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Environmental and Legal Regulation of Radioactive Pollution Management

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Abstract

The article conducts research in the field of radioactive contamination as a problem of natural and man-made emergencies, as a result of which the victims, the preservation of a steady trend of growth in the scale of man-made disasters and the severity of their consequences, are considered as a serious threat to the security of society and the environment, as well as the stability of the development of the ecology of the country. At the same time, the problems of large industrial zones are associated with the concentration of not only potential sources of major radioactive contamination and disasters, but also other environmental industries that are sources of sustainable man-made effects of radiation and chemical factors on the population and the environment. The article discusses the authors' solution to the problems of preventing cases of radioactive contamination, minimising risks and minimising their consequences. The issues of environmental pollution and its impact on public health are considered, and solutions are proposed taking into account the regional characteristics of territories based on a unified methodological approach to assessing the consequences of man-made impacts. Management decisions to prevent cases of radioactive contamination and mitigate their consequences were made in the areas of comprehensive study of sources of pollution and threats of a natural nature, international legal acts on the state of the environment and the circulation of radioactive danger to the life and health of the population, methods for assessing the impact of radioactive and other pollution on the environment and the safety of the population in large industrial regions.

Keywords: environmental protection; radiation pollution; radioactive waste; radioactive materials; radiation safety; environmental legislation.

JEL Classification: F64; K32; Q57.

Introduction

Environmental issues are becoming increasingly relevant and important. This is due to the general environmental situation, the state of which is of universal concern at the international and state levels. The measures taken to

protect the environment are represented by a huge variety, which are combined and systematized by legal norms that represent a separate branch of law - environmental law. The preservation of the natural environment in a State governed by the rule of law requires the adoption at the State and international level of special regulations, strategies, concepts and programs. Today, no state can ignore the need to protect nature from negative anthropogenic and other influences. Many countries, with one success or another, are trying to solve problems with the implementation of many government acts on environmental protection and rational use of natural resources, supporting them with serious financial resources. The right to a favorable environment in the twentieth century has become one of the fundamental and comprehensive subjective human rights. The constitutions of most countries, and first of all the latest constitutions, enshrine the environmental rights of citizens, and accordingly recognize the functions of environmental protection for the state (Portugal, 1976; Spain, 1978; Turkey, 1982 and Brazil, 1988, the basic laws of all states created in subsequent years) (Maddex 2014).

With the development of the nuclear industry and the intensive use of nuclear materials and radioactive substances for peaceful and defense purposes, an unfavorable radiation situation has developed in the world for the population. During the period of Soviet socialist activity, the state gave a political coloring to the radiation safety of the population and was considered in the departmental interests. This problem was of exceptional state secrecy and, accordingly, generated insufficient information about the state of radiation safety, man-made sources of radioactive contamination of territories, irradiation of the population and methods of their rehabilitation. In the context of the ongoing development of nuclear energy and the widespread use of nuclear energy for peaceful and defense purposes, the use of ionizing radiation sources in scientific research and in many industrial fields: medicine, industry, agriculture, the problem of strict regulation of nuclear and radiation safety relations continues to remain relevant (Izbasarova 2014).

To date, 438 nuclear power plants with a total capacity of 374,332 MW are operating in the 31st country. Among the leaders in the number of operating power reactors are the USA (104), France (59), Japan (53), Russia (30). Of the 31 reactors under construction, 18 will be located in Asia. 71 reactors are under construction (World Nuclear Association 2022).

Several dozen countries of the world have technological and other capabilities to create nuclear weapons in the event of an appropriate political decision. According to experts, the number of nuclear warheads in Israel is about two hundred, in India and Pakistan together - about a hundred, most of which are not on operational duty. Five nuclear powers - members of the UN Security Council – have more than 20,000 nuclear warheads in their nuclear arsenals: the United States - about 10,000 (of which 7,000 are on operational duty), Russia - 18,000 (of which 7,800 are on operational duty), England - 200, France - 350, China – 400 (Komarov 2004) .

In this scenario, the problem of radiation pollution due to the use of atomic weapons and peaceful atom has become urgent and requires comprehensive consideration, including various aspects of its prevention.

For a more precise concept of environmental protection in radiation pollution, it is necessary to consider and define this term. To begin with, let's consider what the content of the concept of "environment" is.

1. The Harm of Radioactive Pollution to the Environment

The complexity of assessing and predicting the state of the environment after the radioactive effects of natural and anthropogenic factors, in our opinion, is undeniable. The specifics of such an impact are being studied, which is timely, taking into account historical and modern experience. Minimizing the consequences of negative radioactive exposure is possible in the case of a deep understanding of the functioning of natural systems, as well as the processes occurring in the Earth itself. The Concept of national Security of the Russian Federation, being an important document for the development of specific programs and organizational documents in the field of ensuring environmental safety of Russia, defines priority areas of protection from environmental pollution. Along with increasing the degree of safety of technologies related to the disposal and disposal of toxic waste; the creation of environmentally friendly technologies in all industries; rational use of natural resources; the fight against radioactive contamination is also noted. Radioactive contamination refers to physical pollution, *i.e.* the introduction of an energy source into the environment, manifested in a deviation from the norm of its physical properties. The physical nature of radioactivity consists in the spontaneous transformation of atomic nuclei, leading to a change in their mass number and the appearance of ionizing radiation consisting of three types of (basic) nuclear radiation, called alpha, beta and gamma rays. The nature of the interaction with matter is determined by the type of radiation and its energy (Bashlakova 2015).

Radiation means radiation and is applied not only to radioactivity, but also to a number of other physical phenomena, for example: solar radiation, thermal radiation, etc. That is why the concept of "ionizing radiation"

adopted by the International Commission on Radiation Protection and Radiation Safety Standards is applied to radioactivity (Koch 2017).

Ionizing radiation is called any radiation, when interacting with the medium, the formation of charged atoms and molecules – ions occur, leading to the ionization of the medium (Antonini 2014, 97).

Radioactive contamination can have different origins. It is known that in the composition of the Earth there are elements containing natural radioactive isotopes, such as potassium, vanadium, rubidium, etc., which are distributed almost evenly in the Earth's crust, make up a total radioactivity of about 0.003 curies per 1 m3. Natural potassium consists of a mixture of non-radioactive, with a mass number of 39 and 0.01% radioactive potassium, with a mass number of 40. On average, the content of radioactive elements in the earth's crust is several millionths. One cubic meter of Earth (1500 kg of soil) contains approximately 2 grams of potassium - 40, 15 grams of thorium, 5 grams of uranium. The total amount of radioactive elements in natural water and plants is about 100 times, and in the human body (per unit weight) is 70 times less than in the soil. Radionuclides of terrestrial origin, for example, potassium-40, radionuclides of the uranium-238 family, are easily oxidized metals, their oxides have a low density and are contained in the Earth's crust mainly in the form of oxides and predominate in the Earth's crust. The parent and daughter radionuclides are together in a state of radioactive equilibrium. Radionuclides can escape from other places in a variety of ways as a result of physical, chemical processes, the beginning of which may be the process of radioactive decay. Soils include inorganic material (particles, colloids), soil solution, soil gases, organic substances and living organisms. All soil components include natural radionuclides (Noda *et al.* 2021, 656).

The content of radionuclides in the atmosphere, hydrosphere, lithosphere and their changes are determined by the processes of their formation and transfer. These processes can be understood only considering the nuclear-physical, chemical, geochemical and biochemical properties of radionuclides and the regularities of their transfer processes in various media. Numerous studies have been devoted to the study of the processes of formation, transfer and deposition of natural and artificial radionuclides in the biosphere. However, these processes are essentially diverse, their qualitative description is not always possible, besides, the possibilities of quantitative description are limited. The applied mathematical models require a significant number of parameters obtained for each specific case from experience. On the other hand, there are a huge number of currently known radionuclides, and a complete description of their properties is impossible and unnecessary for the following reasons: - the properties of many of them have not been studied sufficiently, - radionuclides with a short half-life practically do not play a significant role in the irradiation of living organisms, - the content of many radionuclides is very small, which is not essential for radioecology. Of the thousands of artificial radionuclides, the most interesting are several dozen that are formed during nuclear tests (as a result of synthesis reactions, neutron activation reactions and heavy nuclear fission reactions). Radionuclides are also formed in the work of nuclear fuel cycle enterprises. Generated at nuclear power plants - activation products and fission products - and, at burned-out nuclear fuel processing plants - in addition to radionuclides characteristic of emissions and discharges of nuclear power plants - a, also uranium and radionuclides of transuranic elements - neptunium Np, plutonium Pu, americium Am, curium Cm, etc. Radioactive substances entering the atmospheric air settle and enter the soil, and in a few years radionuclides from the soil enter plants, which is the main way they get into human and animal food. So, in emergency situations, for example, in the Chernobyl accident, after radioactive fallout, radionuclides from the soil got into plants the following year. Moreover, radioactive elements entering the soil are retained in it for a long time, but the absorption of radionuclides by soils delays their movement along the soil profile and rapid transition to groundwater, *i.e.* radionuclides accumulate in the upper soil horizons to different depths, depending on the type of soil. The intensity of absorption of radionuclides by the soil absorbing complex affects the fixation in the absorbed state, their migration along the soil profile and entry into plants. In addition, natural radioactive gases are present in the earth's atmosphere: carbon dioxide containing carbon-14, which arises from the effects of cosmic rays on the atmosphere, as well as daughter products of uranium decay radium and radioactive gas radon, which comes out of the Earth and creates a concentration in the atmosphere of about one billionth by weight. The main route of radon entry into organisms is inhalation (during breathing), and the main radiation exposure is associated with daughter products of radon decay. Secondary routes of radon intake are water and the decay of radium incorporated into the body (Gan and Yang 2017, 484).

Radium-226 suppliers to the environment are enterprises for the extraction and processing of various fossil materials: uranium ores; oil and gas extraction; coal industry; construction materials enterprises; energy industry, etc. The total radioactivity of these gases in 1 m3 of air is one million times less than the radioactivity of 1 m3 of Earth. Thus, in a year, approximately 95% of the world's population receives an average radiation dose of about 250 millibers (an off-system unit - the biological equivalent of an X-ray) or 2500 micro-sieverts (a unit of equivalent dose - sievert - sv), including external and internal irradiation. External irradiation is up to 30% (15% of cosmic rays

and 15% of the Earth's surface), and internal irradiation occurs from radioactive substances that have entered the body, such as inhaled radon (50%), potassium isotopes-40 (9%), carbon isotopes-14 (9%), as well as insignificant amounts of other radioactive elements (2%), in total up to 70% of the total annual radiation dose. It should also be said about the remaining 5% of the world's population, who, living in mountainous areas, in the territories of torn sands, near underground springs, where radon or radium is released, receive a dose of natural radioactive radiation 2-5 times higher than the average dose. The exceptions are certain areas in Iran, Iraq, India, Nigeria, Brazil, Madagascar, where the level of natural radiation is 80 times higher than the average dose.

The biological manifestation of radiation exposure varies depending on the degree of exposure. The radioactivity of a substance is estimated by the number of decays per unit of time, and the decay rate is determined by the value of the half-life, namely, the time of halving the activity of a radioactive element. The unit of activity measurement is becquerel - Bk - is equal to one nuclear transformation per second. The off-system unit of activity is curie (Ci) = 3.7 x 101 Bq. The degree of ionization is estimated by the exposure dose of X-ray or gamma radiation. The exposure dose is the total charge of ions of the same sign that occur in the air when all secondary electrons are fully decelerated, which were formed by photons in a small volume of air, divided by the mass of air in this volume. The biological effect of various ionizing radiations is related to the amount of energy absorbed and depends on the spatial distribution, *i.e.* on the linear ionization density. To account for this effect, the concept of equivalent dose H is used, which is determined by the product of the absorbed dose D and the modifying quality coefficient K. The absorbed dose is the average energy transmitted by radiation to a substance in some elementary volume, divided by the mass of the substance in this volume. The unit of absorbed dose of gray (Gy) is equal to 1 J/kg. Non-system unit - rad, 1rad = 0.01Gr. According to the standards of radiation safety NRB 99/2009, an indicator characterizing ionizing radiation – kerma – K - is the ratio of the sum of the initial kinetic energies of all charged ionizing particles in the elementary volume of the substance to the mass of the substance in this volume. The units of measurement are the same as those of the absorbed dose - Gray, rad. The exposure dose is the dose of energy simultaneously associated with the kerma of photon radiation in the air (Rio Declaration on Environment and Development 1992).

In addition to natural sources of radiation, there are numerous anthropogenic ones associated with various technologies for using atomic energy, the most dangerous are atomic accidents or tests. The inevitable spread of technologies using radioactive materials leads to an increase in anthropogenic pressure on the environment. Accidents related to nuclear power, for example at nuclear power plants, can be sources of radioactive contamination. The main amount of radioactive substances is formed and located in nuclear fuel, *i.e.* in uranium dioxide tablets inside the sealed tubes of the reactor fuel elements. Tens of millions of curies of radioactive elements (fission products of uranium) accumulate in each reactor. They can pose a serious danger when they can go outside the NPP with successive damage to several barriers: - cooling failure and damage to pipes with damage, - damage to equipment or pipelines of the primary circuit of the reactor plant, - damage to the tightness of the reactor vessel. The organization of NPP operation safety is an important component. To control the radiation exposure, measurements of the radioactive background are made at the power plant and in the premises of the NPP. Radioactive waste at the nuclear power plants themselves and at the plants for the regeneration of spent nuclear fuel are subjected to complex processing, as a result of which their chemical composition changes qualitatively and quantitatively, but it is always very complex. Radioactive contamination after nuclear power plant accidents will persist longer than with a ground-based nuclear explosion, but the scale of spread (the area of the infected surface) will be ten times smaller (with a small height of the emergency release). However, the small height of the emergency release was considered obvious before the Chernobyl accident. In this accident, the initial height of the release reached 1000 - 1500 m, and the release itself lasted about 10 days, and the dynamics of the release turned out to be complicated – the direction and speed of the air masses carrying radioactive particles changed. Hence the huge areas of radioactive contamination and the complex spatial distribution of this contamination. Short-lived iodine radionuclides, for example, such as radionuclides J-131, J-133 and J-135 have the highest yields during uranium fission (60%, 32% and 8%, respectively). The J-129 ejection is very small. Its yield during uranium fission is ~ 0.9%. However, nuclear fuel reprocessing plants produce the largest J-129 emissions into the environment from NFC enterprises. In general, about 2 tons of J-129 are released into the environment per year. Iodine radionuclides have the ability to migrate due to increased volatility, complexity of chemical behavior, variety of water-soluble forms, low sorption coefficients relative to the most common minerals and soils. It is one of the irreplaceable biogenic elements that play an important role in the process of metabolism. J-129 is so dangerous for global radioecology that it is recognized as one of the main candidates for destruction by transmutation. Among other iodine radionuclides emitted by NFC enterprises, J-131 (in air and water) is critical. Among the radionuclides – fission products in emissions and discharges of nuclear power plants, Sr-90, Cs-134 and Cs-137 are most often considered, and Cs-

134 is essentially not a direct fission product. In thermal neutron reactors, it is formed as a result of neutron activation of the stable isotope Cs-133, which is obtained as the final product of the chain of decay of fission products. Just like Cs-137, the Cs-134 radionuclide is among the critical ones for discharges and emissions of nuclear power plants into the air, reservoirs and soil. Cs-134 is no longer present in global fallouts, including Chernobyl, due to its relatively short half-life. In the emissions and discharges of nuclear fuel reprocessing plants, its content may be noticeably higher than from nuclear power plants. In addition, in the vicinity of nuclear power plants, secondary pollution of the surface atmosphere becomes dangerous if a radioactive zone has formed on the ground. It is dangerous for radioactive dust to spread by wind, which pollutes water bodies and vegetation, penetrates into the respiratory organs, as a result, radionuclides enter the human body, including through food chains. The main constituent element of the cell is carbon (C-14), therefore C-14 accumulates in living organisms and can have a damaging effect by its entry into the composition of protein molecules, DNA and RNA molecules. The damaging effect is manifested when the medium is ionized by C-14 electrons and nitrogen recoil atoms (during the decay of C14 → N-14). The effect of changing the chemical composition of molecules during the decay of C-14 is manifested – transmutation (transformation) of carbon atoms into nitrogen atoms. The transmutation of carbon in the DNA molecule leads to a gene mutation that is difficult to reverse or irreversible. Along with cytogenetic changes, ionizing radiation can cause death or damage to the productivity of individual somatic cells and tissues of the body, for example, active tissues - the hematopoietic or hormonal system (Marzo *et al.* 2021).

In this regard, the IAEA (International Atomic Energy Agency) is implementing the program "Nuclear Safety and Environmental Protection", in which the most urgent problem is the protection of humans and the environment from the effects of nuclear radiation, radioactive emissions from nuclear power plants and other nuclear installations. The federal law "On Radiation Safety of the population" has been adopted in the Russian Federation. Basic Sanitary Rules for the Design and Operation of Nuclear Power Plants (SP AS-2003), Rules for Radiation Safety of Nuclear Power Plants (PRB AS-99), Radiation Safety Standards (NRB-99/2009). Radiation safety is a discipline that solves theoretical and practical problems related to reducing the possibility of emergency situations at radiation-hazardous facilities. The main task is to develop criteria: - to assess ionizing radiation as a harmful factor affecting the environment and the population; - methods for assessing and predicting the radiation situation and bringing it into line with the developed safety criteria by creating a set of measures (administrative, organizational, technical, sanitary and hygienic) aimed at ensuring safety when using atomic energy. The development and improvement of radiation monitoring tools and systems determines the direction of the issues of the second task. Different operating conditions of radiation installations, the radioactive substances used and other factors determine the need for an informed choice of means and frequency of measuring radiation levels, concentrations of radioactive substances. The purpose of radiation monitoring is to determine the degree of compliance with the principles of radiation hazard and regulatory requirements. Radiation control is subject to: - radiation characteristics of gas emissions, liquid and solid waste in the OS; - radiation risks in the technological process in the workplace and in the OS; - radiation factors in contaminated areas and in buildings with an increased level of natural radiation; - levels of exposure of personnel and the public from all sources of ionizing radiation subject to control. The basis of the functional tasks of radiation safety is to reduce the levels of exposure of the population and personnel below the regulated limit, through the implementation of measures: - technical: protective fences, automation of the technological process, cleaning of emissions; - medical and sanitary: provision of personnel with personal protective equipment (PPE), GO headquarters - means of protecting the population; - organizational: registration of work by order or order, admission to work, supervision during work, registration of breaks in work, registration of the end of work.

2. Legal Regulation in the Field of Radiation Safety

One of the most harmful and dangerous sources of pollution of the atmosphere and the environment in general that exist today is radiation. The State should take care of strict regulation of the content of radioactive substances in all elements of the environment: in the soil, in the atmosphere, in the hydrosphere, as well as in food. But the most acute environmental problem of our time for all mankind is the accumulation of radioactive waste in almost all corners of the Earth. And Kazakhstan is no exception in this regard. Of course, ensuring the quality of health and life of the country's population, national security, is possible only if natural ecosystems are preserved; it is important to prevent their contamination with radioactive waste. Such activity should become one of the leading directions of state policy. Speaking about the regulatory and legal regulation of the industry in question, it should be noted that it is carried out both at the domestic and international levels. Among the domestic regulatory and legal documents, the leading place is occupied by the radiation safety of the population (Law of the Republic of Kazakhstan 1998).

Its adoption is due to the need to streamline and regulate public relations in the field of environmental protection from radiation pollution, as well as in order to help the population overcome the fear of the danger of radiation contamination after the Semipalatinsk nuclear test site in Kazakhstan accident. Since 2004, such a body as Rostechnadzor has been creating and developing its environmental activities. The powers and functions that he is vested with in accordance with the legislation of the Republic of Kazakhstan contribute to the implementation of effective measures aimed at preventing, overcoming and eliminating the consequences resulting from man-made accidents, environmental and radiation disasters, atmospheric pollution (Yessymkhanova *et al.* 2021).

However, today the situation with the environmental and radiation situation in Kazakhstan has a number of serious drawbacks. These are, first of all, legislative gaps in legal regulation, the lack of adequate funding in the field of radioactive waste management. What is the source of the formation of radioactive waste? Inevitably leads to the formation of such waste activities related to the direct use of radon medicine, pharmaceuticals and some extractive industries. This indicates that the sectoral legislation in force in these areas also affects the legal regulation of radioactive waste management. The bulk of such waste is generated by the operation of nuclear power plants (NPP). But special attention should be paid to the fact that the storage facilities created at the NPP for the disposal of such waste have limited volumes, besides, most of the nuclear power plants in the country are practically in an emergency state, experiencing a shortage of resources. And despite the fact that some nuclear power plants have their own storage facilities for waste from their activities, the period of their permitted operation is disproportionately small in comparison with the half-life of radioactive waste (only 30 years), whereas waste can decay for tens of thousands of years (Tursynbayeva *et al.* 2020, 428).

If we consider the sphere of legal regulation of radioactive waste management, then we should pay attention to a number of critical shortcomings. So, the current norms of laws, alas, do not provide an appropriate level of clear regulation, and the norms themselves are scattered and often contradict each other, which creates prerequisites for violations. And if this problem is ignored, the environment and all of humanity may soon face inevitable negative consequences. Thus, we can talk about the priority of ensuring safety in the handling of radioactive substances and their waste in the state environmental policy of the Republic of Kazakhstan. But what is necessary to ensure the effectiveness of the state's policy in this area? First of all, it is a powerful control by state bodies over the management of radioactive waste, the adoption of all possible measures to protect the rights of citizens to a favorable environment, to information about its condition, as well as tougher sanctions for violations related to the circulation of radioactive waste (Bekezhanov and Yerkinbayeva 2017, 754).

But the above measures will be less effective if they are not applied in combination with the prevention of environmental pollution. Of no small importance in the regulation of radioactive waste management is the Rules adopted in 2016 for the Organization of Collection, Storage and Disposal of Radioactive Waste and Spent Nuclear Fuel (Order of the Minister of Energy of the Republic of Kazakhstan 2016).

The significance of this legal act lies in the fact that here, for the first time, the legal regime under which such waste is stored is determined. Also, the legal status of organizations whose activities are related to the use of atomic energy has received legislative consolidation. In addition, the subject of legal regulation was: protection of nuclear power facilities from external encroachments and liability for damage. This law extends its effect to all legal relations related to the use of atomic energy for peaceful purposes, with the exception of the development of nuclear weapons and military installations. Considering the system of sources of law that regulate relations in the field of radioactive substances and waste, we note that in Kazakhstan, in addition to acts of significance, acts of subjects, decrees of the President of the Republic of Kazakhstan and Government resolutions, departmental acts, there are acts of an international nature – conventions and treaties. But most researchers in the scientific literature mention two interrelated groups into which all legislation in the field of radioactive waste is divided: these are international treaties of the Republic of Kazakhstan and domestic legislation. Let's consider the two aforementioned groups in more detail. Speaking about the domestic legislation in the field of nuclear waste management, it can be concluded that there are significant gaps and shortcomings in it. This law does not contain fixed definitions of such important concepts as "waste", "radioactive substances", "nuclear fuel" and "radioactive waste management". Here are only some individual requirements established for certain types of activities related to the management of radioactive waste. Some of the terms listed above are disclosed in other republican ones, for example, "On the use of atomic energy" (Law of the Republic of Kazakhstan 2016).

"On radiation safety of the population" (Law of the Republic of Kazakhstan 1998).

Thus, the above gives grounds to assert that federal domestic legislation regulates only those relations that are directly related to nuclear energy. But, as we mentioned earlier, the formation of radioactive waste occurs not only when using atomic energy. An important point, in our opinion, is the mandatory cadastral registration of all radioactive substances and their waste at the state level, but the current legislation does not directly provide for

this moment. At the same time, maintaining such a cadastre, if we take into account the specifics of the activity we are considering, is appropriate, and the Energy Strategy of the Republic of Kazakhstan also notes such a need. If individuals and legal entities do not comply with the established rules when handling radioactive waste, then they may be held liable, according to the current legislation of the Republic of Kazakhstan. Thus, it is an unacceptable violation to import radioactive waste from foreign countries into the territory of the Republic of Kazakhstan in order to place them for temporary storage or complete burial by ejecting into outer space or flooding (Kuderina *et al.* 2021, 371).

Exceptions can be established only by special RC. The legal significance of the Republic of Kazakhstan "On the Use of Atomic Energy" is quite great in establishing a system of state administration in the field of the use of atomic energy, as well as a safety system for its use. The international principle of independence and independence of state management bodies in the organization of the use of atomic energy, as well as state supervision over the safety of its use, is clearly expressed here. But today, unfortunately, we observe a lack of clear and well-coordinated interaction between the two above-mentioned bodies, the emergence of contradictions.

This is due to the fact that their competence has not received a clear legislative definition, in addition, the mechanism of their interaction is not regulated. The most clear and detailed regulation of waste management has been received in the content of regulatory and technical documents and some by-laws. They are imperative for all organizations whose activities are related to radioactive waste. Kazakhstan's legislation in this area has recently been characterized by significant changes. But, nevertheless, the issue of the peaceful use of the atom remains open and the most acute, requiring a legal settlement. Let's touch on the most important of them. Thus, a draft Kazakh law on the redistribution of functions for licensing activities in the field of nuclear energy use is under development. Such a redistribution should take place between the federal executive authorities responsible for managing the use of atomic energy and those responsible for ensuring safety during its use. What useful will this law bring? Its adoption will help resolve the existing contradiction between the existing ROK: "On the Use of atomic Energy" and the ROK "On licensing of certain types of activities". The first of the above laws contains a reference norm, which indicates that the Government of the Republic of Kazakhstan approves the List of Licensed Activities. The second law contains an exhaustive list of activities subject to mandatory licensing in the Republic of Kazakhstan. The addition of this law can only be carried out by a special republican law. It is also important to specify the concept of radioactive waste, distinguishing it from the concept of "radioactive materials" and "spent nuclear fuel". Such a clear distinction will give the most correct understanding of radioactive waste acting as an object of legal regulation. But often there is a substitution and confusion of these concepts, which is unacceptable. Thus, the concept of radioactive waste is contained in Article 3 of the RK "On the Use of Atomic Energy": these are such nuclear materials and radioactive substances, the further use of which is not envisaged. Undoubtedly, the importance of the classification of radioactive waste is the starting point in the development of rules for handling them, as well as various standards related to radiation safety, etc. A gap that has not yet been resolved in domestic legislation remains the lack of a clear classification of waste, as well as criteria by which a particular material can be classified as radioactive. In addition, if one or another object is classified incorrectly, then the law does not establish any responsibility for this. The aforementioned laws do not pay sufficient attention to the issue of waste classification, they contain only the concept of radioactive waste. Mandatory radiation-hygienic certification has been established for radiation waste, on the basis of which their corresponding type and hazard class will be certified. It is also worth distinguishing between nuclear materials and radioactive substances. The first are materials that contain or have the ability to reproduce fissile (fissionable) nuclear substances. If we are talking about radioactive substances, then they do not belong to nuclear materials, but are capable of emitting ionizing radiation. A clear distinction between the two categories listed above is extremely important, since the class of the substance is subject to documentary fixation.

Finally, in our opinion, international legislation in the field of radioactive substances and waste deserves special attention. Analyzing the norms of international law, one can see that here the concept of radioactive waste is much broader than that enshrined in legislation. Such treatment also means decommissioning (physical manipulation), processing, including preliminary, conditioning, storage or disposal of waste. The exception is the off-site transportation activity. Such activities may also be associated with the dumping of waste. It turns out that international law unifies these actions, and domestically, on the contrary, delimits them. Such a fundamental difference has extremely dangerous consequences: it turns out that materials that are classified as nuclear fuel from the position of Kazakh law can be imported into Kazakhstan, but in international law such substances are considered radioactive waste, and, consequently, their import can significantly violate the environmental and economic interests of Kazakhstan. In order to avoid such contradictions, it seems necessary to codify legislation in the field of radioactive waste management. Codification, in our opinion, would contribute to the effective optimization

of the area of legal regulation of the relations under consideration, in addition, the rational use of the subsoil for waste storage would be properly regulated. Moreover, the codification of legislation in this area would make it possible to individualize the responsibility of officials, tightening control by the state. After analyzing the norms of legislation, we came to the conclusion that in the considered area it is only at the stage of formation. Of course, scientists and law enforcement agencies are paying more and more attention to the issues of its effectiveness, as well as the solution of problematic and controversial issues. Kazakhstan needs to pursue a course for further improvement of legislation in the field of radioactive waste management, creating a comprehensive, unified and open system that could ensure compliance with the state interests of the country, as well as the rights and freedoms of citizens.

3. Methods and Materials

Methods of radiation control of the environment the first methods of determining radioactivity in the environment are aimed at obtaining a general, cumulative estimate of the number of gamma -, beta -, alpha-emitting radionuclides. These are very simple measuring units based on recalculated gas discharge meters. Currently, the advantages of methods for evaluating specific radionuclides are considered. In addition, comparative legal methods were applied to the history of radioactive contamination and international legal acts.

4. Results

Regulation of legal relations related to materials in radioactive circulation, radioactive substances and radioactive waste should be carried out under strict state supervision. This, in turn, will allow us to achieve the effectiveness of state regulation in the field of radioactive pollution prevention. It is necessary to prepare special strategic documents in the field of radioactive contamination activities. In terms of preventing radioactive contamination, the following results can be achieved:

- in the field of nuclear energy and industry-participation will allow equal participation in international cooperation between authorized state bodies, organizations and in the field of individual use of nuclear energy.
- in the field of Economics-fundamentals of increasing and expanding the economic efficiency of using nuclear energy in a market economy;
- in the field of ensuring human and environmental safety, it will be possible to create legal grounds for taking into account the risk of radiation exposure to a minimum level.
- in the field of protection of human rights (including property), protection of law and order and ensuring social protection-ensuring social guarantees for residents and employees of facilities in the period of radioactive contamination;
- compensation for damage caused to life, health and all types of property as a result of radiation exposure;
- establishing liability for offenses in the field of radiation pollution;
- priority social conditions will be improved for the regions of placement of radiation pollution objects.

5. Discussion

Several scientists are talking about the impact of radiation pollution. A few general and special aspects of the problems of legal regulation of environmental protection in conditions of radiation pollution are studied in the works of foreign scientists in the field of environmental sphere and law. In particular, Yerkinbayeva L., Kuderina A., Tursynbayeva B.Z., Yessymkhanova Z., Bashlakova O.I., Bekezhanov D., Maddex R.L. and other scientists, and regulatory legal acts in the field of protection from radiation pollution, including those based on international agreements and conventions in the field of environmental protection, atomic energy, radiation safety.

Conclusion

To sum up, in order to protect the environment from radiation pollution, in our opinion, it is necessary to work in the following directions. In particular:

- Observance of human rights to a favorable environment; scientifically based combination of environmental, economic and social interests of a person, society and the state for sustainable development and ensuring a favorable environment and environmental safety; - protection, reproduction and rational use of natural resources as necessary conditions for ensuring a favorable environment and environmental safety;
- Priority of preservation of natural ecological systems, natural landscapes and natural complexes;
- Strengthening the responsibility of state bodies and local self-government bodies for ensuring a favorable environment and environmental safety in areas of radioactive risk;

- Prohibition and strict punishment on the implementation of economic and other activities, the consequences of which for the environment are unpredictable, as well as on the implementation of projects that may lead to degradation of natural ecological systems, modification and (or) destruction of the genetic fund of plants, animals and other organisms, depletion of natural resources and other negative environmental changes;
- Ensuring compliance of economic and other activities with established norms and requirements in the field of environmental protection and environmental safety;
- Public relations arising in the use of natural resources, as well as in the field of their conservation, restoration and reproduction as they are applied, depending on the type of natural resource, are regulated respectively by the land, water, forest legislation of the Republic of Kazakhstan, the legislation of the Republic of Kazakhstan on subsoil and subsoil use, in the field of protection, reproduction and use of wildlife and other legislation of the Republic of Kazakhstan in the field of protection and use of natural resources.
- The procedure for the use of lands that have been exposed to radioactive and (or) chemical contamination, the establishment of protective zones, the preservation of residential buildings, industrial, commercial and socio-cultural facilities on these lands, the conduct of reclamation and technical works on them is determined taking into account the maximum permissible levels of radiation and chemical exposure.
- Protection of land from water and wind erosion, mudslides, landslides, flooding, flooding, waterlogging, secondary salinization, drainage, compaction, contamination with radioactive and chemical substances, clogging, biogenic pollution, as well as other adverse effects;
- Participation of citizens, public and other non-profit associations in solving problems in the field of environmental protection and ensuring environmental safety, taking into account their opinions when making decisions on planning and implementing economic and other activities that may have a negative impact on the environment;
- Organization of measures to provide state social assistance to persons living in a zone with a poor environment or ecology.
- It can be concluded that it is necessary to develop international cooperation in solving global environmental problems and applying international standards in the field of environmental protection and environmental safety.

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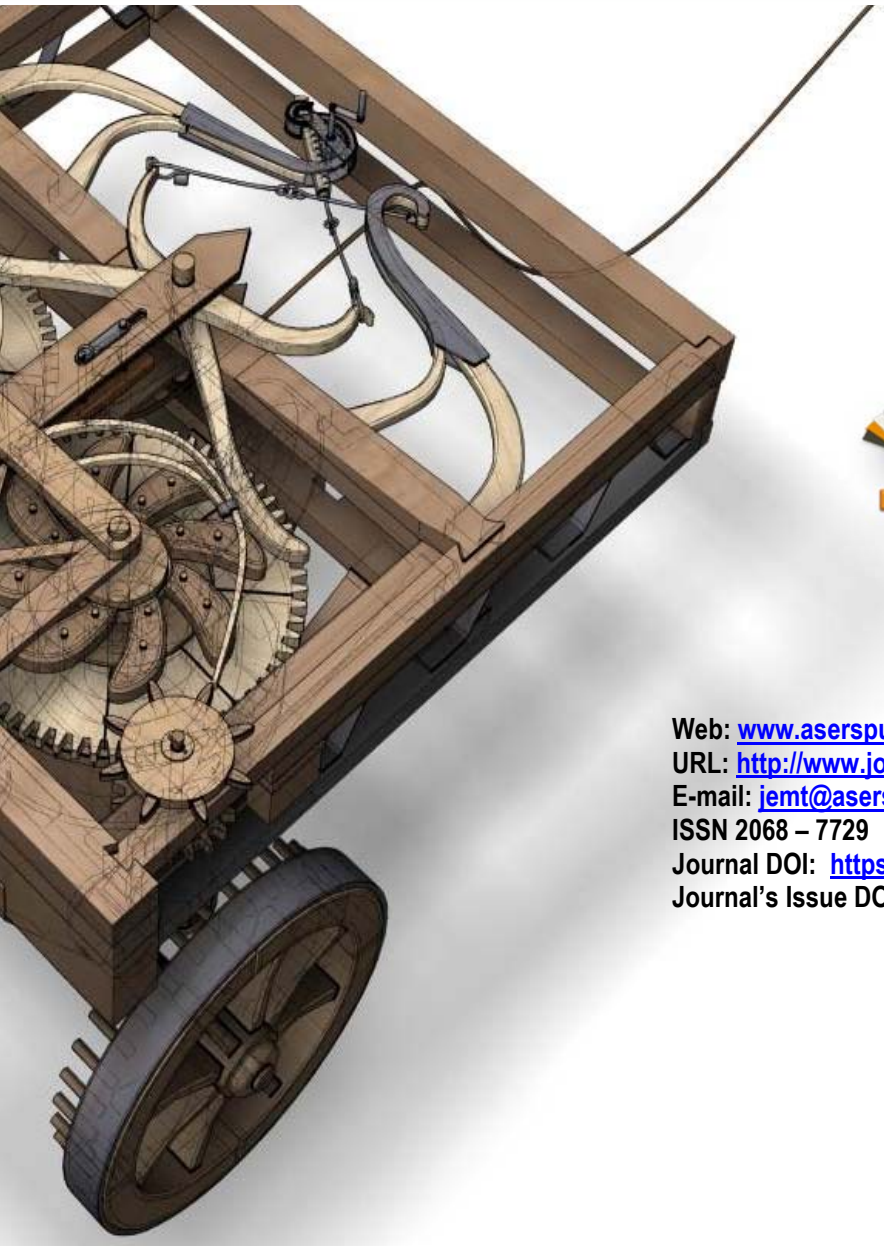

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