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Study on Legal Issues Related to the Impact of Nuclear Pollution on the Marine Environment and Compensation

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Abstract: *Ocean plays a more and more important role in the development of human society. Marine environment protection has become a vital topic when it comes to the ocean exploration and utilization. With the constant development of nuclear power and widespread application of nuclear technology, the nuclear waste discharged from coastal nuclear power plants and marine nuclear power plants, and nuclear leakage caused by nuclear accidents have caused great damage to the marine environment and even human society, and its impact can last for hundreds of years, even thousands of years, or even longer. Therefore, most of countries have taken marine nuclear pollution prevention and control as an important task facing mankind. China, as one of the countries with the longest coastline and its people's life is closely related to ocean, should pay more attention to marine nuclear pollution.*

Keywords: *Marine Nuclear Pollution; National Compensation; Legal System*

1. Introduction

With the constant exploration of alternative resources, each country has accelerated the step of nuclear energy exploration and utilization. The particularity of nuclear energy itself makes its impact on human beings and the environment beyond national boundaries. The contradiction among countries caused by the problem of how to handle nuclear pollution has become an inevitable important topic in the international society.

At present, more than 60 types of radionuclides have been inspected in the ocean, which are existed in all the materials in the ocean. Seawater is the primary receiving medium of radionuclides, marine organisms are the transmission medium of radionuclides in seawater, and sediments are the final destination of radionuclides. Radionuclides enter the ocean migrate in various marine media through seawater diffusion, biological feeding, food chain transmission and particle sedimentation, resulting in pollution to the marine ecological environment.[1]

Therefore, most of countries have taken marine nuclear pollution prevention and control as an important task facing mankind. China, as one of the countries with the longest coastline and its people's life is closely related to ocean, should pay more attention to marine nuclear pollution.

2. The Status Quo of Marine Nuclear Pollution

With the problem of marine nuclear pollution becoming increasingly prominent, in order to explore the impact of nuclear pollution on marine ecological environment, scholars at home and abroad have carried out many researches and studies, with researching objects including all radionuclides entering the marine environment and various media of the marine environment.

Globally speaking, since most nuclear factories and test sites are located in the northern hemisphere, the radioactivity level in the ocean of the northern hemisphere is higher than that of the southern hemisphere, while the radionuclide content decreases gradually with the increase of water depth in the vertical distribution; In 2000, the activities of 137Cs and 90Sr in ocean surface water were 2Bq / L. [2]However, due to the impact of nuclear facility discharge and nuclear accident, the nuclear pollution in some sea areas was significant, resulting in the activities of 137Cs and 90Sr in some marginal sea water bodies reaching tens of Baker per liter. By measuring the content of 137Cs in seawater, some foreign experts found that, under the influence of BNFL nuclear fuel company in the northeast of the Irish sea, the content closest to the sewage outlet was hundreds of times higher than that at the sea inlet. The 137Cs

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content in the Sea of Japan is also different at different times. It is found that the 137Cs content in the surface water measured from 1993 to 1994 is 2.7 ~ 3.8m Bq/l, which is consistent with the level of the North Pacific. However, from 1986 to 1987, the 137Cs content in the surface water of the Sea of Japan increased sharply and then decreased, which is speculated to be the impact of Chernobyl accident. [3]After the Fukushima nuclear accident in 2011, experts analyzed the radionuclide data of seawater near the sewage discharge point and pointed out that the peak discharge of radioactive sewage was in early April one month after the earthquake, but the radionuclide concentration was still very high in July, and the content level of 137Cs in seawater in July was 10000 times higher than that in 2010, the absorption and enrichment of seafood needs to be further studied.[4]

There are two kinds of radioactive materials in the ocean, namely natural radionuclides and artificial radionuclides. Among them, the content level and distribution law of natural radionuclides in the ocean have been quite clear. For example, the activity of 238U in seawater is 40Bq / m3 and the activity of 40K is 12.2 Bq/l. On the whole, its content in the ocean is relatively stable and is regarded as the environmental background, which has little impact on the ocean and human beings. [5]It is usually not regarded as the source of marine nuclear pollution. Artificial radionuclides in the ocean are the source of marine nuclear pollution. Due to different sources and environmental behaviors, the content levels of different artificial radionuclides in the ocean vary greatly and change with time. When studying the offshore radiation environment and biodiversity protection, Tang Senming and others pointed out that the artificial radionuclides in the ocean mainly come from the following four sources: (1) Fission products, activation products and residues produced by nuclear explosion, which mainly enter the ocean in the form of radioactive dust; (2) Radioactive emissions from nuclear powered ships and nuclear power plants are mainly discharged into the ocean through reactor cooling water and waste liquid; (3) The release of low and medium level radioactive waste is mainly the radioactive waste disposed by a few nuclear powers in deep waters such as the Pacific Ocean; (4) Radionuclides from nuclear medicine and scientific research are mainly the discharge of radioactive liquid effluent produced in research.[6]

3. Difficulties and Related Compensation Faced by Marine Nuclear Pollution Control

The ocean, as an important part of human living environment, provides various resources for human beings. Marine nuclear pollution will inevitably affect human health and safety through radionuclide migration. Therefore, monitoring the content level of radionuclides in the ocean and studying the migration of radionuclides among marine media are of great significance to master the current situation of marine nuclear pollution and evaluate the impact of nuclear facilities and the consequences of nuclear accidents. However, the rapid development of marine economy has led to the deepening of marine development activities, which not only has a great impact on the marine environment, but also puts forward a more severe test for the marine environment in offshore waters. By analyzing the current marine pollution problems, it can found find that there are still many problems and limitations in cross-national sea area governance cooperation and national and local policy leading design in implementing marine pollution governance.[7]

Through analysis, radioactive substances may accumulate in certain organisms and be eaten by workers through a certain way. Therefore, what should be considered here is which organisms the radioactive substances are mainly concentrated in and whether they will be eaten by human being. [8]However, there are problems that cannot be ignored in the protection of marine environment, especially on the issue of nuclear pollution, especially on the issue of compensation. For the compensation of nuclear pollution to the marine environment, due to the asymmetry of benefits in the use of nuclear technology, especially nuclear energy, this asymmetry of benefit distribution will inevitably affect the dispute of compensation in the process of nuclear pollution to the marine environment. Because the international that can obtain greater benefits from the use of nuclear technology often takes a negative attitude towards the issue of compensation, while the international that suffers from the "externality" of nuclear technology often needs to strive for greater compensation. Secondly, for the nuclear pollution of the marine environment, there are difficulties in compensation evaluation. The nuclear pollution evaluation of the marine environment is based on economic factors, while ignoring the ecological value evaluation of nuclear pollution to the polluted sea area. However, the real ecological loss in the marine environment is often greater than the economic loss.[9]

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4. Establishment of Prevention Mechanism and Related Compensation Method about Marine Nuclear Pollution

In the process of preventing the marine environment from being polluted, changing the legislative direction can more effectively prevent and control the marine environment from being damaged by nuclear pollution.

Due to the close relationship between the interests of the countries around the ocean in the marine environment, the legislation in the prevention of nuclear pollution on the marine environment needs to be solved through an international cooperative relationship. In the dispute settlement mechanism, the political method should be adopted first. The main reason is that in general, in international cooperation, it is usually the legal act between the most important international subject countries. Therefore, to solve the problems arising from cooperation through political consultation is, to some extent, the most efficient, fastest, most economical resource cost saving and most executive way.[10]

The first step of using the formal method should be for the disputing parties to negotiate, and "the parties should make their best efforts to reach a mutually satisfactory solution to the relevant matters through consultation". At the same time, resources can be used for mediation and adjustment in the whole process of upgrading settlement. Second, if consultation, mediation and mediation cannot reach a satisfactory solution for all parties, legal means can be used to make specific decisions on the disputes between the parties. However, at the same time, if the parties have entered the legal settlement procedure, but the parties still have a solution through negotiation, the negotiated solution can be adopted. This can not only ensure the interests of the parties, but also maximize efficiency.

First of all, the legal strategy of taking compensation as punishment and compensation in national legislation should be changed. The prevention of nuclear pollution should be regarded as the goal, restrictive standards for the use of nuclear technology also should be established, so as to supervise these standards through legislation. So as to actively prevent the occurrence of nuclear pollution. Although this legislative strategy may restrict the use of nuclear technology, it can avoid the problems in the application of nuclear technology.[11]

In order to ensure the safety of nuclear radiation environment, China has formulated and promulgated the safety supervision of designed nuclear facilities, radioactive waste management and nuclear material control, including administrative regulations, departmental rules, guidelines and technical documents in many aspects such as civil nuclear safety supervision and management, radioactive material transportation management and nuclear technology application. Among them, there are 4 administrative regulations, more than 30 regulations, more than 70 guidelines and more than 180 technical documents issued by the nuclear safety supervision department and relevant departments. In 2003, the National People's Congress formulated the Peoples Republic of China Law of Prevention and Control of Radioactive Contamination, which is the first law in the field of nuclear energy in China. The objectives of China's radiation environment monitoring at the present stage are to strengthen the construction of radiation environment monitoring capacity, standardize monitoring methods, improve the quality of radiation environment monitoring team, improve the national radiation environment monitoring network, build a radiation safety monitoring and emergency system, and form a monitoring capacity suitable for China's nuclear safety and radiation environment management. We will comprehensively carry out radiation environmental quality monitoring, focusing on supervisory monitoring of effluent from nuclear facilities and pollution monitoring of nuclear technology application projects. At present, the Chinese government is organizing the formulation of the "circular economy law", and "reduction", "reuse" and "recycling", which have become the main line of outlining the draft of the circular economy law. In the process of the establishment, independent development and nuclear power development of China's nuclear industry, the competent departments of China's nuclear industry and nuclear safety supervision departments have also successively promulgated rules, regulations and technical standards on the recycling of radioactive waste and physical science in the nuclear industry and nuclear technology utilization industry.

Finally, arbitration organizations should be established between countries or through international organizations to arbitrate and assess the damage caused by nuclear pollution to the marine environment during the use of nuclear technology among countries, so as to solve the compensation disputes between countries. The compensation guarantee mechanism between countries can be established. Through the establishment of long-term protection agreements between countries, the countries and third countries that have suffered losses can be guaranteed compensation.

On the issue of compensation for marine environmental governance caused by nuclear pollution, each

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country has their own relevant provisions.

According to the relevant laws and regulations of Japan, the operators of nuclear power plants must ensure their power plants with statutory third-party liability insurance, with an insured amount of US $1.3 billion, and the excess of disaster losses shall be borne by the government.

The United States, Canada and other countries have mandatory third-party liability insurance requirements for potentially dangerous nuclear power plants, which is insufficient in China. Article 70 of the Tort Liability Law of the People' s Republic of China in 2009 stipulates that if a nuclear accident at a civil nuclear facility causes damage to others, the operator of the civil nuclear facility shall bear tort liability, but shall not be liable if it can be proved that the damage was caused by war or intentionally by the victim. According to the relevant provisions of the international liability law, the operator shall first bear the tort liability for the nuclear pollution caused by the nuclear leakage, and the State shall bear the supplementary liability other than the operator for the part that the operator cannot compensate.

The Atomic Energy Act of the United States in 1954 formulated a series of laws and bills corresponding to the main components of the atomic energy legal system. The Atomic Energy Law of 1954 covers all aspects of civil and military atomic energy utilization activities, and makes detailed provisions one by one, covering a wide range and strong operability. The law not only encourages the development and research of atomic energy, but also focuses on regulating various activities in the field of atomic energy industry. It is the atomic energy basic law with the largest number of articles and the longest length in the world. In 1957, the first legislation on nuclear damage compensation - Price - Anderson Act of the United States came out.

Similar to the United States, guided by the Atomic Energy Act of 1959, German atomic energy legal system regulates various fields of atomic energy utilization and management by adopting different laws and decrees and finally jointly form a relatively perfect atomic energy legal system. It is worth noting that Germany is the only country among the major nuclear power countries to establish the "phase out policy of nuclear power" in law.

Presently, China has adopted the Nuclear Insurance Pool system which is more popular all over the world, but there is no mandatory requirement for liability insurance for nuclear power plants. China Nuclear Insurance Pool, established in 1999, at present, has 21 member units, with its domestic and overseas underwriting capacity has ranked fifth and third in the world respectively. China Nuclear Insurance Pool has also participated in the reinsurance of nuclear insurance of Fukushima nuclear power plant, but the proportion is relatively small, which will not affect the operational stability of non-life insurance companies in the nuclear co insurance. Since nuclear risks are usually listed as exclusions in the conventional insurance market, nuclear insurance business needs to arrange reinsurance in specific nuclear insurance market and various international nuclear power insurance organizations, such as NEIL in the United States and EMANI in Europe.[12]

At present, in addition to construction insurance and property insurance, domestic nuclear power plant insurance usually also covers public liability insurance and nuclear power third-party liability insurance to protect the damage caused by nuclear power accidents to the public. The insured amount of public liability insurance of a single nuclear power plant is usually tens of millions of yuan.

5. Conclusion

With the needs of social and economic development, coastal nuclear energy utilization and nuclear technology development are entering a period of rapid development, and the problem of marine nuclear pollution is more severe. The ocean maintains a dynamic balance in the continuous circulation of media such as seawater, suspended solids, organisms and sediments. Studying the migration law of radionuclides in the ocean can not only determine the transmission routes of different radionuclides and provide a scientific basis for formulating the discharge standard of nuclear waste liquid and evaluating the quality of marine environment, but also an urgent need to control marine nuclear pollution and protect marine biological population and human health.

It is suggested to strengthen the prevention and control of marine nuclear pollution from the following aspects: (1) Carry out a comprehensive survey of radioactivity in China's offshore waters and master the current situation of China's marine radioactivity; (2) Strengthen the radiation background investigation, environmental capacity investigation and dynamic monitoring of coastal nuclear power plants and other nuclear facilities in the early stage of construction, operation and decommissioning, and master the dynamics of radiation environment in the sea area; (3) Accelerate the construction of marine radioactivity

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monitoring and early warning system and train relevant technical personnel; (4) Enhance exchanges in the nuclear and marine fields with major nuclear power application countries, and improve China's engineering technology and scientific research capabilities; (5) Clarify the target nuclides, sensitive biological groups and potential impact on human beings of marine nuclear pollution, establish an effective evaluation system, and promote the stable and harmonious development of marine and nuclear undertakings.

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