

Analysis of Perception of Nuclear Energy and Radiation among Residents living near NPP

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1. Introduction

In 2011, a massive earthquake struck the northeastern coast of Japan, causing an explosion at the Fukushima nuclear power plant and releasing a large amount of radioactive material. Following the Fukushima accident, public concern in Korea over the health effects of radiation increased, along with heightened worries about the safety of nuclear power plants. In response, the government implemented measures such as restricting the import of Japanese food products, strengthening inspections of actual goods and seawater for radioactivity, and disclosing the results through official websites. These activities were carried out to promote nuclear and radiation safety and to improve risk communication, and it is necessary that such efforts continue.

The IAEA (International Atomic Energy Agency) has emphasized that taking into account the characteristics of different target groups is essential in risk communication. Accordingly, effective communication requires consideration of the specific traits of each audience. Since residents living near nuclear power plants are the group most directly affected and influential in nuclear acceptance, it is important to examine their perceptions in particular.

Therefore, this study analyzes case studies on the perceptions of nuclear energy and radiation among residents living near nuclear power plants both in Korea and abroad.

2. Materials and Methods

In this study, we examined perception surveys on nuclear energy and radiation conducted among residents living near nuclear power plants by the Zhejiang CDC, the Liaoning CDC, and KIRAMS. Furthermore, we analyzed influencing factors such as anxiety and trust.

3. Results and Discussion

The Zhejiang Provincial Center for Disease Control and Prevention (Zhejiang CDC) conducted a survey on public perceptions of radiation among residents living near a nuclear power plant. The study targeted residents within a 30 km radius of the Sanmen NPP (Nuclear Power Plant) in Zhejiang Province. From this population, 751 individuals aged 18 years or older were randomly selected. Trained investigators, after receiving

standardized instruction, conducted face-to-face interviews using a structured questionnaire. The survey assessed Radiation-Related Knowledge (RRK), Nuclear Energy-Related Knowledge (NERK), levels of anxiety about radiation, and attitudes toward nuclear power plants. The RRK section included questions such as awareness of the ubiquity of natural radiation, while the NERK section covered topics such as nuclear accidents and radioactive waste. The correct response rate was 39.4% for RRK and 30.5% for NERK. Regarding anxiety, older respondents tended to report lower anxiety levels. Similarly, respondents with higher educational attainment and those living farther from the NPP also showed lower levels of anxiety. A notable finding, however, was that higher levels of education were paradoxically associated with greater anxiety about nuclear power plants.

The Liaoning CDC conducted a survey on perceptions of radiation among residents living near a nuclear power plant. The study focused on the Hongyanhe NPP, targeting populations within a 30 km radius. A total of 546 participants, including 133 teachers and 413 students from one middle school and one high school in the area, were recruited. Data collection was carried out through questionnaires, online surveys, and face-to-face interviews, with trained researchers visiting the schools to provide explanations and administer the survey. The survey examined RRK, NERK, perceptions of NPP safety, attitudes toward nuclear power, trust in information channels, and perceived benefits of nuclear energy. Teachers demonstrated significantly higher levels of RRK and NERK compared to students (mean correct answers: teachers 10.58, students 8.04). Teachers also reported higher perceptions of safety, more favorable attitudes, and greater trust compared to students. Regarding trust, both groups indicated that experts and authoritative media were the most reliable sources of information.

The Korea Institute of Radiological and Medical Sciences (KIRAMS) conducted a survey on radiation risk perception among residents living near nuclear power plants (NPPs) in South Korea. The study targeted residents living within 3–5 km of the Preventive Action Zone (PAZ) around four NPP sites: Kori, Hanbit, Wolsong, and Hanul. A total of 1,200 participants (300 per NPP site), aged 20–84 years, were randomly selected. Standardized and trained interviewers conducted face-to-face surveys with residents. The questionnaire covered four domains: risk perception,

perceived benefits, trust, and psychological distress, each measured through 2–6 questions. Overall, risk perception was relatively high. Women, older individuals, and those without occupational experience in the nuclear field reported higher levels of risk perception. Lower levels of trust in nuclear energy were also associated with higher risk perception, whereas no significant correlation was found between trust and perceived benefits. Psychological distress and depressive symptoms were significantly associated with heightened risk perception. Regional variation was observed: Wolsong residents exhibited the highest risk perception, likely influenced by the prior tritium issue, whereas Hanbit residents showed the lowest. In terms of demographics, women and older participants reported higher risk perception. Conversely, residents with prior radiation safety training or work experience in nuclear-related fields showed lower risk perception.

Table 1 presents the studies analyzed in this research on the perception of radiation among residents living near nuclear power plants (NPPs). All three studies were conducted with residents around NPPs; however, the Liaoning CDC study specifically targeted teachers and students at schools located within the vicinity of the NPP. In Korea, KIRAMS conducted a survey across four NPP sites, which enabled regional comparisons. Regarding anxiety, the Liaoning CDC study found that individuals with higher educational attainment demonstrated greater knowledge but also reported higher anxiety levels. In contrast, the KIRAMS study indicated that those with experience in radiation safety education exhibited lower levels of anxiety. The Liaoning findings suggest that higher educational levels may lead to greater exposure to information, which—without specialized professional training—could heighten anxiety. With respect to trust, the Zhejiang study showed a decline in trust toward government and industry announcements, accompanied by an increase in neutral responses. The Liaoning study found higher levels of trust in experts and authoritative media. Meanwhile, in the KIRAMS study, trust increased among those with professional education or work experience related to nuclear energy.

Table 1: Studies on the perceptions of nuclear energy and radiation

Division	Zhejiang CDC	Liaoning CDC	KIRAMS
subject	Residents living near NPP	Teachers & Students living near NPP	Residents living near NPP
Method	Face to face interviews	Face to face interviews	Face to face interviews
Individuals	751	546 (133 teachers, 413 students)	1,200 (300 per site)
Factors	Risk, Benefit, Trust, Psychological distress	RRK & NERK, Anxiety, Attitudes	RRK & NERK, Perception, Attitudes, Trust, Open-ended responses

4. Conclusion

In this study, we analyzed survey-based research cases on the perception of nuclear energy and radiation among residents living near nuclear power plants in both domestic and international contexts. The selected studies include those conducted by Zhejiang CDC, Liaoning CDC, and KIRAMS. All three studies commonly used random sampling of nearby residents and conducted face-to-face surveys. Liaoning CDC focused on students and teachers at schools near the plant, while KIRAMS surveyed residents at four nuclear sites in Korea and provided regional comparisons. Findings suggest that professional education on radiation and information from credible experts can contribute to reducing anxiety and increasing trust toward nuclear energy. This study may serve as a useful reference for developing future strategies for communication on nuclear energy and radiation.

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