Challenges behind the Implementation of the Precautionary Principle

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Having examined the implementation of the precautionary principle in law making, law enforcement, and judicial application, it can be concluded that the principle has not been effectively implemented, at least not in law enforcement and judicial application stages. Before proposing any recommendations to improve the situation, this article identified two key challenges behind current implementation status. One is about the complexity of the principle itself, and the other is about the political willingness.

the precautionary principle | nuclear safety regulation | community interest

1. Indeterminacy of Perceived Risk Level Required to Justify Precautionary Action

It is known that the precautionary principle aims to deal with serious uncertain risks for the natural environment and public health. However, one of the key challenges of implementing the precautionary principle in nuclear safety regulation is how to draw the line of threshold of precautionary actions.

1.1. How to Define Uncertainty and Risks

It is clear that, in the MOX plant case, the two parties had different opinions on whether the precautionary principle can be applied, facing similar scientific evidence. Behind the dispute, the true question is in which level risks perceived in nuclear activities can justify the precautionary actions to regulate them, and what types of precautionary actions are necessary.

To address the question, firstly, it should be made clear how uncertainty and risks are presented in nuclear related policy-making. Risk is a concept closely related to uncertainty [1] (p. 317). In a social sense, the fact that people need to make decisions under uncertainties means risks are unavoidable. Complexity in practice means a compulsion to select, and contingency means danger of disappointment and the necessity to take risks [2] (p. 25). Wynne clarifies risk as a state that “system behavior is basically known, and outcomes can be assigned a probabilistic value [3]”. Risk analysis is a process combined with objective calculation and a subjective estimate of the consequences [4]. In the nuclear safety field, the risks can be characterized by complexity, spatial and temporal extent, potential catastrophe, improbability, diverse uncertainties, plurality of perspectives, and learning-with-time [5] (p. 127).

Considered from a scientific lens, the notion of uncertainty derives from probability theory and quantum physics [6]. In a “post-modern” appreciation of science, uncertainty always exists [7] (p. 501), which is based on the limitation of scientific knowledge and human activities [8] (p. 92). The validity of scientific knowledge may change with time [9]. Due to different development levels of science and technology, the level of uncertainty vary in different fields. There is an entire spectrum of different levels of knowledge, ranging from the unachievable ideal of complete deterministic understanding to total ignorance [10] (p. 11). The certainty of damage brought by radioactive materials are somewhere in the middle. However, one important factor to consider is the increased availability of scientific evidence. A common criticism of the precautionary principle is that it may lead regulators to make bad choices because the public tends to be overly fearful of certain immediate risks that are statistically far less dangerous [11][12] (p. 33, pp. 177–178). This is often not the case today. Firstly, now much more materials are available for the public with the continuous efforts of organizations, such as International Commission on Radiological Protection. The nuclear pollution has become a common debate, which no doubt helps the public to form a relatively objective opinion about nuclear atoms. Secondly, the consequence of radiation on animals and plants has been elaborated by much more sophisticated assessment technologies. Much more evidence is given of the potential impact of radionuclides than in the past, when the MOX plant case was challenged. For example, impact on an organism resulting from a given absorbed dose of ionizing radiation has been experimentally quantified and reported as relative biological effectiveness of specific radiation types [13].

1.2. The Strictness of the Precautionary Principle

For policy-makers, uncertainty exists in practically all policy making situations. It cannot be eliminated, but confusion can be arguably best reduced to a minimum by drawing a line using law and policy as a tool [9] (p. 195). Then, a further question is where policy-makers should draw the line of perceived risk level for a defensible precautionary [14] (p. 63), i.e., how strict the precautionary principle should be. After many years’ debates, the precautionary principle was classified into strong form and weak form [15] (p. 68), according to the strictness of the requirement of actions [16] (p. 20). In its strong form, where a very low level of perceived risk is permitted, a “morally unacceptable harm” with “scientifically plausibility” will trigger the precautionary principle. By contrast, in its weak form, a larger level of perceived risk is tolerated [17] (p. 10892), and only “threats of serious or irreversible damage” can trigger it.

Deville and Harding proposed a rule to help determine the strictness of the precautionary principle, which is “the more significant and uncertain the threat is, the greater the precaution required [18] (pp. 121–122)”. This provides an indication of how to locate the threshold level of the precautionary principle in nuclear safety. In nuclear safety fields, the threat known is increasing, and the uncertainty is decreasing. On the one hand, new impacts of the radiation brought by low dose radionuclides are being better demonstrated and disclosed. On the other, scientific uncertainty is decreasing a the scientific evidence becomes more sufficient, which means that the precautionary principle allows less uncertainty. Overall, a moderate perceived risk level is required by the precautionary principle. In other words, in nuclear safety, a moderate form of the precautionary principle should be adopted, and the perceived risk level should be between “morally unacceptable harm that is scientifically plausible” and “threats of serious or irreversible damage when lack of full scientific certainty”.

2. The Hard Balance of National Interest and Community Interest in Nuclear Safety

Another significant challenge to the implementation of the precautionary principle in international nuclear safety regulation is the hard balance between national interest and community interest. A significant deficiency of the current nuclear energy law is that it only encourages states to implement the nuclear safety rules themselves, therefore giving broad discretionary power to policy-makers [19] (p. 28). It is easy to understand the unwillingness of states to pay costs of precautionary actions to assure community interest, especially the interests of potentially affected states and non-nuclear states.

2.1. Inconsistency between the Beneficiaries and Risk Takers

In terms of nuclear activities, there is an inconsistency between the beneficiaries and risk takers. An important character of nuclear safety regulation is its special type of decision-making options. The beneficiaries of approval of nuclear facility constructions are nuclear states, mostly developed states [20], while the cost of damage risk is borne by the international community. Compared with other areas such as biodiversity conservation, where “multiple risks” are involved [21], the situation in nuclear safety regulations faced by decision-makers is often a one-in-two choice: “national interest first” or “community interest first”. A “national interest first” situation means that states prioritize their economic benefits and the health of nationals. States are motivated to build more nuclear reactors and installations, produce carbon-free electricity, lower the average retail price of electricity, and achieve industrial upgrading. Meanwhile, in terms of risks brought by nuclear accidents and nuclear waste release, they seek to protect their industry and domestic victims [22] (p. 209), regardless of risks posed to the international community. In this way, they can achieve a maximum of national interest. A “community interest first” situation means that, when risks are involved during nuclear activities, states seek to ensure the interest of most vulnerable groups of the world and can take actions to control the threats, even at the cost of prohibition of the nuclear activity.

From a realistic perspective, states always choose to develop their nuclear infrastructures on a self-benefit basis and neglect the environmental interest of the international community. This leads to political maneuvering involving the implementation of the precautionary principle [16] (p. 14). For example, the plants may adopt a wrong way of calculation of radioactivity to make the operation more permissible, and the regulatory bodies indulge them in pursuit of national economic interests. In the MOX plant case, the UK claimed that discharges from the THORP plant were very small, far lower than specific or site limits set in accordance with domestic and European regulations. The doses from the THORP plant were a fraction of 1 percent of natural background radiation [23] (p. 7). Ireland argued that the MOX plant used a wrong method of calculation that underestimated the “total beta” radioactivity actually discharged. It was not based on the Environmental Agency approved method for complex sites such as Sellafield. In this way, it underestimated the “total beta” radioactivity actually discharged. If the accusation of Ireland is true, the behavior of the UK would be a typical example of “national interest first” behavior and infringes community interest.

2.2. The Insufficient Protection of Community Interest

Community interest is also not protected adequately under current peer review mechanisms. Under current peer review mechanisms, experts will examine the safety of nuclear installations and activities according to nuclear safety standards made by CSS. The composition rules of CSS indicate the potential inequality in discourse of standards-making between developed states and less developed states. The discourse power of economically less developed states may be deprived by the cost of participation. According to the rule on CSS conferences, "all costs involved in the participation of each CSS member, including travel and per diem expenses, will be borne by the nominating member State" [24]. It means less developed states may have a poor access to CSS and standards-making. Obviously, the CSS members from developed states will be present on behalf of their national interests. For instance, when they are defining what is "best available scientific information and technologies", they may firstly consider the available technologies in their states. In this case, the difference of development levels among states may lead to a hegemonic standards-making and substantial inequity. Lack of participation of less developed states leads to neglect of their interests. The effective implementation of the precautionary principle in these states is therefore adversely affected.

To conclude, the "national interest first" logic of states hinders the implementation of the precautionary principle in nuclear safety regulation. It necessitates a more effective, fair, well designed implementation framework in nuclear safety fields.

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