# RADIOLOGICAL THREATS TO THE SECURITY ENVIRONMENT

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***Abstract:*** *The threats to the modern security environment from radiological materials are explored. The possible scenarios for radiological impact from open and / or closed radioactive sources and nuclear weapons and the degree of potential danger are analyzed. The psychological effects of the population are examined. The role of state policy in radiological threats is stated*.

**Keywords**: RADIOLOGICAL, RADIOACTIVE SOURCES, THREATS

## *1. Introduction*

In the new geostrategic situation in Europe and in the context of profound transformations in the domestic political situation in individual countries, there are serious changes in the nature of the security threats. The spectrum of new specific security challenges and threats is expanding. Some of them are hard to foresee. Such are the proliferation of weapons and technologies, including weapons of mass destruction, terrorism; refugee problems and illegal immigration; the manifestations of Islamic fundamentalism; environmental problems, industrial accidents and disasters, etc. Some of these threats have an international dimension and are of a global nature. Therefore, broad international co-operation is needed to neutralize them. They have a lasting character and therefore influence national and international security for a long time. The proliferation of nuclear weapons and other weapons of mass destruction is a threat to international security. It is a threat to our country as well. The number of countries that develop their own programs and produce dual-purpose materials, technologies and equipment has grown a lot. Attempts have been made to procure or develop and trade in nuclear technologies and materials from criminal groups and individuals using drug trafficking and arms trafficking channels or creating new ones. Countries such as Iraq, India, Pakistan and others are striving to acquire nuclear weapons and more.

The terrorism is the most serious threat to Bulgaria. This is a clear from the annual report on the state of our National Security in 2016. An in-depth analysis of the external environment for security and the dynamics of the processes in the world has been made, which determines the strengthening of the existing and emergence of new risks and threats to security of the Republic of Bulgaria. International terrorism and the proliferation of weapons of mass destruction, regional conflicts, migration processes, cross-border organized crime in the Balkans, terrorist threats from religiously motivated groups, hybrid actions against NATO and the EU, particularly against our country, as well as many other listed risks , which requires adequate management of the resulting hazards. [2]

The external environments, as well as the listed risks in the internal environment for our national security, require a set of interrelated priorities and sectorial policies integrated with EU, NATO, UN and OSCE security policies.

## *2. The Possible Scenarios for Radiological Impact to National Security*

It is impossible to predict all potentially possible scenarios of radiological terrorism, which may differ in terms of objectives, ways and means that can be used. Objects may be individuals of the population, communities, the entire population of a country, and even predetermined purposes or persons may be predetermined. The use of radioactive sources or materials is one of the most likely scenarios for terrorist action plans. These are unprotected closed sources that can be placed in a variety of locations inside or outside buildings, vehicles, industrial sites, and other one. Radioactive substances in the form of hermetically sealed sources are used for various purposes in industry, medicine and more. These sources have a variety of activities, but the greatest danger is the unprotected sources of high activity. The consequences can be serious.

Radioactive material can either be dispersed in the environment (Radiological Dispersal Device (RDD)– dirty bomb) or directly irradiate people (Radiation Emission Device) resulting in individuals being exposed to alpha, beta or gamma rays. Polonium poisoning has been already employed in different occasions; orphan sources could easily be attached to explosive devices to spread ionizing radiations that can be inhaled, ingested or leading to people's skin or clothes being exposed). Of course, the most dangerous incidents should be theorized against nuclear power plants, with the risk of leaks or (worse) explosions resulting in a wider contaminated area with longer lasting effects not only on people, but also on the environment.

An RDD is a conventional bomb not a yield-producing nuclear device. RDD is designed to disperse radioactive material to cause destruction, contamination, and injury from the radiation produced by the material. An dirty bomb can be almost any size, defined only by the amount of radioactive material and explosives. A passive dirty bomb is a system in which unshielded radioactive material is dispersed or placed manually at the target. An explosive RDD—often called a "dirty bomb"—is any system that uses the explosive force of detonation to disperse radioactive material. A simple explosive RDD consisting of a lead-shielded container—commonly called a "pig"—and a kilogram of explosive attached could easily fit into a backpack. An atmospheric RDD is any system in which radioactive material is converted into a form that is easily transported by air currents. A variety of radioactive materials are commonly available and could be used in an RDD, including Cesium-137, Strontium-90, and Cobalt-60. Hospitals, universities, factories, construction companies, and laboratories are possible sources for these radioactive materials. [1]

Improvised Nuclear Device (IND) is intended to cause a yield-producing nuclear explosion. An IND could consist of diverted nuclear weapon components, a modified nuclear weapon, or indigenous-designed device. INDs can be categorized into two types: implosion and gun assembled. Unlike RDDs that can be made with almost any radioactive material, INDs require fissile material—highly enriched uranium or plutonium—to produce nuclear yield. [1]

Although the exact impact from a RN attack is hard to estimate, there are some simulations made on the damage that a detonation containing radioactive materials would cause to a city.

As part of the US Department of Homeland Security's Improvised Nuclear Device (IND) preparedness program Mr. Brooke Buddemeier from the Lawrence Livermore National Laboratory have calculated that a 10KT ground explosion within 1.6 miles of the U.S Capitol would lead to 1 million people exposed to 1Gy or more in the first 4 days. His simulation suggests that such a scenario would lead to more than 50,000 deaths due to blast, burn or radiation. Another simulation made by Dr. Cham Dallas from the Institute of Disaster Management and presented to the US Senate

Homeland Security Committee concludes that 180,000 people would be injured and in need of treatment (10KT detonation). [1, 6]

Another effect in radiological incidents is psychological. After terrorist incident, terror is instilled in the population, especially if the attack is against a soft target. Way afterward, statements of radiological use for the attack will heighten this fear, leading to psychosis and possible alienation of suspected ill/contaminated victims. Such substances are usually not perceptible by human senses, thus creating a fear determined by the absence of recognizable threats. [3]

Under affected area there is a sociological and will directly influence our collective behavior; in the wake of terrorist attacks against music venues, stadiums or restaurants, many people will decide to avoid such places. Long term effects however, can lead to behavior and routine changes, adapting one's lifestyle to new threats and fears. [6]

There are also logistic and operational problems to consider. Radiological substances released in an urban area will lead to prolonged emergency situations in time and space; metropolitan areas contaminated with biological, chemical or radiological agents will be forbidden for long periods, complicating the victim's rescue operations and influencing institutional, economic and normal activities resumption. Table 1 suggests possible radioactive materials as means of use.

***Table 1:*** *Source or material, which can use for nuclear terrorism [9]*

| Source or material | Source dimensions | Danger and Mode of Action |
|---|---|---|
| Small radioactive sources (nuclear medicine, brachytherapy) | $1nm^3 \div 100\ cm^3$ | External exposure |
| Large radioactive sources ($^{192}Ir$ $^{60}Co$) | $1\ cm^3 \div$ some $m^3$ | External exposure |
| Radioactive material containing a large source | $500\ cm^3 \div 1\ m^3$ | Spray with or without explosive. External and internal irradiation. |
| Spent nuclear fuel | above $1\ m^3$ | Spray with or without explosive. External and internal irradiation. |
| Attack against NPP or reactor failure | Fuel elements - length 5m | |
| Reactor failure | Destroyed active area or elements on first contour | External and internal irradiation. |
| Traffic incident with radioactive material | 100÷200 l | External and internal irradiation. |
| Nuclear charge | A suitcase bomb | Shock wave, външно облъчване |
| Nuclear blast | A suitcase bomb | Shock wave, thermal radiation. External and internal irradiation. |

Apart from the use of various devices by terrorists, it is not possible to exclude the attack of Kozloduy NPP or of nuclear power plants near our country. History has known cases of terrorist attack, which has led to many implications for the security environment. This report [10] presents the results of an independent analysis of the health and economic impacts of a terrorist attack at Indian Point that results in a core meltdown and a large radiological release to the environment. We find that, depending on the weather conditions, an attack could result in as many as 44,000 near-term deaths from acute radiation syndrome or as many as 518,000 long-term deaths from cancer among individuals within fifty miles of the plant. These findings confirm that Indian Point poses a severe threat to the entire New York metropolitan area. The authors of [11] give examples of technogenic emergencies with the disposal of radioactive particles from recent decades and present the existing potential sources of ionizing radiation near Bulgaria. In [12] is an analysis of their possible influence on the radiation situation in Bulgaria.

## *3. Role of the country to prevent the proliferation of radiological weapon*

The fight against organized crime, and in particular with terrorism, is a long process, accompanied by expense of many human and material resources.

A major element of this struggle is the construction of anti-terrorist specialists. Of course, the problem of material provision of these specialists, as well as improvement of their knowledge and skills, is no importance, given rapid development of means and means used by terrorists to carry out their criminal acts.

Therefore, in parallel with practical work to prevent the criminal acts of individuals or terrorist groups, countries such as Bulgaria, which have no significant resources in organizational and financial terms, should use experience, financial and material assistance that can and should be in this critical period. The type of aid should primarily consist of providing know-how, specialized software and cooperation on information exchange, experience and training of specialists on the use of a technical tool for detecting banned and especially dangerous materials, as well as in the field of exchange of experience on the implementation of the Law on Measures against Money Laundering.

Of particular importance for the internal infrastructure in this plan is also the possible assistance for additional equipment with video equipment and equipment for observing passengers and freight in the area of the main railway stations; the purchase and additional equipment of equipment for carrying out radioactive control of goods at the border stations and the interior of the country; the preparation and further training of employees who will be involved in the management and handling of special equipment; providing the necessary protective equipment, in the event of extraordinary and crisis situations. [13]

The Government of the Republic of Bulgaria support adoption of Resolution 1373 (2001) by the UN Security Council, has undertaken and takes practical measures for its implementation. Through various legislative and administrative measures, the Bulgarian country has effective control over use of its territory by natural and legal persons who plan, assist, finance or commit terrorist acts against other states or their citizens. The Bulgarian Government is and will continue to make efforts, on a bilateral and multilateral basis, for the signature, ratification and implementation by the UN Member States of all universal and regional conventions relating to the fight against terrorism, and in particular the 1999 Convention on fight against terrorist financing. The Republic of Bulgaria will actively and constructively support all international fora for the adoption and enforcement of an effective international law system against terrorism, including a UN General Convention against Terrorism, which will be the universal reference framework for the multiplicity of international law instruments against terrorism.

The author B. Dimitrov [8] is concerned with the automated information systems for radiation monitoring in the Republic of Bulgaria and their capabilities for assessing the nuclear environment and warning to population. The emphasis is placed on the Unified Radiation Monitoring Information System, and the other existing

systems at national and institutional level. The purpose is to determine the capabilities of these systems to provide information on gamma levels that support the process of forecasting, warning and disclosing the population in nuclear, hazard cases.

## *4. Conclusion*

Although the initial radiation and nuclear crisis response plans exist in all EU countries. In an average or large-scale incident, an affected country may not have the strength to deal with the situation for several reasons:

• Lack of capability and decontamination capacity,

• Limited stock of decontamination solutions,

• Limited specialized medical abilities and capacity,

• Lack of capacity and capacity for waste management (including disposal of contaminated water),

• Limited capacity and capacity to respond to crises (CR) and counteraction.

Only a few countries in EU have deployed military capabilities to decontaminate early staff. This creates a requirement for a minimum level of interoperability between countries and synchronized their Plans. Some cross-border bilateral or multilateral radiological and nuclear exercises are already in place, but in most cases they are related to incidents involving nuclear power plants and are concentrated on CR alone.

Prevention and CBRN protection and recovery are complex in nature and expensive questions. Efforts should focus on prevention measures; However, these failures, an international system, ready to deal with CBR (N) incidents, must be established to mitigate the effects.

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