
International Mechanisms for the Prevention of Atomic Radiation

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Abstract

The atomic energy may have great radiations which may cause bad effects on human health and the environment. A lot of national and international agencies are working on this important issue. This research has highlighted some very important aspects of this issue and also discussed the role of local and international agencies to prevent atomic radiations. The full implementation of the treaty on the non-proliferation of nuclear weapons is required to control atomic radiation pollutions and this achievement must be at a global level. It must support the efforts of the international community to eliminate weapons of mass destruction. The United Nations suggested several treaties and agreements in this regard. Still, legal solutions to this problem are not sufficient. Therefore, this research recommends initiating the international treaties on an urgent basis to avoid the exposure of atomic radiation to the world.

Keywords: Environment; Radioactive pollution; Atomic radiation prevention.

1. INTRODUCTION

For thousands of years, man has been struggling to secure his life on earth against nature. Now, he must strive to repair the damages, he has caused to nature so that he can survive (Azouz, 2009). In recent years, with the development of modern technology, the use of nuclear energy has been increased. It has caused the leakage of atomic radiation. This leads to the emergence of a serious problem that threatens the survival of man on the earth. Despite many uses that have been benefited from nuclear energy and it has caused enormous damages to human life and the environment. This may be due to nuclear accidents that can occur because of the wrong use of nuclear energy.

The volume of pollution increased dramatically, especially during the leakage of atomic radiation. It occurred in the Chernobyl nuclear reactor and the Tsunami in Japan in 2007. The second was the result of a nuclear leak due to an earthquake that hit Japan (Al-Baz, 2006). So, it was necessary to find a quick solution to prevent the leakage of these radiations. Therefore, the international community stressed the need to take all measures to combat atomic pollution. Many international and regional conferences and many international organizations are working that enacts laws and regulations regulating the prevention of ionizing radiation and arrange the necessary research for this purpose (Government of Jordon, 2007).

It is observed that most of the existing literature is focused on the issues of studies focused on international environmental protection. Adequate attention is not paid to atomic radiation and its dangerous effects on the international community. Faytheh (2014) has shed light on the definition of environmental pollution and radiation pollution. This study has focused to combat radiation pollution. It has highlighted the necessity of extensive scientific research and continuous studies on radiation. It has emphasized the establishment of nuclear analysis centers that would study soil, food, and water samples to ensure that they would be free of any potential radioactive contamination.

The importance of the research is due to the increase in the intensity of radioactive contamination. The expansion of its scope is due to the increase in risks to human life. It is resulted due to the emittance of radioactive radiation because of the technological development witnessed by humankind in the past years. Despite the efforts made by the United Nations and the international treaties dealing with radiation and nuclear pollution, initiatives are still very few which are compared to the conventions and treaties related to pollution of the seas. Perhaps, this is because the problem of radioactive air pollution has not been received enough attention (Azouz, 2009).

This research is aimed to shed light on international treaties and conventions concerning atomic radiation prevention and to review the glitches and shortcomings. It is also aimed to highlight the several efforts made by international and regional organizations, and the international community to prevent atomic radiation. It may open the ways for legal experts and may lay the foundation stone to motivate further studies in this research domain. Furthermore, it is intended to demonstrate the adequacy of international legislations and conventions to prevent atomic radiation.

Because of the technological progress that the world has witnessed during the past few years, the reactors have become threats to neighboring countries. It happens in the nuclear reactor in Chernobyl, and the discovery of the proportion of radioactive materials in neighboring countries (United Nations, 2008). It called to impose international cooperation to protect the environment and reduce the severity.? Therefore, this research is structured to answer these questions i.e. what does atomic radiation mean? What are the important international agreements to protect against atomic radiation? and what efforts have the international and regional organizations to prevent atomic radiation?

2. ATOMIC RADIATION

It is high-energy radiation that ionizes the medium, in which it passes. Once the beam collides with the atoms of the medium, it leads to the ejection of some electrons of the atoms and the formation of ions in the medium. This means the conversion of the atom to a positive ion and is not considered within the atomic radiation due to its inability to fission in both atoms and molecules (Al-Qassas, 2005), and therefore it is a type of radiation that can penetrate in materials for different distances, including the bodies of living things, such as X-rays, etc.

Radioactive Contamination

It is the leakage of radioactive elements, resulting from nuclear accidents, into one of the components of the environment. It is one of the most dangerous types of environmental pollutions. As, it causes serious damage to a human that may lead to his death (Government of Jordan, 1987; Fahmy, 1992; Nassif, 1992; Al-Hamidi, 2008; Attia, 2009; Shehab, 2002). The sources of radioactive contamination are either natural or industrial (Siraj, 2000; Rabeh, 2010). The natural sources are cosmic rays (Al-Qassas, 2005) and radioactive gases from the Earth's crust such as potassium-40 and rubidium-87. The industrial sources are radioactive elements from the decomposition of uranium-238 and thorium-232 (Al-Qassas, 2005).

It is the effort of human beings that these elements are being utilized in nuclear power plants and nuclear reactors (Al-Mukhaady, 2006; Hilal, 2005; Al-Alfi, 2009; Al-Mahdi, 2006; Autres, 2005). Moreover, these are disposed of in radioactive waste disposal plants (Al-Hamidi, 2008). Later, the radioisotopes are used in industry, agriculture, medicine (Al-Mahdi, 2006; Al-Hamidi, 2008; Hatamleh, 2009; Government of Jordan, 2007), and nuclear explosions that occur in the field of experiments (Saedan, 2008; Lamm, 2001). The radioactive materials are divided into two parts which are the radiations of a positive ionic nature (electromagnetic), such as gamma and x-rays, commonly used in scientific works, and the radiations of particle nature, such as alpha and beta rays (Attia, 2009; Ghorabeiyaand Al-Qirhan, 1991).

Effects on Human Health and Environment

Humans are more affected by nuclear radiation. Nuclear radiation is caused by the ionization process. Because of ionization, the normal functioning of some of the essential components of cells that make up living tissue is either changed or destroyed (Pwadi, 2007). These effects may be either physical or hereditary. The physical effects may include pathological symptoms of the central nervous system, diseases of the digestive system and cancer, etc. Whereas the hereditary effects may cause to change the composition of genes, congenital malformations, and chromosome injuries, especially for children and fetuses in the womb (Al-Jazzarand Saqr, 2011; Faytheh, 2014). As for the effect of nuclear radiation on the environment, it leads to the negative change that affects one of the elements of the environment. As a result of the human overuse of radioactive materials and isotopes in various industrial and biological activities, there is an excessive increase in the proportion of nuclear radiation in the environment beyond the permissible limit (Saedan, 2008).

Atomic Radiation Prevention Methods

For the prevention of atomic radiation, the principles of radiation protection are recommended by the International Commission for Radiation Protection. Especially, justification of exposure should be justified in

the sense of any risks resulting from radiation exposure (Safety Series No. 115, 1996). It is assumed a specific percentage of risk commensurate with the level of exposure, justification, and optimal improvement of prevention. This is followed by planning to set the reference values that may be adopted in the next stage of preventive measures to ensure that the exposure values that individuals receive as a result of exposure from radioactive residues, under different conditions, and must remain lower than the reference values (Lockhard, 2009). Based on this, we find that the problem of environmental pollution is one of the problems that need concerted international and local efforts to combat it. At the national level, (Law of Nuclear and Radiation Control, 2011), each country must issue the necessary legislation to protect the national environment. The state must see to sign and ratify many international and bilateral agreements to achieve more cooperation.

3. INTERNATIONAL AGREEMENTS

International and regional organizations were interested in working to conclude international and regional agreements (Allam, 1985) and conferences to provide legal protection against the dangers of atomic radiation leakage resulting from the use of nuclear energy. Beginning with the Stockholm Conference in 1972, which was condemned by nuclear weapons experiments, and required the countries to stay away from that, because they cause serious radioactive contamination. Similarly, the United Nations Resolution No. 4934 (A, B& C) of 1972 AD at its twenty-seventh session, which stressed the necessity of an urgent halt to nuclear testing. Moreover, General Assembly Resolution No. 49/75 E of 1994 emphasized on the gradual reduction of nuclear danger, and General Assembly Resolution No. 62/42 of 2007 stressed on nuclear disarmament. However, many international agreements had established goals for environmental conservation. Some of these goals were based on the method of repair and compensation for environmental damage after it had occurred. It had based more on the protective method against all environmental damages (Boualam, 2018), especially the damage of atomic radiation leakage.

The Geneva Convention on the Protection of Workers from Ionizing Radiation 1960

It emphasized the necessity of taking appropriate measures to protect workers from ionizing radiation (Al-Atta, 2009). It had informed the International Labor Office about the measures, and educated workers to prevent ionizing radiation. It had stressed the necessity of national laws and regulations to be included as a clear declaration of work. It also included a comprehensive and continuous medical examination of the workers exposed to radiation during their work. Moreover, it was essential for each country to determine the proportions of permitted radioactive materials and to review these ratios considering the current information (Al-Atta, 2009).

The Convention for the Physical Protection of Nuclear Material 1980

This convention focused on the physical protection of nuclear materials (Tullio, 2003). It was required from all the member states to ensure the use of nuclear materials (plutonium, uranium-235, uranium-233, and radioactive fuel) for peaceful purposes only. It was forbidden for the member states to export nuclear materials or allow these to be transported through their territories unless the buying state had guaranteed that these materials would be protected under the agreement.

The Convention for The Early Notification of a nuclear accident or radiological emergency 1986

It was an agreement that established a system for reporting nuclear accidents that might result in a launch in a member state (Marc and Droit, 1998). The accident might affect across the international borders that could be important in terms of radiation security for another country. The state must be liable to inform the time of the accident, its location, and other information to the neighboring state. This information could be provided either directly or through the International Atomic Energy Agency (United Nations General Assembly, 2002).

The Convention for the Assistance in the event of a Nuclear Accident 1986

The Convention affirmed that the member states should cooperate with the International Atomic Energy Agency to facilitate the provision of immediate assistance in the event of a nuclear accident to protect lives, property, and the environment from the effects of radiation leakage. The affected countries might request assistance directly from the state of another party, or through the International Atomic Energy Agency, or with other international organizations. Here, the affected country must be notified of the type of assistance provided to it (United Nations General Assembly, 2002).

The Convention for The Nuclear Safety 1994

This agreement encouraged the member parties to strive and to achieve the agreed nuclear safety goals by fulfilling the safety obligations at the national level (Marc and Droit, 1998). At the international level, each contracting party was obligated to submit a periodic report on the measures it had taken to comply with the terms of the agreement. The other contracting parties would review those reports. The obligations were largely based on the principles contained in the safety fundamentals document developed by the International Atomic Energy Agency. It was included to set an appropriate legislative framework that would require all countries to adopt and inspect the places of the explosion. This agreement was applied only to civilian ground stations for nuclear power generation.

Based on this, international environmental legislation considered that the use of radioactive uranium was a procedure for testing nuclear weapons which have severe effects on human beings and the environment. And if international law condemns the use of nuclear weapons, then as a matter of preliminary, their experiments also fall under the same danger. The advisory opinion of the International Court of Justice on the legality of the threat or use of nuclear weapons was issued on 8 July 1996. It has welcomed the unanimity of all the judges of the Court to reaffirm that all countries should strive, in good faith, to conduct negotiations that lead to nuclear disarmament in all its aspects under strict and effective international control, and to reach these negotiations to a conclusion (International Court of Justice, 1996).

As for the issue of uranium enrichment, it had attracted great controversy. Especially in the reactions of the Iranian nuclear crisis, as this issue had raised scientific problems and law at the same time. The legal position on the issue of uranium enrichment had become a major part of the interactions of the Iranian nuclear crisis. This was linked to the provisions of the Nuclear Non-Proliferation Treaty, as it had proved that the Nuclear Non-Proliferation Treaty (NPT) texts did not help in resolving the dispute radically because each party was able to find among the texts of the treaty what supported its position. As the treaty talked about general principles and not about uranium enrichment activities (Mahmoud, 2005).

The Iranian side had adhered to Article No. 4 of the treaty, according to which states were not prohibited from carrying out nuclear activities for peaceful purposes. Rather, all states parties to the treaty have been forced, either alone or in cooperation with each other or with international organizations, to facilitate any possible exchange of equipment, materials, and scientific and technical information for the use of nuclear energy for peaceful purposes, and this text was applied to uranium enrichment (Rabeh, 2010). In its report of 2004, the supreme body of the United Nations has recognized the problem but took a vague position on the issue. They claimed that the escalating tension between the goals of achieving a more effective non-proliferation regime and the right of all signatories to the NPT to develop civilian nuclear industries should be addressed (Berkovic, 2005).

In any case, many of the national decisions and legislations focused on combating radioactive pollution, the most prominent of them are mentioned here. Resolution No. 35/21 was adopted by the General Assembly of the United Nations in 1998, which stressed the observance of the highest safety standards in the design and operation of nuclear facilities. It emphasized to carry out peaceful nuclear activities to minimize the risks to life and environmental health. Likewise, the General Assembly Resolution No. 14/60 of 14 November 2005, in which it emphasized international cooperation to enhance the ability to cope with disasters accompanied by radiological accidents. The Arab League Council also issued several resolutions calling for the development of peaceful uses of nuclear energy and the development of an Arab collective program for the use of nuclear energy for peaceful purposes (Mesbah, 2014). For the national legislation, the most prominent is the Russian Federation Law of 2000 regarding ratification of the Comprehensive Nuclear-Test-Ban Treaty, the Australian Comprehensive Nuclear-Test-Ban Treaty Act of 1998, the Irish Nuclear Test Ban Act of 2008, Jordan's Nuclear Energy and Radiation Protection Act 2001, Ionizing Radiation Protection Act 2002 Cypriot Law, and National Control Authority Law No. 48 of 2012, Iraq to Prevent Nuclear, Chemical, and Biological Weapons (CTBTO, 2015).

4. INTERNATIONAL ORGANIZATIONS

International law had established that international organizations would contribute to developing the rules of international laws by holding international conferences. These conferences resulted in the conclusion of binding international agreements (Sana, 2011). The United Nations Organization had played an effective role in developing international environmental laws. As the United Nations General Assembly, in its first resolution, had established the United Nations Atomic Energy Commission and had set the goal of eliminating all weapons that could be used for mass destruction (McCaffery and Lutz, 1978; Gillis, 2013).

International Atomic Energy Agency (IAEA)

Since the inception of IAEA, it had made enormous efforts to achieve its goals as in Article No. 2 and 3 (Wardieh, 2012). It had supervised the international conferences held within the United Nations for the peaceful use of nuclear energy. Besides, it had issued many scientific publications such as the Nuclear Facility Safety Circular, the regulation for the safe transportation of radioactive materials (International Atomic Energy Agency, 2019), Radiation Protection and the Safety of Radioactive Sources, and the international basic safety standards for the protection from ionizing radiation and safety of radiation sources (Siraj, 2000). It had also issued many regulations related to the safety of reactors, protection of their workers, transportation of radioactive materials, and method of their packaging & storage. The internal legislation of the countries had borrowed many of its provisions (Fadil, 1976).

In 1990, an Inter-Agency Committee on Radiation Safety (IACRS) was established to serve as a forum for consultation and cooperation in radiation safety matters among international organizations. The Agency had held several national seminars on the legal and regulatory framework for the nuclear power program. These included a national workshop on developing and implementing a safety supervisory framework in Nairobi, Kenya in March 2018; and a national workshop on a safety supervisory framework in Accra, Ghana in February 2018 (International Atomic Energy Agency, 2019). Finally, the agency had helped countries in improving nuclear safety and security, and emergency preparedness and response (zoghbi, 2017). The work was usually bounded by international agreements and standards to protect people and the environment from the harmful effects of nuclear radiation (Weshash, 2009).

Food and Agriculture Organization (FAO)

FAO is an organization of the United Nations. The organization's role was not limited to develop the uses of atomic energy in agriculture (Nasser, 2020). Rather, it had carried out joint scientific researches with specialized scientific bodies to assess the extent of the impact of radiation pollution on nutrition and agriculture in general (Fadil, 1976). There is also a joint program between FAO and the International Atomic Energy Agency. Since 1964, it had been divided into three sub-programs. The sub-program comprised of food and environmental safety had been aided in four main areas of research coordination and support. Besides, it had provided technical advisory services, support, and training to laboratories. It had helped in collecting, analyzing, and disseminating information, primarily in areas related to the use of ionizing radiation, residues of pesticides, veterinary drugs, and radioactive contamination of foodstuffs.

United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)

The committee collected information and data on radiation from the member states of the United Nations or the specialized agencies. It developed technical proposals, determines the type of equipment and their use to measure radiation, and draws up annual reports that show the levels of radiation and its impact on human beings (Abu Al-Khair, 2009). A debate was held in Geneva in 1960 under the supervision of the United Nations and the World Health Organization regarding statistics on radiation and genetics. The committee continued its activities to study the impact of the fall of nuclear dust and the effects of radiation on the genetic aspects (Banouna, 1971). In 1974, the committee was functionally attached to the United Nations Environment Program (UNEP). It gave the committee's work a basic dimension in the global system for protecting the environment from the dangers of radioactive pollution (Qader, 2014). The committee developed a strategic plan to provide a vision for all its activities during the period 2009-2013. It had considered that its main goal was to increase awareness and deepen understanding among authorities, scientific circles, and civil society regarding levels of ionizing radiation; and the related effects on health and the environment (United Nations, 2008). Besides, it was considered that the committee would assess the radiation levels arising from energy production and their effects on health and the environment. And all this would be performed based on Paragraph No. 6 of General Assembly Resolution 62/100.

International Committee for Radiation Protection (ICRP)

The committee provides recommendations and directions regarding protection from the risks arising from the use of ionizing radiation in various fields (United Nations General Assembly, 2002; Muhammad and Al-Shuwaifi, 2010). These recommendations are published about four times each year in the journal of the Annals of the International Committee. The committee had contributed to develop guidelines for radiation dose limits for professional workers. It had made a basic philosophy for radiation protection. It had recommended general

principles governing the selection of levels of intervention in radiological emergencies. It had suggested a general framework for the values within which such levels are expected to fall (Siraj, 2000).

World Health Organization (WHO)

This organization had contributed very actively in the field of combating radioactive pollution. The Codex Alimentarius Commission Program in 1963 was an achievement of the committee (Al-Majzoub, 2005). It had supervised many environmental projects and programs. It had worked on monitoring the effects of radiation on food and had set international standards for the limits of radiation contamination of food (Azouz, 2009). After the accident of Chernobyl in 1986, the organization held a series of meetings related to the disaster. It has resulted in the issuance of the WHO report on the health effects of the Chernobyl accident.

International Labor Organization (ILO)

The organization took several measures to protect workers in atomic installations from exposure to radiation hazards (Arafa, 1997). It was done with the cooperation of the International Atomic Energy Agency and other relevant organizations (Fadil, 1976). Recommendation No. 112 was issued in June 1959 to regulate medical services for workers. Special measures were taken for the workers who were exposed to atomic radiation. In June 1960, the organization had drawn up an international agreement under which the signatories were pledged to specify the doses to which workers could be exposed. Besides, they would take other measures for workers and juveniles, following Recommendation No. 114 attached to the agreement and they would include it in their national legislation too.

5. THE ROLE OF REGIONAL ORGANIZATIONS

The organization is considered regional when its formation and competence is limited to a specific geographical area. The regional organization usually arises between countries linked with each other by common ties such as the association of civilization, geographical location, language, or religion.

League of Arab States

The League of Arab States is an example of the development of the idea of a limited general international organization. It was limited to a group of countries that share the unity of culture and civilization. Its establishment was welcomed by the Arab peoples (Sarhan, 1974). Based on this, the Arab Atomic Energy Authority was established under Resolution No. 2120 of 1965. It seeks to reach the development of instructions for protection from radiation, the safety of atomic installations and physical protection, and the establishment of a network for radiation monitoring in Arab countries. It would confront any accidents that might result in radioactive pollution of the environment and exposing citizens to the dangers of nuclear radiation. Besides, it develops methods of radiological analysis (Mesbah, 2014).

Middle East Regional Center for Radioisotopes for Arab Countries

It had defined the objectives and functions of the center in Article No. 3 of the committee (Fatih, 1974). It had emphasized the training of the specialists on the applications of radioisotopes taking into account the needs of the host country and the countries involved by organizing public and private programs. Especially, it would work for the applications of radioisotopes in medicine and industry for the prevention of radiation. Article No. 13 of the agreement had defined the basic standards for health and safety. This was confirmed in the 29th clause where amendments might be made for these rules and principles following the provisions of Paragraphs number 38 and 39 of the Agency's health and safety procedures.

The National Center for Nuclear Safety and Radiation Control

This authority plays the main role in securing the Egyptian environment from the dangers of radioactive pollution that result from nuclear activities or accidents in the surrounding countries or regions through pollution in the air, water, or soil. Also, it sets up an emergency plan in coordination with the Crisis Management Center of the Armed Forces, the Civil Defense Authority of the Ministry of Interior, and the management of the Suez Canal Authority (Hammad, 2002).

Organization of African Unity (OAU)

OAU is an intergovernmental organization (Sarhan, 1974). Several conferences and agreements had been held including the Accra conference on nuclear pollution. It was held in Accra, the capital of Ghana, in May 1988. This conference had condemned the operations of landfill waste in African lands and warned of the dangers of radioactive pollution on the lands and their health hazards to the citizens of the African continent (Azouz, 2009). This is evident from the international efforts made by both international and regional organizations to prevent the leakage of atomic radiation, that the international conventions and treaties on the prevention of atomic radiation are still very few if compared to the conventions and treaties related to pollution of the seas. Probably, this is because the problem of air pollution has not cared for sufficient interest in the past few years (Azouz, 2009).

In the above discussions, we can see that the international community has not provided adequate legal solutions to address this problem, both in the international norms and agreements (Azzam, 2021).

6. CONCLUSIONS

We determined the leakage of radioactive materials or waste resulting from nuclear accidents or explosions that had transcended the national borders of the country in which the accident or explosion occurred. It had increased the volume of pollution due to the leakage of atomic radiation. So, it was necessary to find quick solutions to prevent the leakage of atomic radiation. It had made the issue of protecting the environment from nuclear radiation an international issue that could be resolved only within the framework of international organizations established for this purpose. The International Commission for Radiation Protection had resolved the inclusion of three principles, justification and optimization for prevention and dose restriction. The requirement of international interest in protecting the environment from nuclear radiation appeared after the Chernobyl accident in 1986. The worldwide increasing use of nuclear technologies and applications had also increased the need to analyze and evaluate the radiological effects of radioactive material emissions to the environment. It had become evident that most of the international agreements and conferences were not updated. Conclusions of the other new agreements were not reviewed, and amendments were not made to them for a long time. The United Nations and other international and regional organizations had also suggested several international agreements that regulated the use of atomic radiation to prevent them. Despite all of these efforts, we concluded that the international community had not provided sufficient legal solutions to address this problem. In conclusion, we are facing an indisputable truth, which is that the human race has devoted huge efforts to destroy life on Earth, and it is forgotten that it is part of nature.

7. RECOMMENDATIONS

It is recommended to strive for the national and international mechanisms in the field of the use of nuclear energy and its waste including the legislative, executive, administrative, and punitive measures to ensure the achievement of nuclear environmental security in general. At the same time, it should be able to prohibit the use of radioactive uranium shells as a deadly weapon and its use should be considered as an international crime. There is a need to adopt a better mechanism for exchanging information between countries and international governmental and non-governmental organizations on environmental problems. This mechanism must be characterized by speed and accuracy and far from procedural and formal aspects, to benefit any threat to the environment. It is required to urge all countries to participate and join the conferences aimed at protecting the environment and to ratify international and regional agreements that are in the interest of the environment. It is suggested to the international regime to prevent the spread of nuclear weapons and radioactive materials. It must be activated to create an international legal regime binding on all parties to the treaty. It is based on imposing deterrent sanctions, restrictions, and international responsibilities on countries violating international conventions. The nuclear facilities must be subjected to inspection and guarantees must be adopted by the International Atomic Energy Agency. It is strongly recommended to conclude the cooperation agreements with various international organizations specialized in protecting the environment from radioactive pollution, benefiting from their experiences in this field, and reviewing their internal legislation.

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