluation of the model situation. This includes an assessment of the effectiveness of the adopted measures, their compliance with applicable legislation and radiation protection principles, as well as the identification of potential risks and complications and formulating recommendations for practice. This approach makes it possible to comprehensively assess preparedness for radiological emergencies within the EPZ and the specific aspects of response to an accident at a nuclear facility.

## 3 Model scenario

The model scenario represents a fictional case of a radiological accident at the Temelin NPP affecting the Emergency Planning Zone (EPZ). The aim is to demonstrate the practical application of radiation protection principles, emergency response procedures, and decontamination measures. Although this is a model case, the individual steps correspond to real organizational and technical procedures used at nuclear power plants in the Czech Republic.

During the morning hours, a terrorist attack occurred on Unit 1 during normal operation. The attack was extensive and resulted in a sudden increase in dose rate within the containment area. Security forces neutralized the attackers, after which the emergency response was initiated. The continuous monitoring system recorded a gradual increase in measured values in the vicinity of the primary circuit technological equipment. Control measurements performed by a dosimetrist confirmed the presence of radioactive aerosols within the containment and their release into the environment. The measured values exceeded established limits; therefore, the event was classified as a radiological accident (emergency event of Level 3). In accordance with standard procedures, the plant emergency staff, the plant fire brigade, the radiation protection unit, and other emergency preparedness components were activated.

Due to an eastern wind, the plume of radioactive aerosols began to move toward Sectors 12, 13, and 14 within the EPZ of the Temelin NPP. These sectors form an area extending from the plant in the direction of the towns of Protivín and Čičenice. Sector 12 covers the area surrounding Čičenice, Sector 13 represents the transitional area between Čičenice and Protivín, and Sector 14 includes the territory in the vicinity of Protivín. All of these sectors comprise a number of smaller municipalities in which identical protective measures were declared. In the affected sectors, mobile monitoring units and field response teams were deployed. In coordination with data from the teledosimetric system (TDS), these units refined and specified the radiological situation in the field.

Elevated dose rate values were measured, naturally decreasing with increasing distance from the source of the release. Within a radius of approximately one kilometer from the plant, the values ranged around 1.5–2.0 mSv/h; at a distance of five kilometres, they decreased to below 100–200 μSv/h; and at a distance of ten kilometres, they fell below 30–50 μSv/h. These values corresponded to a short-term release without a significant contribution of radioactive iodine. The reported values represent model, indicative dose rate levels corresponding to a short-term release of radionuclides of limited extent.

Since the spread of contamination affected Sectors 12, 13, and 14, two evacuation routes designated for this part of the Emergency Planning Zone (EPZ) were selected for evacuation. Evacuation Route No. 3 leads from the vicinity of the power plant through Čičenice toward Vodňany, where Decontamination Site No. 3 is located. This route was used primarily for the evacuation of the population from Sector 12 and part of Sector 13. For residents of Sector 14, Evacuation Route No. 4 was activated, leading through Žďár to Nový Dvůr, where Decontamination Site No. 4 was activated. Both decontamination sites are located outside the contaminated areas in order to ensure easy accessibility from main transport routes and to enable the smooth movement of both people and equipment.

The Police of the Czech Republic ensured traffic control throughout the entire affected area. Access to Sectors 12, 13, and 14 was closed, control checkpoints were established on the main access roads, and measures were taken to prevent unauthorized persons from entering the area. At the same time, the police managed traffic along Evacuation Routes No. 3 and No. 4, where it was necessary to ensure the smooth movement of evacuation vehicles as well as emergency response units. The police also provided security for both decontamination sites and coordinated the arrival of evacuees from individual municipalities.

The transport of the population from the affected sectors is carried out using a combined approach. The majority of residents evacuate using their own vehicles, which enables rapid relocation and reduces the burden on evacuation buses. For individuals without access to private transportation, evacuation buses organized by the municipalities in cooperation with the IRS are provided. Special attention is paid to people with limited mobility. As part of emergency preparedness, the mayors of the affected municipalities maintain records of these residents, and ambulance vehicles or Fire and Rescue Service (FRS) vehicles are deployed for their transport to ensure their timely evacuation. Units of the company's Fire and Rescue Service (FRSp), in cooperation with the South Bohemian Regional Fire and Rescue Service, provided technical support and carried out decontamination processes. Along Evacuation Routes No. 3 and No. 4, they established and operated vehicle decontamination stations, where vehicles leaving the affected sectors were cleaned. At the same time, they participated in the establishment of Decontamination Sites No. 3 and No. 4 for the decontamination of persons and ensured water logistics as well as the handling and disposal of contaminated waste materials. A monitoring team conducted supplementary monitoring of the radiological situation in the immediate vicinity of the power plant and transmitted the measured values to the radiation protection unit. Firefighters also provided fire safety assistance at damaged technological units where there was a risk of fire due to non-standard operating conditions.

When implementing decontamination measures, it is essential to follow to the correct sequence of steps. This procedure includes an initial screening check, possible decontamination of both equipment and personnel, and a subsequent exit check before entering the clean zone.

Immediately after the declaration of the radiological event, protective measures consisting of sheltering the population in buildings, closing windows, and limiting outdoor activities were implemented throughout the affected area of the Emergency Planning Zone (EPZ). The intake of iodine prophylaxis was also ordered, as the released radionuclides could have contained quantities of radioactive iodine; this represented a conservative approach. Subsequently, a controlled evacuation using improvised evacuation means was ordered for Sectors 12 to 14, where dose rate values of 30–50 μSv/h were measured. This measure primarily concerned residents of municipalities located in the immediate vicinity of the release and individuals who were present outdoors at the time of the event. Information was disseminated through warning systems and local public broadcasts. The meteorological situation was continuously evaluated in order to anticipate further dispersion of radionuclides.

Directly within the power plant premises, monitoring portals detected several contaminated individuals among the personnel. These individuals were immediately directed to designated areas, where decontamination of both the people and their protective equipment was carried out. In the case of two workers, surface contamination of the hands and footwear was confirmed and successfully removed. No internal contamination was detected.

Following the stabilization of the situation, sealing of the affected technological equipment was initiated, along with the gradual reduction of radionuclide concentrations in the air using filtration systems. The emergency staff and other emergency response components coordinated subsequent actions, including the assessment of the radiological situation in the affected sectors, monitoring of meteorological conditions, and preparations for potential further interventions.

After the acute phase of the accident had subsided, control sampling of soil, water, and vegetation was carried out in the vicinity of the power plant as well as in the affected municipalities in order to assess the environmental impacts. Finally, the entire event was evaluated in terms of the effectiveness of the measures adopted. The rapid activation of emergency response units, appropriate delineation of zones, timely public information, and effective traffic management prevented the spread of contamination beyond the anticipated sectors. The model scenario thus demonstrates the importance of coordinated emergency preparedness and the correct application of radiation protection principles during emergency events affecting the emergency planning zone.

### 3.1 Potential complications and failures in the model scenario

Although the model scenario describes an ideal course of response, a real emergency event may be influenced by a number of factors that could slow down or disrupt evacuation operations. The following section summarizes the most likely complications that could occur during the evacuation process.

A frequent complication may be a traffic accident on an evacuation route. Although evacuation routes are selected to ensure sufficient capacity and good traffic flow, a collision involving a private vehicle, a technical failure, or a sudden blockage of the roadway cannot be ruled out. In the case of a minor accident that does not compromise the traffic flow of the route, occupants of the damaged vehicle may be collected by acquaintances or transported by components of the Integrated Rescue System (IRS) to the nearest evacuation point in order to avoid delays in the evacuation process. If the route becomes completely impassable, it is necessary to inform the Police of the Czech Republic or other Integrated Rescue System components. The report may be made by the participant in the accident, if capable, or by any evacuee who observes the incident. The police subsequently designate an alternative route or decide to redirect all traffic to another evacuation route. In the present scenario, if Evacuation Route No. 3 were blocked, evacuation could be redirected to Evacuation Route No. 4. These measures ensure that evacuation can continue even in the event of a sudden blockage of the primary route.

Another complication that may affect the evacuation process is a situation in which a resident refuses to leave their home. A typical example may involve an elderly woman who informs a neighbour in advance that she does not intend to evacuate and will remain at home. The neighbour, during the boarding an evacuation bus, notices that the woman is not among the evacuees and informs the evacuation vehicle coordinator. An attempt at telephone contact follows, which often remains unsuccessful. If firefighters or another Integrated Rescue System component have sufficient capacity and resources, a patrol carries out a personal check and attempts to establish direct contact at the residence. If, however, repeated knocking or banging on the door elicits no response and the situation does not allow further delay of the evacuation, the IRS components continue their operations and the person remains sheltered in place. The name of the person is forwarded to the crisis staff, which classifies them among people requiring subsequent follow-up after the acute phase of the event has subsided. This procedure reflects the need to balance an individual approach to residents with the requirement to ensure the smooth and timely evacuation of the entire sector.

Another specific complication may be the presence of domestic animals. Some residents refuse to evacuate without their pets, which can delay boarding of evacuation buses and disrupt the organization of the entire process. However, evacuation is primarily focused on the protection of people rather than animals; therefore, residents are advised to leave their pets in enclosed areas within their homes. If residents nevertheless take their pets with them, it is preferable that the animals be placed in a transport crate or carrier bag that allows safe transport without posing a risk to other evacuees. An animal not secured in a crate or carrier may cause disorder, bite or scratch individuals, induce stress among other evacuees, or complicate subsequent decontamination procedures.

An integral part of emergency preparedness for residents within the Emergency Planning Zone in the event of a release of radioactive substances is the requirement to use improvised evacuation protective equipment during evacuation, such as a raincoat, rubber boots, a cap, and a respirator or another means of respiratory protection. These items serve to reduce the risk of surface contamination and to protect other evacuees. If, however, an individual arrives at an assembly point or evacuation bus without such protective equipment, they cannot be included among the evacuees, as they could pose a risk to the safety of others. In such cases, the individual is either directed to individual evacuation, for example using their own vehicle, or provided with substitute protective clothing, such as a disposable protective suit, which is available to the components of the IRS. After being equipped with substitute protective clothing, the individual may continue evacuation together with others. Personnel at the decontamination site are informed in advance that this individual requires a more thorough inspection. This procedure ensures that evacuation proceeds safely and that other people within the evacuation flow are not endangered.

**Conclusion**

Nuclear power plants represent a significant element of a state's critical infrastructure and, at the same time, a strategic source of electricity whose importance continues to grow under current energy policy conditions. With the increasing importance of nuclear power, the requirements for protecting these facilities against security threats are also rising, particularly with regard to terrorist and cyberattacks. The security of nuclear facilities therefore encompasses not only the technical safety of operation, but also a comprehensive system of emergency preparedness and population protection.

The presented model scenario of a radiological accident at the Temelin NPP confirmed the importance of a coordinated emergency response, rapid activation of the components of the Integrated Rescue System, and effective monitoring of the radiological situation. At the same time, it demonstrated the significance of proper delineation of affected sectors, the organization of evacuation, and timely public information within the emergency planning zone.

The model scenario also highlighted potential complications that may adversely affect the implementation of protective measures, such as traffic restrictions, refusal of evacuation by some residents, or insufficient use of personal protective equipment. These factors confirm that the effectiveness of emergency preparedness does not depend solely on technical and organizational measures, but also on the level of population preparedness and the ability of the public to respond appropriately to instructions issued by crisis management authorities.

The article confirms the importance of regular training of emergency response units, continuous updating of emergency plans, and ongoing public education in the field of protection during radiological emergencies. An effective emergency preparedness system represents a key instrument for minimizing the consequences of radiological accidents and a significant element in ensuring state security and population protection.

Model scenarios of this type can also serve as a basis for the further development of emergency preparedness, training of the Integrated Rescue System components, and the optimization of protective measures within emergency planning zones.

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**Primary Paper Section:** A

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