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Assessment of Public Perception of Radioactive Waste Management in Korea

SeongKyung Cho, Janis R. Trone, Jooho Whang, Moo Y. Lee

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Sandia National Laboratories
Albuquerque, New Mexico 87185 and Livermore, California 94550

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Assessment of Public Perception of Radioactive Waste Management in Korea

SeongKyung Cho
Myongji University, Bangmok College of Basic Studies
San 38-2, Nam-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, 449-728, Korea

Janis Trone
Performance Assessment and Decision Analysis
Sandia National Laboratories
P.O. Box 5800
Albuquerque, NM 87185-MS0718

Jooho Whang,
Kyung Hee University, College of Engineering
1 Seocheon-dong, Giheung-gu, Yongin-si, Gyeonggi-do, 446-701, Korea
(Currently at Korea Institute of Energy Research)

Moo Y. Lee
Performance Assessment and Decision Analysis
Sandia National Laboratories
P.O. Box 5800
Albuquerque, NM 87185-MS0718

Abstract

The essential characteristics of the issue of radioactive waste management can be conceptualized as complex, with a variety of facets and uncertainty. These characteristics tend to cause people to perceive the issue of radioactive waste management as a 'risk'. This study was initiated in response to a desire to understand the perceptions of risk that the Korean public holds towards radioactive waste and the relevant policies and policy-making processes. The study further attempts to identify the factors influencing risk perceptions and the relationships between risk perception and social acceptance.

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NOMENCLATURE

GMO	Genetically Modified Object
IAEA	International Atomic Energy Agency
NGO	Non-Governmental Organization
NPP	Nuclear Power Plant
PD	Producer/Distributor (Media)
RWM	Radioactive Waste Management
SNF	Spent Nuclear Fuel
SNL	Sandia National Laboratories

1. INTRODUCTION

1.1 Research Background and Purpose

Nuclear power is reemerging as a very important source of energy especially as part of the broader movement toward low-carbon sustainable green growth. However, management of radioactive waste, including Used Fuel or Spent Nuclear Fuel (SNF), still remains to be resolved. Especially, with the cancellation of the Yucca Mountain Project after a long period of vicissitude, the issue of radioactive waste management needs to be discussed from the beginning again. Currently, we are asked to view the issues of energy and progress centering on humanity with a central focus on environmental issues. In this context, radioactive waste management should not be approached as an issue limited to a single country or region. Otherwise, radioactive waste, if not managed in a responsible manner, might have a negative effect on both the earth and humanity.

The world now needs to seek more serious international cooperation, putting aside a 'wait and see' strategy, for presenting definite and specific ideas concerning this important issue and putting them into practice. International cooperation should be made at two levels, the science and technology level and the social and cultural level. Its focus should be put on identifying the most suitable technologies for managing radioactive waste and setting up research and development (R&D) to advance such technologies. Meanwhile, improved nuclear governance[1] is needed for elevating trust in radioactive waste management and ensuring social acceptance for construction of storage facilities. Accordingly, now is the time the world should cooperate more closely to develop a comprehensive and integrated framework clarifying the risk of radioactive waste which is now complicated, unclear and ambiguous.

This study was initiated to respond to this problem. We now need a proper structure for coping with the global problem resulting from radioactive waste and a system allowing for participation of all stakeholders including experts and citizenry. The purpose of this study is to provide evidence of the need for nuclear governance and thus to draw a general consensus among the many people involved. To do this, it aims to learn about the perception of risk that the public holds towards radioactive waste and the relevant policies and policy-making process. The study further attempts to identify the factors influencing risk perception and the relationships between risk perception and social acceptance.

To obtain more practical results through this study, participants were classified for analyses according to their concerns regarding the issue of radioactive waste management. This study focuses on developing an integrated model by identifying and verifying factors influencing risk

[1] Nuclear Governance is a system for making nuclear-relevant decisions which seeks to make transparent the political, economic, social, environmental, scientific and engineering aspects involved in the decisions making process. Nuclear Governance includes both government and private actors and promotes participation of stakeholders, including experts and the general public, in the decision making process. Nuclear Governance is of particular importance in situations where, because of the nature of the nuclear issues, cooperation and coordination between a diverse group of stakeholders is required.

perception and social acceptance of radioactive waste and its management through theoretical discussions. Specifically speaking, risk perception of radioactive waste management was analyzed by classifying the types of waste subject to management as Spent Nuclear Fuel (SNF)/used fuel, high-level radioactive waste, and low-to-intermediate level radioactive waste. According to the legal framework regarding radioactive waste in Korea, radioactive waste can be classified as either 'low-to-intermediate level radioactive waste,' 'high-level radioactive waste' or 'SNF.' In Article 2 of the Republic of Korea Atomic Energy Safety Act, radioactive waste is specified as radioactive materials or the materials (including SNF) contaminated by radioactive materials subject to disposal. Low-to-intermediate level radioactive wastes, according to Article 2 of the Enforcement Decree of the Atomic Energy Safety Act, are radioactive wastes, excluding high-level radioactive wastes. These are the types of radioactive waste that emit alpha rays and have a half-life of over 20 years, a radioactivity concentration below 4,000Bq/g and heat release rate below $2kW/m^3$. High-level radioactive wastes, according to Article 2 of the Enforcement Provisions of the Nuclear Act, have a higher radioactivity concentration and heat release rate than the values set by the Korean Ministry of Education, Science and Technology.

In Korea, a low-to-intermediate level radioactive waste disposal facility has been under construction in Gyeongju as of November 2010 and is scheduled to be completed in December 2012. However, SNF is currently being stored in temporary repositories located at each respective power plant. Alternative management for SNF has not yet been officially discussed. Meanwhile, the importance of the policy, trust in those involved in policy decision making and the influence of related groups upon the policy-making process were respectively analyzed to learn about the perception of the radioactive waste management policies and policy-making process. News media was separately analyzed for its dual role as a participant in the policy-making process and as an interested party. Based on these analyses, two models, a risk perception model and a social acceptance model for radioactive waste management were first presented, and then an integrated model was additionally suggested.

While it is true that nuclear governance for radioactive waste management cannot be formed by a single party, nor can it be applied equally to all nations or situations. Nevertheless, basic principles and context can be shared. Accordingly, this study which analyzed cases in Korea is expected to provide a clue to the realization of international cooperation at the social and cultural level in relation to radioactive waste management in the future.

1.2 Framework of Discussion

The issue of radioactive waste management essentially requires integrated discussion not only at the technological level but also at the political, diplomatic, security, economic, social, cultural, legal and institutional levels. Speaking of this issue at the technological level, each country shows closed and tepid attitudes toward the stable securing of technology through research and development. At the political level, there are likely to be fierce debates over the decision of disposal or recycling due to diverse values among the citizenry of the various nations.

At the political, diplomacy and security levels, the key concern is to secure the use of sufficient nuclear energy based on trust from the global community as a precondition under the banner of absolute nuclear non-proliferation. At the economic level, securing a stable sufficient budget for

radioactive waste management and transparent operation are vital requirements. Additionally, there is the possibility of controversy over the scale and feasibility of financial support for the construction of facilities for radioactive waste management. At the social and cultural levels, accommodating the different concerns arising from the diversity of special interests and effectively handling the conflicts to realize a viable policy remains to be resolved. At the legal and institutional level, the issue of radioactive waste management should be directed toward a discussion about how to construct a sustainable management system with special consideration focused upon uncertainties.

In this context, the essential characteristics of the issue of radioactive waste management can be conceptualized as complex, with a variety of facets and uncertainty. These characteristics tend to cause people to perceive the issue of radioactive waste management as a 'risk[2]'. Such a risk is characteristic of a society advancing based on science and technology. Generally, experts in science and technology and laymen differ in their understanding and evaluation of risks. While experts approach risk based on probabilities and consequences and evaluate it using scientific analyses, laymen are more likely to view risk within the context of the hazard[3]. That is, the probability of facing an unfortunate incident causes people to worry, and this worry is closely associated with the group to which people perceiving the risk belong. At this time, the amount of perceived hazard, the lack of knowledge about the hazard, the distrust in the authorities managing the hazardous situation, and the level of media's interest all contribute to anxiety. The concept of risk connotes diverse subjective judgment, so different conclusions can be drawn depending on the individual's criteria. Here, the criteria mean the integrated and dimensional framework of perception of an 'individual.' Naturally, people have different understandings and perceptions regarding radioactive waste management issues. To narrow down or to overcome this gap, communication is absolutely needed. Depending on this communication, the level of social acceptance for radioactive waste disposal facilities can be determined.

Douglas & Wildavsky (1982) say that social acceptance is not determined at the personal level but differs according to cultural characteristics of social groups. Fischhoff (1977) argues that different factors influencing risk perception combine to affect social acceptance. Then, what is social acceptance? Here, social acceptance means taking a supportive or neutral position, with no opposition or resistance, for a determined policy (including the construction of radioactive waste disposal facilities) even though different opinions exist or the policy might cause discomfort due to different concerns.

According to Wartburg & Liew (1999), factors affecting social acceptance can be largely divided into rational factors and emotional factors. They also suggested trust as a special factor. Here, the rational factor is composed of the level of knowledge and understanding of the usefulness and reliability of the technology, while the emotional factor consists of personal experience and risk perception. The trust factor includes openness, honesty and the level of trust in the institution.

The argument that the level of knowledge affects the preference of an issue is confirmed by a study conducted by Slovic (2000). Kunreuther (2001) explains that the level of risk perception lowers as the knowledge about nuclear power becomes higher. Sjöberg (1991) also showed a

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[2] A risk refers to the worry about hazard or loss, or the state of harm or loss.

[3] Hazard refers to risk and catastrophe together. Here, catastrophe refers to the damage caused by the catastrophe.

close correlation between the level of knowledge about nuclear power and risk perception. However, Johnson & Covello (1987) argues that the role of knowledge needs to be studied more in depth even though it clearly plays a central role in risk perception.

Trust attenuates the complexity of an issue when people judge the issue confronting them. To say again, risk perception and acceptance can differ depending on which experts can be trusted or whose opinions are correct (Earle & Cvetkovich, 1995). This reveals that the trust invested in nuclear power experts, the government or the operating agency of a technology or facility might have a very important effect on risk perception (Cvetkovich, 1999). The argument for the effect of trust on risk perception is also found in a study by Siegrist (1999). According to Chung & Kim (2009), residents' trust level influenced social acceptance of nuclear energy. Additionally, as people have a higher belief that radioactive waste management can be safe with the current level of science and technology and a higher trust level in related organizations or agencies, they are more likely to be less sensitive to the issue of construction of radioactive waste disposal facilities in their residential area (Freudenburg, 1993).

The social amplification theory states that risk events interact with individual bias in ways that will either increase (amplify) or decrease (attenuate) the perception of risk. According to the social amplification theory, the consequence of risk can differ depending on how effectively the amplifying 'stations,' such as individuals, groups and organizations that deliver and spread information, are functioning (Kasperson et al., 1988). That is, information and its effect spread like ripples toward parts of society through such routes. What should be noted here is that news media organizations, as brokers of professional information, play a key role in helping people to form their perception of risk (Kasperson & Kasperson, 1996). However, the news media does not always accurately or completely mirror the facts as they are. According to Johnson & Covello (1987), news media tends to be selective and biased in order to elevate the dramatic effect of an incident and to stress faults and the dynamics of the dispute. Moreover, media coverage is inclined to focus on the unusual and extreme risks. They indicate that the media rarely covers risks such as auto accidents, which are commonplace yet significant in terms of their levels of occurrence. The media's inclination affects the formation of perception by those exposed to such media coverage.

Based on this discussion, a risk perception and social acceptance model for radioactive waste management is presented as follows: knowledge, trust and media affect risk perception, and all of these combined might affect social acceptance. 'Knowledge' in this proposition means the basic knowledge about radioactive waste, and 'trust' here refers to the trust in the policy-making process and the authorities responsible for deciding the policy on radioactive waste management. 'Media' means all the news sources that combine to present a perception, their use as an information source, the depth of trust they garner and thoughts concerning the effect of media.

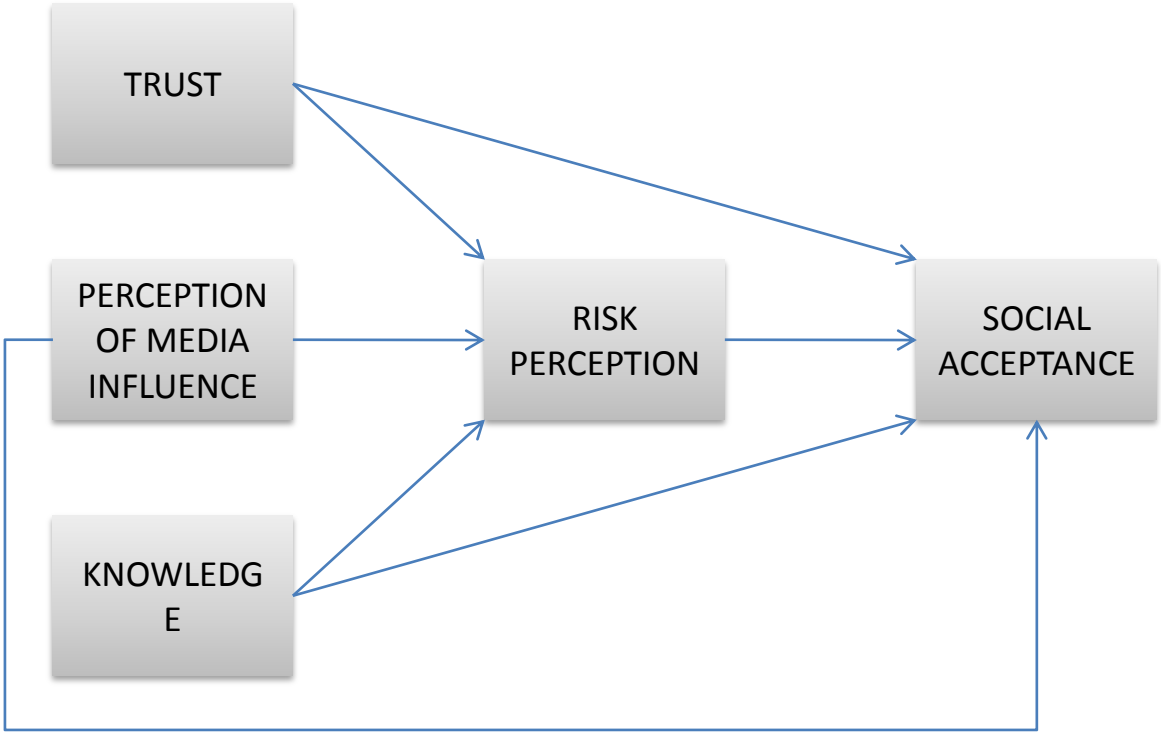

Figure 1-1 Risk Perception and Social Acceptance Model for Radioactive Waste Management

1.3 Methodology

This study used a modified and extended version of the research framework and methodology adopted in 1991 by the U.S. Sandia National Laboratories (SNL) for their report titled, 'Perceptions of Risk in the Management of Nuclear Wastes: Mapping Elite and Mass Beliefs and Attitudes.' It also used the questionnaire developed by the SNL for carrying out the research at that time by partially modifying and supplementing it in consideration of differences between the past and present and also nation-specific considerations.

The questionnaire survey was conducted online and conventionally for two months from May 25 to July 25, 2010. For sampling, both a probability sampling method and non-probability sampling method were used. A total of 1,200 questionnaires were sent to citizens, people in nuclear circles (research, regulatory, nuclear power plant (NPP) and radioactive waste management sectors), the National Assembly, Non-Governmental Organizations (NGOs), news media (journalists, producers/distributors (PDs)), government agencies, residents living near nuclear power plant sites (Gori, Wolseong, Younggwang, Uljin), residents living near the construction site of the low-to-intermediate level radioactive waste disposal facility in Gyeongju, and nuclear power plant workers residing in the town nearby an NPP.

After excluding invalid answerers, a total of 1,183 respondents were finally analyzed. Breaking

them down into subject groups, 329 were citizens and 191 were from nuclear circles, including 50 from the research sector, 48 from the regulatory sector, 50 from the NPP sector and 48 from the radioactive waste management sector. A total of 50 respondents represented the National Assembly, 50 were from NGOs, and representing the news media were 41 journalists and 22 PDs. A total of 218 respondents were residents living near nuclear power plant sites, 45 from Gori, 60 from Wolseong, 63 from Yeonggwang and 50 from Uljin. Power plant workers residing in nearby towns were 111. By gender, males comprised 60.0% and females 40.0%. By education, doctorates were 7%, masters degree holders were 16.8%, college graduates 57.7%, and high school graduates or lower were 18.5%. By age, 24.3% were in their 20s, 35.9% in their 30s, 23.0% in their 40s and 16.8% in their 50s or older. The distribution of subjects by gender, education and age are shown in Tables 1, 2 and 3.

Table 1-1 Gender Distribution of Subjects

<table>
<tr><th colspan="2"></th><th colspan="2">Male</th><th colspan="2">Female</th></tr>
<tr><td colspan="2">Total (n=1115)</td><td colspan="2">60.0%</td><td colspan="2">40.0%</td></tr>
<tr><td colspan="2">Citizens (n=329)</td><td colspan="2">46.8%</td><td colspan="2">53.2%</td></tr>
<tr><td rowspan="4">Nuclear Circles (n=191)</td><td>Research Sector (n=50)</td><td rowspan="4">78.0%</td><td>66.0%</td><td rowspan="4">22.0%</td><td>34.0%</td></tr>
<tr><td>Regulatory Sector (n=48)</td><td>85.4%</td><td>14.6%</td></tr>
<tr><td>NPP Sector (n=50)</td><td>84.0%</td><td>16.0%</td></tr>
<tr><td>RWM Sector (n=43)</td><td>76.7%</td><td>23.3%</td></tr>
<tr><td colspan="2">National Assembly (n=50)</td><td colspan="2">66.0%</td><td colspan="2">34.0%</td></tr>
<tr><td colspan="2">NGOs (n=50)</td><td colspan="2">38.0%</td><td colspan="2">62.0%</td></tr>
<tr><td rowspan="2">Media (n=63)</td><td>Journalist (n=41)</td><td rowspan="2">60.3%</td><td>70.7%</td><td rowspan="2">39.7%</td><td>29.3%</td></tr>
<tr><td>PD (n=22)</td><td>40.9%</td><td>59.1%</td></tr>
<tr><td colspan="2">Government (n=51)</td><td colspan="2">66.7%</td><td colspan="2">33.3%</td></tr>
<tr><td rowspan="4">Local Residents (n=218)</td><td>Gori (n=45)</td><td rowspan="4">47.2%</td><td>42.2%</td><td rowspan="4">52.8%</td><td>57.8%</td></tr>
<tr><td>Wolseong (n=60)</td><td>51.7%</td><td>48.3%</td></tr>
<tr><td>Yeonggwang (n=63)</td><td>50.8%</td><td>49.2%</td></tr>
<tr><td>Uljin (n=50)</td><td>42.0%</td><td>58.0%</td></tr>
<tr><td colspan="2">Gyeongju Residents (n=52)</td><td colspan="2">50.0%</td><td colspan="2">50.0%</td></tr>
<tr><td colspan="2">Power Plant Workers Residing in Nearby Towns (n=111)</td><td colspan="2">80.2%</td><td colspan="2">19.8%</td></tr>
</table>

Table 1-2 Highest Level of Education Distribution of Subjects

		Doctor		Master		Bachelor		High School or Lower	
Total (n=1115)		7%		16.8%		57.7%		18.5%	
Citizens (n=329)		5.2%		12.5%		60.2%		22.1%	
Nuclear Circles (n=191)	Research Sector (n=50)	17.3%	18.0%	26.2%	30.0%	52.9%	52.0%	3.6%	-
	Regulator Sector (n=48)		41.7%		31.3%		22.9%		4.2%
	NPP Sector (n=50)		2.0%		14.0%		84.0%		-
	RWM Sector (n=43)		7.0%		30.2%		51.2%		11.6%
National Assembly (n=50)		2.0%		38.0%		60.0%		-	
NGOs (n=50)		-		20.0%		76.0%		4.0%	
Media Circles (n=63)	Journalists (n=41)	1.6%	2.4%	9.5%	9.8%	88.9%	87.8%	-	-
	PD (n=22)		-	9.5%	9.1%		90.9%	-	-
Government (n=51)		-		13.7%		82.4%		3.9%	
Local Residents (n=218)	Gori (n=45)	-	-	11.5%	24.4%	45.4%	44.4%	43.1%	31.2%
	Wolseong (n=60)		-	11.5%	15.0%		41.7%		43.3%
	Yeonggwang (n=63)		-	11.5%	1.6%		47.6%		50.8%
	Uljin (n=50)		-	11.5%	8.0%		48.0%		44.0%
Gyeongju Residents (n=52)		-		21.2%		48.1%		30.7%	
Power Plant Workers Residing in Nearby Towns (n=111)		0.9%		7.2%		71.2%		20.7%	

Table 1-3 Age Distribution of Subjects

		20s		30s		40s		50s and older	
Total (n=1115)		24.3%		35.9%		23.0%		16.8%	
Citizens (n=329)		31.3%		35.9%		16.4%		16.4%	
Nuclear Circles (n=191)	Research Sector (n=50)	17.8%	30.0%	30.9%	14.0%	29.8%	32.0%	21.5%	24.0%
	Regulator Sector (n=48)		6.3%		33.2%		18.8%		41.7%
	NPP Sector (n=50)		4.0%		46.0%		44.0%		6.0%
	RWM Sector (n=43)		32.6%		30.2%		23.3%		14.0%
National Assembly (n=50)		26.0%		50.0%		22.0%		2.0%	
NGOs (n=50)		22.0%		52.0%		24.0%		2.0%	
Media Circles (n=63)	Journalists (n=41)	25.4%	17.1%	38.1%	41.5%	30.2%	34.1%	6.3%	7.3%
	PD (n=22)		40.9%		31.8%		22.7%		4.5%
Government (n=51)		19.6%		47.1%		23.5%		9.8%	
Local Residents (n=218)	Gori (n=45)	32.6%	35.6%	32.6%	28.9%	20.6%	22.2%	14.2%	13.3%
	Wolseong (n=60)		33.3%		35.0%		18.3%		13.4%
	Yeonggwang (n=63)		30.2%		34.8%		17.5%		17.5%
	Uljin (n=50)		32.0%		30.0%		26.0%		12.0%
Gyeongju Residents (n=52)		30.8%		32.7%		19.2%		17.3%	
Power Plant Workers Residing in Nearby Towns (n=111)		8.1%		40.5%		28.8%		22.6%	

2. RISK PERCEPTION OF RADIOACTIVE WASTE MANAGEMENT

2.1 Risk Perception of SNF/Used Fuel Management

2.1.1 Risk Perception of SNF/Used Fuel Management for Different Stages

Risk perception of SNF/used fuel management[4] was measured at four stages; production, temporary storage, transport and permanent storage of the used fuel. The level of risk perception at each stage was measured using a 5-point Likert scale. The questionnaire items and scale used for measuring risk perception of used fuel management were as follows:

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
①	②	③	④	⑤

- **Nuclear power generation is risky.**
- **Radioactive waste stored temporarily at a nuclear power plant is risky.**
- **The transport of SNF is risky.**
- **Permanent storage of SNF is risky.**

As for the perception of used fuel management by stakeholders, citizens revealed that they perceive a relatively high risk (3.48). Looking at their risk perception for different stages of management, it was highest for the temporary storage stage (3.68), followed by the transport stage (3.61) and the permanent storage stage (3.59). However, their risk perception of used fuel production at the nuclear power generation stage (3.04) was relatively lower. Those engaged in the nuclear industry perceived used fuel management as not risky (2.35). Their risk perception was the lowest for the production stage (2.14) but the highest for the transport stage (2.59), followed by the permanent storage stage (2.42) and the temporary storage stage (2.25). The transport stage was perceived as most risky by all sectors, i.e. the research (2.62), regulatory (2.67), NPP (2.30) and radioactive waste management (2.81) sectors. What is most noteworthy is that the radioactive management sector that will shoulder the responsibility for transporting used fuel in the future showed the highest risk perception for the transport stage. This sector also showed the highest risk perception for used fuel management for which the sector will be responsible. The National Assembly showed a slightly high risk perception (3.23) for used fuel management, and the temporary storage stage (3.54) was seen most risky, followed by the permanent storage stage (3.36), the transport stage (3.30) and the production stage (2.7). NGOs regarded used fuel management as very risky, and their ranking of risk level placed the temporary storage stage as highest (4.48), followed by the permanent storage stage (4.40), the transport stage (4.38) and lastly the production stage (4.22). News media circles tend to perceive

[4] In the body text, unless otherwise specified, SNF/used fuel is collectively referred to as used fuel.

used fuel management as risky (3.37), with the temporary storage stage (3.75) being particularly highly risky, followed by the permanent storage stage (3.44), the transport stage (3.33) and finally the production stage (2.95). Journalists and PDs showed an equal order of risk perception regarding stages, but PDs (3.60) revealed a higher risk perception for used fuel management than journalists (3.24). This result is noteworthy because PDs are not usually involved in the process of communication between the media and nuclear circles or the NPP. Risk perception among government officials concerning used fuel management was not high, but they held risk perception at similar levels for the transport stage (3.14), the permanent storage stage (3.10) and the temporary storage stage (3.04), with their perception for the production stage being a bit lower (2.53). Residents near nuclear power plants did not consider used fuel management as risky (2.82), their perceived risk level ranking was in the order of permanent storage stage (3.05), transport stage (3.01), temporary storage stage (2.83) and the production stage (2.39). Considering the fact that residents have experienced the production and temporary storage stages of used fuels directly or indirectly, the results are seen as a reflection of their experience on risk perception. Meanwhile, residents in Gyeongju, where a low-to-intermediate level radioactive waste disposal facility is under construction, perceived used fuel management as highly risky (3.30). The transport stage (3.75) was perceived most risky, followed by the permanent storage stage (3.52), the temporary storage stage (3.19) and the production stage (2.72). Power plant workers residing in nearby towns perceived used fuel management as not risky (1.79). They showed a very low risk perception only for the transport stage (2.10) and perceived the permanent storage stage (1.86), the temporary storage stage (1.62) and the production stage (1.59) as not risky.

The results of analyzing stakeholders' risk perception regarding used fuel management confirm that the parties differently perceive the risk according to their own personal situations and responsibilities. A significantly different risk perception exists between citizens and the governmental policy makers for used fuel management. A similarly different risk perception exists between citizens and members of the nuclear circles who provide information and opinions as feedback during the policy-making process. The existence of definite gaps in risk perception confirms that the policy for used fuel management must be made deliberately. Not surprisingly, NGOs showed the highest risk perception, taking distinctively different positions from other stakeholders. As for the risk perception for each of the different stages, the risk regarding the production stage was perceived as the lowest across all respondents, while the temporary storage and transport stages were regarded as highly risky. These results might be able to provide clues as to what kinds of information are required and what areas should be discussed in the process of making a policy for used fuel management.

Table 2-1 Citizens' Risk Perception of SNF/Used Fuel Management for Different Stages (n=329)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	4.0%	28.3%	34.7%	26.1%	7.0%	3.04	0.99
Temporary Storage	2.4%	8.5%	26.1%	44.7%	18.2%	3.68	0.95
Transport	0.9%	9.7%	30.4%	45.0%	14.0%	3.61	0.88
Permanent Storage	3.0%	8.5%	30.1%	42.9%	15.5%	3.59	0.95
Used Fuel Management	2.6%	13.8%	30.3%	39.7%	13.7%	3.48	0.78

Table 2-2 Nuclear Circles' Risk Perception of SNF/Used Fuel Management for Different Stages (n=191)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	22.5%	50.3%	18.3%	8.9%	0%	2.14	0.87
Temporary Storage	24.6%	42.4%	17.3%	14.7%	1.0%	2.25	1.02
Transport	12.6%	38.7%	28.3%	17.8%	2.6%	2.59	1.01
Permanent Storage	18.3%	41.4%	22.0%	16.8%	1.6%	2.42	1.02
Used Fuel Management	19.5%	43.2%	21.5%	14.6%	1.3%	2.35	0.81

Table 2-3 Comparison of Nuclear Circles' Risk Perception of SNF/Used Fuel Management for Different Stages

	Research Sector (n=50)	Regulatory Sector (n=48)	NPP Sector (n=50)	RWM Sector (n=43)	Entire Nuclear circles (n=191)
Production	2.20	2.35	1.72	2.30	2.14
Temporary Storage	2.42	2.31	1.92	2.37	2.25
Transport	2.62	2.67	2.30	2.81	2.59
Permanent Storage	2.46	2.63	2.02	2.60	2.42
Used Fuel Management	2.42	2.49	1.99	2.52	2.35

Table 2-4 National Assembly's Risk Perception of SNF/Used Fuel Management for Different Stages

(n=50)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	2.0%	46.0%	32.0%	20.0%	0%	2.70	0.81
Temporary Storage	0%	16.0%	28.0%	42.0%	14.0%	3.54	0.93
Transport	0%	14.0%	46.0%	36.0%	4.0%	3.30	0.76
Permanent Storage	0%	12.0%	44.0%	40.0%	4.0%	3.36	0.75
Used Fuel Management	0.5%	22.0%	37.5%	34.5	5.5%	3.23	0.63

Table 2-5 NGO′ Risk Perception of SNF/Used Fuel Management for Different Stages

(n=50)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	0%	8.0%	2.0%	50.0%	40.0%	4.22	0.84
Temporary Storage	0%	2.0%	4.0%	38.0%	56.0%	4.48	0.68
Transport	0%	2.0%	6.0%	44.0%	48.0%	4.38	0.70
Permanent Storage	0%	2.0%	6.0%	42.0%	50.0%	4.40	0.70
Used Fuel Management	0%	3.5%	4.5%	43.5%	48.5%	4.37	0.63

Table 2-6 Media Circles' Risk Perception of SNF/Used Fuel Management for Different Stages

(n=63)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	1.6%	31.7%	39.7%	23.8%	3.2%	2.95	0.87
Temporary Storage	0%	9.5%	20.6%	55.6%	14.3%	3.75	0.82
Transport	0%	19.0%	33.3%	42.9%	4.8%	3.33	0.84
Permanent Storage	0%	19.0%	23.8%	50.8%	6.3%	3.44	0.88
Used Fuel Management	0.4%	19.8%	29.4%	43.3%	7.2%	3.37	0.70

Table 2-7 Comparison of Media Circles' Risk Perception of SNF/Used Fuel Management for Different Stages

	Journalists (n=41)	PDs (n=22)	Entire Media Circles (n=63)
Production	2.88	3.09	2.95
Temporary Storage	3.56	4.09	3.75
Transport	3.20	3.59	3.33
Permanent Storage	3.34	3.64	3.44
Used Fuel Management	3.24	3.60	3.37

Table 2-8 Government's Risk Perception of SNF/Used Fuel Management for Different Stages

(n=51)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	5.9%	49.0%	33.3%	9.8%	2.0%	2.53	0.83
Temporary Storage	7.8%	23.5%	31.4%	31.4%	5.9%	3.04	1.06
Transport	0%	21.6%	47.1%	27.5%	3.9%	3.14	0.80
Permanent Storage	0%	21.6%	51.0%	23.5%	3.9%	3.10	0.78
Used Fuel Management	3.4%	29.0%	40.7%	23.1%	3.9%	2.95	0.70

Table 2-9 Residents' Risk Perception of SNF/Used Fuel Management for Different Stages

(n=218)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	26.0%	32.6%	17.4%	22.0%	1.4%	2.39	1.14
Temporary Storage	18.8%	27.5%	17.0%	24.8%	11.9%	2.83	1.32
Transport	12.8%	27.1%	17.9%	30.3%	11.9%	3.01	1.25
Permanent Storage	13.8%	22.0%	21.6%	31.2%	11.5%	3.05	1.24
Used Fuel Management	17.9%	27.3%	18.5%	27.1%	9.2%	2.82	1.08

Table 2-10 Comparison of Residents' Risk Perception of SNF/Used Fuel Management for Different Stages

5-Point Scale

	Gori Residents (n=45)	Wolseong Residents (n=60)	Yeonggwang Residents (n=63)	Uljin Residents (n=50)	Residents around Power Plants (n=218)	Gyeongju Residents (n=52)	Power Plant Workers Residing in Nearby Towns (n=111)
Production	2.71	2.68	2.35	1.80	2.39	2.73	1.59
Temporary Storage	3.42	3.47	2.35	2.16	2.83	3.19	1.62
Transport	3.60	3.68	2.33	2.54	3.01	3.75	2.10
Permanent Storage	3.56	3.72	2.48	2.50	3.05	3.52	1.86
Used Fuel Management	3.32	3.39	2.38	2.25	2.82	3.30	1.79

Table 2-11 Entire Subjects' Risk Perception of SNF/Used Fuel Management for Different Stages

(n=1115)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	17.3%	35.8%	23.1%	19.4%	4.3%	2.58	1.11
Temporary Storage	14.5%	24.1%	19.5%	29.6%	12.3%	3.01	1.27
Transport	8.8%	22.6%	26.5%	32.0%	10.1%	3.12	1.14
Permanent Storage	11.2%	22.7%	24.9%	30.9%	10.2%	3.06	1.18
Used Fuel Management	13.0%	26.3%	23.5%	28.0%	9.2%	2.94	1.04

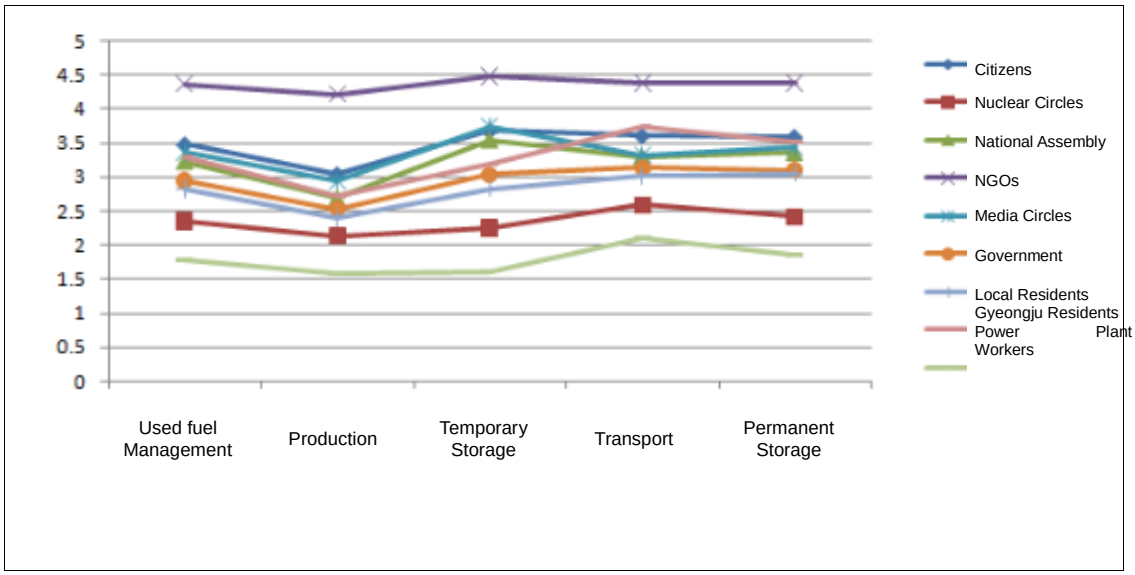

Figure 2-1 Comparison of Stakeholders' Risk Perception of SNF/Used Fuel Management for Different Stages

2.1.2 Risk Perception for Reprocessing and Recycling [5] of SNF/Used Fuel Management

The questionnaire items and the scale used for measuring the risk perception for reprocessing and recycling of used fuel management were as follows:

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
①	②	③	④	⑤

- **Reprocessing of SNF is risky.**
- **Recycling of SNF is risky.**

According to the results of analyzing stakeholders' risk perception for reprocessing and recycling of used fuel, citizens perceived the reprocessing (3.44) and recycling (3.37) as risky. However, nuclear circles tend to perceive the reprocessing (2.37) and recycling (2.23) of used fuel as not risky. All sectors of the nuclear circles perceived the reprocessing of used fuel as more risky than the recycling. The research sector (reprocessing: 2.34, recycling: 2.30) showed the narrowest difference of 0.04 in risk perception between the reprocessing and recycling of used fuel, while the NPP sector (reprocessing: 2.18, recycling: 1.98) had the largest difference of 0.20 between

[5] In the body text, unless otherwise specified, reprocessing and recycling are defined in terms of nuclear proliferation and non-proliferation, respectively. Reprocessing in this context refers to the technology developed to recover fissionable plutonium from irradiated fuel to use in the production of nuclear weapons, while recycling would use the recovered product as fuel for nuclear power plants.

the two. The regulatory sector (reprocessing: 2.58, recycling: 2.42) and the radioactive waste management (reprocessing: 2.37, recycling: 2.21) revealed a difference of 0.16, respectively, in risk perception between the two. It is noteworthy that the research sector of nuclear circles showed an almost equal level of risk perception for reprocessing and recycling. The National Assembly revealed an equal risk perception (3.00) for reprocessing and recycling, while NGOs showed a higher risk perception for reprocessing (4.36) than recycling (4.32). Media circles perceived reprocessing (3.22) and recycling (3.16) as risky. Journalists (reprocessing: 3.12, recycling: 3.10) perceived the risk of reprocessing and recycling at a similar level, while PDs (reprocessing: 3.12, recycling: 3.10) showed a slight difference of 0.12 in risk perception between them. The government had a normal level of risk perception for reprocessing (3.06) and recycling (3.02), with a slight difference of 0.04 between them. Residents at sites of nuclear power plants differed in perceiving the risk from other stakeholders, showing a high risk perception for recycling (3.02) than reprocessing (2.92). This tendency was also confirmed by Gyeongju residents (reprocessing: 3.46, recycling: 3.60). Meanwhile, power plant workers residing in nearby towns are very likely to regard the risk of reprocessing (1.93) and recycling (1.76) as not risky.

According to the results of comparing risk perception of used fuel management, reprocessing and recycling, citizens, the National Assembly, NGOs and media circles showed a relatively higher risk perception for used fuel management, followed by reprocessing and recycling. As mentioned before, however, the National Assembly perceived the risk of reprocessing and recycling at the same level. The government, nuclear circles and power plant workers residing in nearby towns perceived used fuel management as mostly risky. Nuclear circles regarded used fuel management as more risky than recycling, while the government perceived reprocessing as more risky than used fuel management. Given these results, presenting definite criteria for reprocessing and recycling technologies might help avoid unnecessary disputes arising from the process of deciding related policies in the future.

Table 2-12 Citizens' Risk Perception for Reprocessing and Recycling of SNF/Used Fuel (n=329)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Reprocessing	2.1%	13.7%	34.7%	36.8%	12.8%	3.44	0.95
Recycling	2.4%	16.7%	34.7%	35.3%	11.9%	3.37	0.98

Table 2-13 Nuclear Circles' Risk Perception for Reprocessing and Recycling of SNF/Used Fuel

(n=191)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Reprocessing	16.2%	47.1%	20.9%	15.2%	0.5%	2.37	0.95
Recycling	20.4%	48.7%	19.4%	11.0%	0.5%	2.23	0.92

Table 2-14 Comparison of Nuclear circles' Risk Perception for Reprocessing and Recycling of SNF/Used Fuel

5-Point Scale

	Research Sector (n=50)	Regulatory Sector (n=48)	NPP Sector (n=50)	RWM Sector (n=43)	Entire Nuclear circles (n=191)
Reprocessing	2.34	2.58	2.18	2.37	2.37
Recycling	2.30	2.42	1.98	2.21	2.23

Table 2-15 National Assembly's Risk Perception for Reprocessing and Recycling of SNF/Used Fuel

(n=50)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Reprocessing	0%	30.0%	44.0%	22.0%	4.0%	3.00	0.83
Recycling	0%	30.0%	44.0%	22.0%	4.0%	3.00	0.83

Table 2-16 NGO′ Risk Perception for Reprocessing and Recycling of SNF/Used Fuel

(n=50)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Reprocessing	0%	2.0%	6.0%	46.0%	46.0%	4.36	0.69
Recycling	0%	2.0%	8.0%	46.0%	44.0%	4.32	0.71

Table 2-17 Media Circles' Risk Perception for Reprocessing and Recycling of SNF/Used Fuel

(n=63)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Reprocessing	1.6%	22.2%	30.2%	44.4%	1.6%	3.22	0.87
Recycling	0%	25.4%	34.9%	38.1%	1.6%	3.16	0.83

Table 2-18 Comparison of Media Circles' Risk Perception for Reprocessing and Recycling of SNF/Used Fuel

5-Point Scale

	Journalist (n=41)	PD (n=22)	Entire Media Circles (n=63)
Reprocessing	3.12	3.41	3.22
Recycling	3.10	3.27	3.16

Table 2-19 Government's Risk Perception for Reprocessing and Recycling of SNF/Used Fuel

(n=50)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Reprocessing	0%	27.5%	43.1%	25.5%	3.9%	3.06	0.83
Recycling	0%	29.4%	41.2%	27.5%	2.0%	3.02	0.81

Table 2-20 Local Residents' Risk Perception for Reprocessing and Recycling of SNF/Used Fuel

(n=218)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Reprocessing	16.5%	22.9%	22.9%	27.5%	10.1%	2.92	1.25
Recycling	15.6%	20.6%	23.9%	25.7%	14.2%	3.02	1.29

Table 2-21 Comparison of Local Residents' Risk Perception for Reprocessing and Recycling of SNF/Used Fuel for Different Stages

5-Point Scale

	Gori Residents (n=45)	Wolseong Residents (n=60)	Yeonggwang Residents (n=63)	Uljin Residents (n=50)	Residents around Power Plants (n=218)	Gyeongju Residents (n=52)	Power Plant Workers Residing in Nearby Towns (n=111)
Reprocessing	3.53	3.53	2.27	2.44	2.92	3.46	1.93
Recycling	3.58	3.65	2.49	2.44	3.02	3.60	1.76

Table 2-22 Risk Perception for Reprocessing and Recycling of SNF/Used Fuel (n=1115)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Reprocessing	11.5%	26.3%	26.6%	27.2%	8.4%	2.95	1.15
Recycling	12.8%	27.6%	26.1%	24.6%	9.0%	2.89	1.17

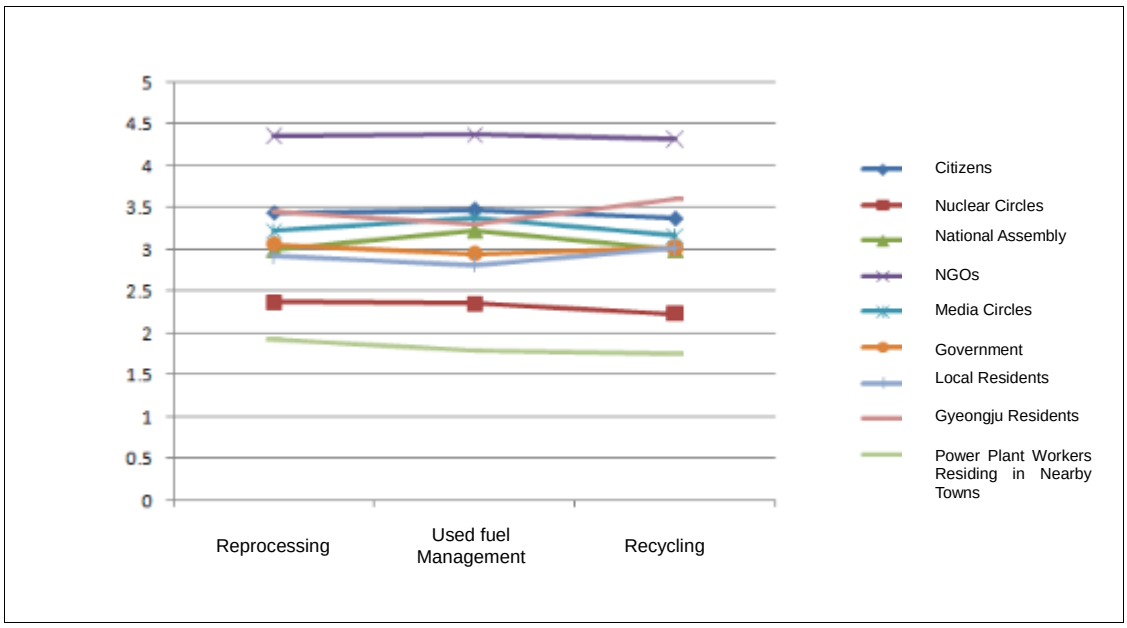

Figure 2-2 Comparison of Stakeholders' Risk Perception for Reprocessing, Recycling and Management of SNF/Used Fuel

2.1.3 Risk Perception of SNF/Used Fuel

The following questionnaire item and Likert scale were used to measure the level of risk perceived for used fuel:

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
①	②	③	④	⑤

· SNF is risky.

Comparing stakeholders' risk perception of used fuel, it was found that the level of risk perceived by NGOs (4.36) was distinctly higher than that of other stakeholders. It is particularly important to find out why 48.0% of the respondents answered 'very risky.' Citizens (3.58) were the second highest in perceiving it as risky, followed by media circles (3.57) at an almost identical level. It should also be noted that residents of Gyeongju (3.42) showed a higher risk perception for used fuel than residents (2.99) near sites of nuclear power plants. Article 18 of the Special Act on Supporting the Areas for Attracting Low-to-Intermediate Level Radioactive Waste Facilities states, "The SNF facilities under Paragraph 5, Article 2, of the Atomic Energy Safety Act must not be constructed in areas near low-to-intermediate level radioactive waste facilities." Therefore, Gyeongju, where a low-to-intermediate level radioactive waste disposal facility is under construction, is excluded from the possibility of a SNF facility. While, residents (2.99) living near sites of nuclear power plants, where the SNF is currently stored, tend to have a low level of risk perception for used fuel. Risk perception, however, differs quite a lot among the regions. Residents in Gori (3.60) and Wolseong (3.73) had a higher level of perception for the risk of used fuel, while those in Yeonggwang (2.27) and Uljin (2.46) showed a low level of risk perception. The SNF licensed storage capacity in use during the 2nd quarter of 2010 was 82.0% in Gori, 64.0% in Wolseong, 66.8% in Yeonggwang and 63.3% in Uljin. The temporary storage facility in Gori is likely to be filled up earliest among the four regions. This worry might explain why Gori residents' risk perception of used fuel was so high. The temporary storage facility in Wolseong has enough storage room, but its cumulative storage capacity is 26 times larger than the combined capacity of the other three regions due to the large amount of fuel used. It is also assumed that the use of the dry storage facility in Wolseong might influence its residents' risk perception of used fuel. Other regions used a wet storage facility for temporarily storing used fuel.

Table 2-23 Comparison of Risk Perception for Reprocessing, Recycling and Management of SNF/Used Fuel

		Never Risky		Not Risky		Neutral		Risky		Very Risky		Mean		Standard Deviation	
All (n=1115)		10.1%		21.6%		23.4%		34.2%		10.7%		3.14		1.17	
Citizens (n=329)		1.8%		11.2%		28.6%		43.8%		14.6%		3.58		0.93	
Nuclear Circles	Research (n=50)	14.1%	12.0%	31.4%	26.0%	24.1%	28.0%	26.7%	30.0%	3.7%	4.0%	2.74	2.88	1.11	1.10
	Regulatory (n=48)		4.2%		33.3%		22.9%		35.4%		4.2%		3.02		1.02
	NPP (n=50)		30.0%		36.0%		16.0%		16.0%		2.0%		2.24		1.12
	RWM (n=43)		9.3%		30.2%		30.2%		25.6%		4.7%		2.86		1.06
National Assembly (n=50)		0%		12.0%		36.0%		48.0%		4.0%		3.44		0.76	
Media Circles	NGOs (n=50)	0%		2.0%		8.0%		42.0%		48.0%		4.36		0.72	
	Journalists (n=41)	0%	0%	9.5%	14.6%	27.0%	29.3 %	60.3%	51.2%	3.2%	4.9%	3.57	3.46	0.71	0.81
	PDs (n=22)		0%		0%		22.7%		77.3%		0%		3.77		0.43
Government (n=51)		0%		19.6%		45.1%		31.4%		3.9%		3.20		0.80	
Local Residents	Gori (n=45)	15.1%	4.4%	26.1%	20.0%	15.6%	13.3%	30.7%	35.6%	12.4%	26.7%	2.99	3.60	1.30	1.21
	Wolseong (n=60)		1.7%		11.7%		15.0%		55.0%		16.7%		3.73		0.94
	Yeonggwang (n=63)		22.2%		44.4%		19.0%		12.7%		1.6%		2.27		1.00
	Uljin (n=50)		32.0%		26/0%		14.0%		20.0%		8.0%		2.46		1.34
Gyeongju Residents (n=52)		0%		26.9%		17.3%		42.3%		13.5%		3.42		1.04	
Power Plant Workers Residing in Nearby Towns (n=111)		39.6%		34.2%		18.9%		4.5%		2.7%		1.96		1.01	

Meanwhile, the risk perception for reprocessing and recycling of used fuel and used fuel itself was compared among the different groups. Citizens, the National Assembly, media circles, the government and power plant works residing in nearby towns showed the highest risk perception for used fuel itself. However, NGOs perceived the risk of used fuel management as the highest, while local residents at sites of power plants and Gyeongju residents perceived recycling to be the most risky. Given these results, it can be confirmed that used fuel itself is generally perceived as risky.

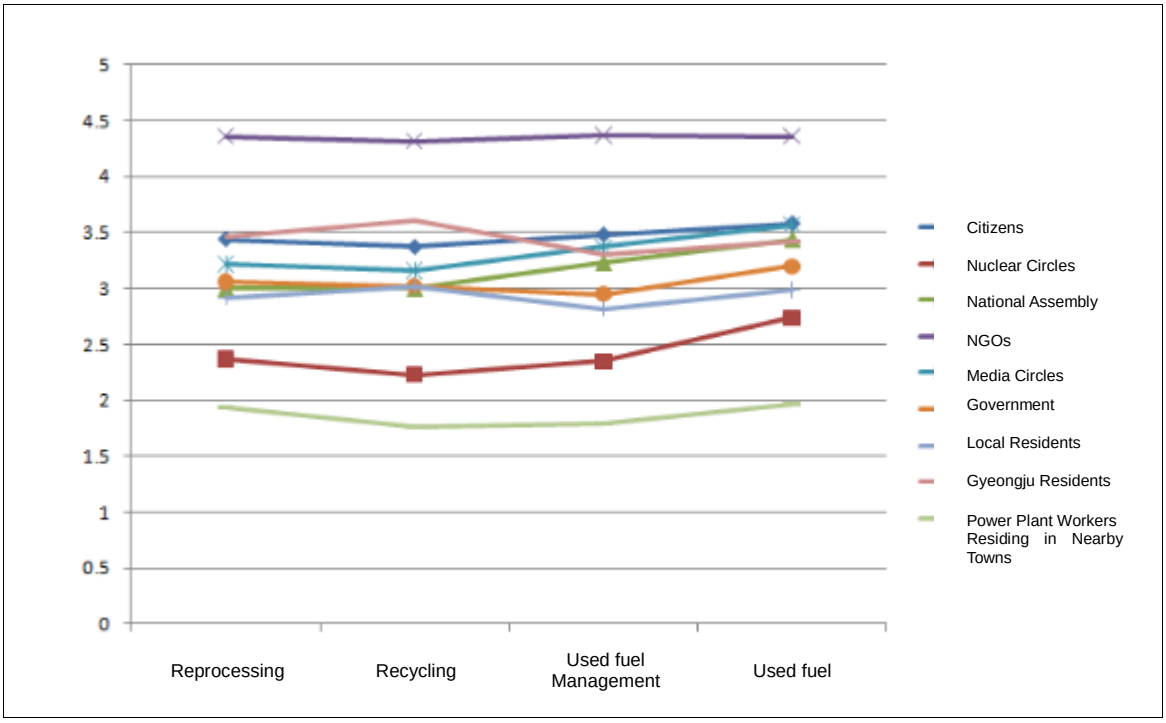

Figure 2-3 Comparison of Stakeholders' Risk Perception for Reprocessing, Recycling and Management of SNF/Used Fuel and for SNF/Used Fuel

2.2 Risk Perception of High-Level Radioactive Waste Management

2.2.1 Risk Perception of High-Level Radioactive Waste Management for Different Stages

Stakeholders' risk perception of high-level radioactive waste management was measured at four stages of management, which were production, temporary storage, transport and permanent storage. The level of risk perception at each stage was measured using a 5-point Likert scale. The questionnaire items and scale used for measuring risk perception of high-level radioactive waste were as follows:

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
①	②	③	④	⑤

- **Nuclear power generation is risky.**
- **Radioactive waste stored temporarily in a nuclear power plant is risky.**
- **Transport of high-level radioactive waste is risky.**
- **Permanent storage of high-level radioactive waste is risky.**

As for the risk of high-level radioactive waste perceived by stakeholders, citizens showed a relatively high level (3.56) of risk perception for the high-level radioactive waste management and even a higher level for the transport stage (3.81). Nuclear circles are likely to perceive high-level radioactive waste management to be almost without risk (2.38) and showed the highest level of risk perception for the transport stage (2.66). Comparing the sectors of nuclear circles, the regulatory sector (2.56) and the radioactive waste management sector (2.55) had a similar level of risk perception, while the research sector (2.45) tended to show a relatively low risk perception. The nuclear power plant sector (1.99) perceived almost no risk. Nevertheless, the four sectors all showed a higher level of risk perception for the transport stage than for other stages. The National Assembly was likely to perceive high-level radioactive waste to be a little risky (3.38) and regarded the transport stage (3.64) as the most risky among the four stages. NGOs showed a very high risk perception for high-level radioactive waste (4.40), with 50.0% of them answering ‘very risky.’ These groups also saw the transport stage (4.50) to be the most risky followed by the temporary storage stage (4.48), which showed a miniscule difference between these two stages. Media circles perceived high-level radioactive waste management to be very risky (3.70) and saw the temporary storage stage (3.75) to be more risky than the transport stage (3.44). Journalists (3.30) and PDs (3.70) in media circles showed a significantly different perception toward the risk of high-level radioactive waste management. Especially, PDs had a very high risk perception for the temporary storage stage (4.09). The government’s risk perception (3.03) of high-level radioactive waste management was not so high, but that group perceived the risk of transport stage (3.35) to be more risky than other stages. Residents of sites of nuclear power plants revealed a relatively lower risk perception (3.05) for high-level radioactive waste management, seeing the permanent storage stage (3.05) to be a little more risky than the transport stage (3.02). However, residents in Gyeongju, where a low-to-intermediate level radioactive waste disposal facility is under construction, revealed a little higher risk perception (3.25), showing a higher risk perception for the transport stage (3.58). Power plant works residing in nearby towns perceived high-level radioactive waste to be not risky (1.76).

Given the results of analyzing stakeholders’ risk perception of high-level radioactive waste, it is confirmed that each group holds a different level of risk perception as they do for used fuel management. Comparing citizens’ risk perception (3.56), nuclear circles had a very low level of risk perception (2.38), while the government (3.03) showed a big gap in risk perception. NGOs (4.42) revealed a higher level of risk perception than citizens for high-level radioactive waste management.

Generally, used fuel is regarded as part of the high-level radioactive waste. In Korea, however, it is known that high-level radioactive waste, excluding used fuel, is not produced in the current nuclear power generation system. Therefore, there is no difference between SNF, which is used fuel, and high-level radioactive waste at the level of radioactive waste management. Despite this fact, stakeholders showed a slight difference in perceiving the risk of these two areas. Nuclear circles, local residents at sites of nuclear power plants, Gyeongju residents and power plant workers residing in nearby towns, who are all related to nuclear power plants directly or indirectly, showed a slightly higher risk perception for used fuel management than for high-level radioactive waste management. On the contrary, citizens, the National Assembly, NGOs, media circles and the government perceived the risk of high-level radioactive waste management to be more risky than for used fuel management. Media circles, in particular, showed a much higher difference in risk perception of the two areas, about 3 times higher than that of other parties.

Table 2-24 Citizens' Risk Perception of High-Level Radioactive Waste Management for Different Stages

(n=329)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	4.0%	28.3%	34.7%	26.1%	7.0%	3.04	0.99
Temporary Storage	2.4%	8.5%	26.1%	44.7%	18.2%	3.68	0.95
Transport	1.2%	7.0%	24.6%	44.4%	22.8%	3.81	0.91
Permanent Storage	3.0%	8.5%	30.1%	42.9%	15.5%	3.59	0.95
High-Level RWM	2.7%	13.1%	28.9%	39.3%	15.9%	3.56	0.79

Table 2-25 Nuclear circles' Risk Perception of High-Level Radioactive Waste Management for Different Stages

(n=191)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	22.5%	50.3%	18.3%	8.9%	0%	2.14	0.87
Temporary Storage	24.6%	42.4%	17.3%	14.7%	1.0%	2.25	1.02
Transport	13.1%	37.7%	22.5%	23.6%	3.1%	2.66	1.07
Permanent Storage	18.3%	41.4%	22.0%	16.8%	1.6%	2.42	1.02
High-Level RWM	14.6%	43.0%	20.0%	16.0%	1.4%	2.38	0.82

Table 2-26 Comparison of Nuclear Circles' Risk Perception of High-Level Radioactive Waste Management for Different Stages

5-Point Scale

	Research Sector (n=50)	Regulatory Sector (n=48)	NPP Sector (n=50)	RWM Sector (n=43)	Entire Nuclear circles (n=191)
Production	2.20	2.35	1.72	2.30	2.14
Temporary Storage	2.42	2.31	1.92	2.37	2.25
Transport	2.64	2.83	2.34	2.86	2.66
Permanent Storage	2.46	2.62	2.02	2.60	2.42
High-Level RWM	2.45	2.56	1.99	2.55	2.38

Table 2-27 National Assembly's Risk Perception of High-Level Radioactive Waste Management for Different Stages

(n=50)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	2.0%	46.0%	32.0%	20.0%	0%	2.70	0.81
Temporary Storage	0%	16.0%	28.0%	42.0%	14.0%	3.54	0.93
Transport	0%	6.0%	36.0%	46.0%	12.0%	3.64	0.78
Permanent Storage	0%	12.0%	44.0%	40.0%	4.0%	3.36	0.75
High-Level RWM	0.5%	20.0%	35.0%	37.0%	7.5%	3.38	0.65

Table 2-28 NGO's Risk Perception of High-Level Radioactive Waste Management for Different Stages

(n=50)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	0%	8.0%	2.0%	50.0%	40.0%	4.22	0.84
Temporary Storage	0%	2.0%	4.0%	38.0%	56.0%	4.48	0.68
Transport	0%	0%	4.0%	42.0%	54.0%	4.50	0.58
Permanent Storage	0%	2.0%	6.0%	42.0%	50.0%	4.40	0.70
High- Level RWM	0%	3.0%	4.0%	43.0%	50.0%	4.42	0.61

Table 2-29 Media Circles' Risk Perception of High-Level Radioactive Waste Management for Different Stages

(n=63)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	1.6%	31.7%	39.7%	23.8%	3.2%	2.95	0.87
Temporary Storage	0%	9.5%	20.6%	55.6%	14.3%	3.75	0.82
Transport	0%	14.3%	22.2%	60.3%	3.2%	3.52	0.78
Permanent Storage	0%	19.0%	23.8%	50.8%	6.3%	3.44	0.88
High-Level RWM	0.4%	18.6%	26.6%	47.6%	6.7%	3.70	0.84

Table 2-30 Comparison of Media Circles' Risk Perception of High-Level Radioactive Waste Management for Different Stages

5-Point Scale

	Journalists (n=41)	PDs (n=22)	Entire Media Circles (n=63)
Production	2.88	3.09	2.95
Temporary Storage	3.56	4.09	3.75
Transport	3.37	3.82	3.52
Permanent Storage	3.34	3.64	3.44
High-Level RWM	3.30	3.70	3.70

Table 2-31 Government's Risk Perception of High-Level Radioactive Waste Management for Different Stages

(n=51)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	5.9%	49.0%	33.3%	9.8%	2.0%	2.53	0.83
Temporary Storage	7.8%	23.5%	31.4%	31.4%	5.9%	3.04	1.10
Transport	0%	17.6%	39.2%	33.3%	9.8%	3.35	0.90
Permanent Storage	0%	21.6%	51.0%	23.5%	3.9%	3.10	0.78
High-Level RWM	3.4%	28.0%	38.7%	24.5%	5.4%	3.03	0.73

Table 2-32 Risk Perception of High-Level Radioactive Waste for Different Stages (n=1115)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	17.3%	35.8%	23.1%	19.4%	4.3%	2.58	1.11
Temporary Storage	14.5%	24.1%	19.5%	29.6%	12.3%	3.01	1.27
Transport	9.1%	20.8%	22.3%	34.9%	12.8%	3.22	1.18
Permanent Storage	11.2%	22.7%	24.9%	30.9%	10.2%	3.06	1.18
High-Level RWM	13.0%	25.6%	22.5%	28.7%	9.9%	2.98	1.06

Table 2-33 Local Residents' Risk Perception of High-Level Radioactive Waste Management for Different Stages (n=218)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	26.6%	32.6%	17.4%	22.0%	1.4%	2.39	1.14
Temporary Storage	18.8%	27.5%	17.0%	24.8%	11.9%	2.83	1.32
Transport	11.9%	27.5%	17.9%	32.1%	10.6%	3.02	1.23
Permanent Storage	13.8%	22.0%	21.6%	31.2%	11.5%	3.05	1.24
High-Level RWM	17.6%	27.4%	18.5%	27.5%	17.1%	2.45	1.10

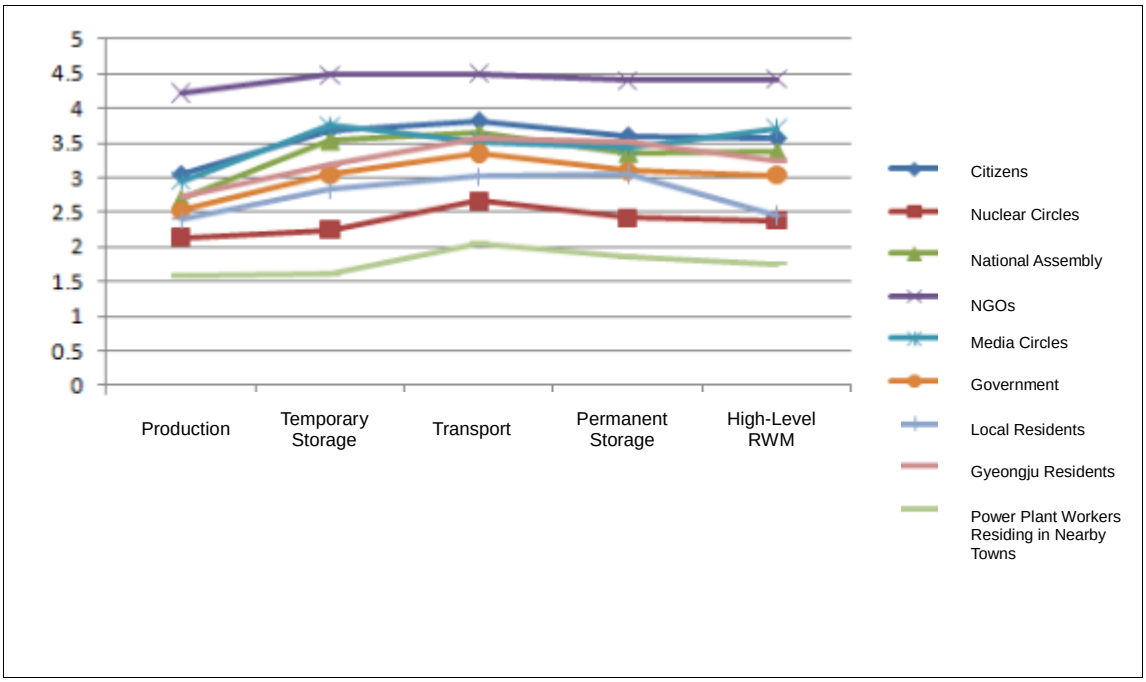

Figure 2-4 Stakeholders' Risk Perception of High-Level Radioactive Waste Management for Different Stages

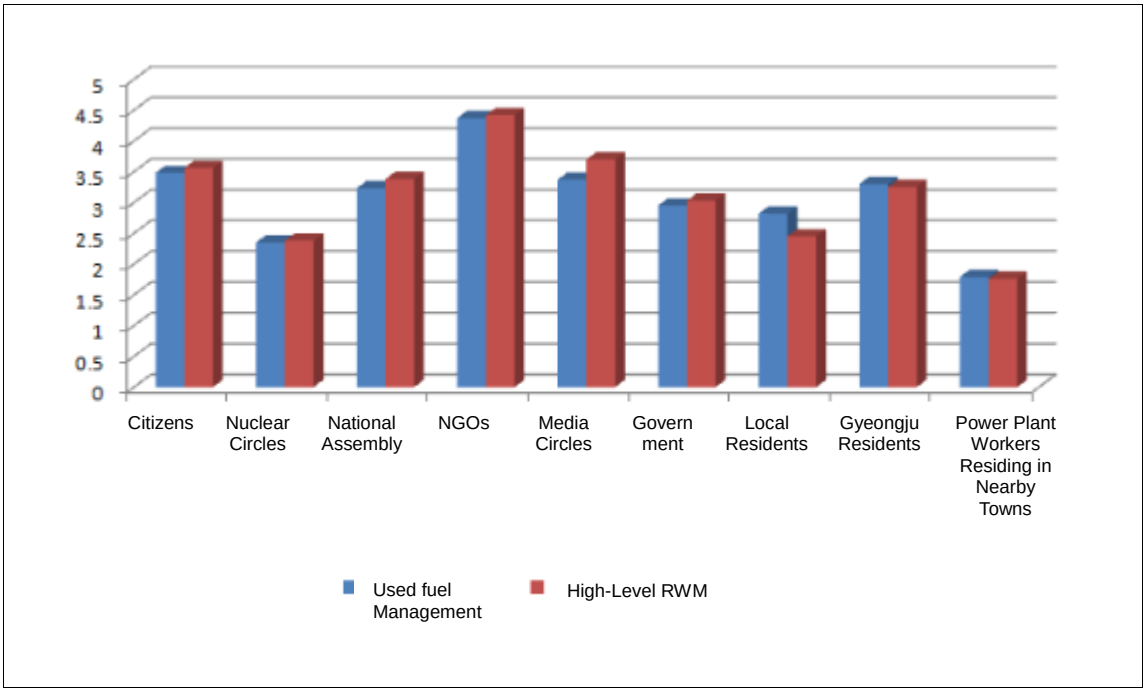

Figure 2-5 Comparison of Stakeholders' Risk Perception of Used Fuel and High-Level Radioactive Waste Management for Different Stages

2.2.2 Risk Perception of High-Level Radioactive Waste

The following questionnaire item and Likert scale were used to measure the level of perceived risk for high-level radioactive waste:

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
①	②	③	④	⑤

· High-level radioactive waste is risky.

Comparing the level of risk perceived by respective stakeholders for high-level radioactive waste, NGOs (4.46) showed the highest level of risk perception followed by citizens (3.74), media circles (3.65) and the National Assembly (3.62). Residents (2.98) at sites of nuclear power plants had a risk perception of the same pattern as shown for used fuel.

Comparing the level of risk perception for high-level radioactive waste and used fuel, high-level radioactive waste was perceived as a little more risky. The National Assembly (0.18) showed the largest gap between them, followed by media circles (0.18) and citizens (0.16).

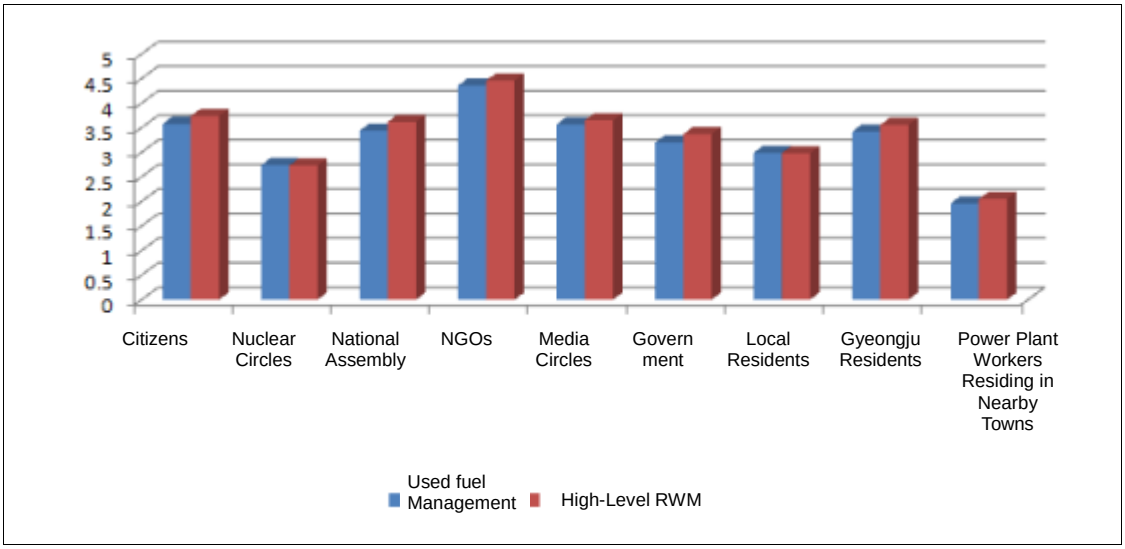

Figure 2-6 Comparison of Stakeholders' Risk Perception of Used Fuel and High-Level Radioactive Waste

Table 2-34 Comparison of Risk Perception of High-Level Radioactive Waste

		Never Risky		Not Risky		Neutral		Risky		Very Risky		Mean		Standard Deviation	
All (n=1115)		9.4%		20.4%		21.5%		36.3%		12.4%		3.22		1.18	
Citizens (n=329)		2.1%		7.6%		24.3%		45.6%		20.4%		3.74		0.94	
Nuclear Circles	Research (n=50)	13.1%	16.0%	34.0%	28.0%	23.0%	26.0%	26.2%	30.0%	3.7%	0%	2.73	2.70	1.10	1.07
	Regulatory (n=48)		4.2%		35.4%		25.0%		27.1%		8.3%		3.00		1.07
	NPP (n=50)		28.0%		38.0%		12.0%		18.0%		4.0%		2.32		1.19
	RWM (n=43)		2.3%		34.9%		30.2%		30.2%		2.3%		2.95		0.92
National Assembly (n=50)		0%		6.0%		36.0%		48.0%		10.0%		3.62		0.75	
NGOs (n=50)		0%		0%		6.0%		42.0%		52.0%		4.46		0.61	
Media Circles	Journalists (n=41)	0%	0%	9.5%	4.5%	22.2%	18.2%	61.9%	72.7%	6.3%	4.5%	3.65	3.77	0.74	0.61
	PDs (n=22)		0%		12.2%		24.4%		56.1%		7.3%		3.59		0.81
Local Residents	Government (n=51)	0%		17.6%		373.%		35.3%		9.8%		3.37		0.89	
	Gori (n=45)	13.3%	6.7%	27.5%	15.6%	17.0%	11.1%	32.1%	37.8%	10.1%	28.9%	2.98	3.67	1.24	1.24
	Wolseong (n=60)		1.7%		5.0%		26.7%		55.0%		11.7%		3.70		0.81
	Yeonggwang (n=63)		19.0%		46.0%		20.6%		14.3%		0%		2.30		0.94
	Uljin (n=50)		26.0%		42.0%		6.0%		22.0%		4.0%		2.36		1.21
Gyeongju Residents (n=52)		0%		21.2%		15.4%		50.0%		13.5%		3.56		0.98	
Power Plant Workers Residing in Nearby Towns (n=111)		36.9%		33.3%		18.0%		10.8%		0.9%		2.05		1.03	

2.3 Risk Perception of Low-to-Intermediate Level Radioactive Waste Management

2.3.1 Risk Perception of Low-to-Intermediate Level Radioactive Waste Management for Different Stages

For measuring risk perception, the management of low-to-intermediate level radioactive waste was divided into four stages, which are production, temporary storage, transport and permanent storage. The following questionnaire items and Likert scale were used:

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
①	②	③	④	⑤

- **Nuclear power generation is risky.**
- **Radioactive waste stored temporarily at a nuclear power plant is risky.**
- **Transport of low-to-intermediate level radioactive waste is risky.**
- **Permanent storage of low-to-intermediate level radioactive waste is risky.**

The risk of low-to-intermediate level radioactive waste management perceived by stakeholders for the four different stages was measured. Citizens showed a relatively high level of risk perception for the low-to-intermediate level radioactive waste management (3.46), revealing a level of risk perception for the stages in the order of temporary storage (3.68), transport (3.58), permanent storage (3.55) and production (3.04). Nuclear circles (2.16) did not perceive the management of low-to-intermediate level radioactive waste as risky, and the risk perception for the stages was in the order of temporary storage (2.25), production (2.14), transport (2.10) and permanent storage (2.01). The research sector (2.25) showed a relatively higher risk perception for the low-to-intermediate level radioactive waste management, and the regulatory sector (2.23) also revealed a similar level of risk perception. Meanwhile, the radioactive waste management sector responsible for transport (2.05) and permanent storage (1.95) of low-to-intermediate level radioactive waste had a distinctively lower risk perception than for production (2.30) or temporary storage (2.37). The National Assembly showed a somewhat high risk perception (3.19) for the low-to-intermediate level radioactive waste management, revealing risk perception in the order of temporary storage (3.54), transport (3.28), permanent storage (3.24) and production (2.70). NGOs had a significantly different risk perception from other parties. They showed a very high risk perception level for low-to-intermediate level radioactive waste management (4.35), but the ratio of respondents for ‘not risky’ was just 2.0%. The level of risk perception for the stages is in the order of temporary storage (4.48), transport (4.36), permanent storage (4.32) and production (4.22). Media circles’ risk perception (3.38) of low-to-intermediate level radioactive waste management was somewhat high, and journalists (3.22) were likely to have a higher risk perception than PDs (3.69). The level of risk perceived by media circles was in the order of temporary storage (3.75), transport (3.48), permanent storage (3.37) and production

(2.95). The government's risk perception (2.79) of low-to-intermediate level radioactive waste management was not high, and its level for the stages was in the order of temporary storage (3.04), transport (2.84), permanent storage (2.76) and production (2.53). As for residents at sites of nuclear power plants, they had a risk perception for low-to-intermediate level radioactive waste management (2.78) that was similar to the level of the government. Local residents showed an equal level of risk perception, unlike other parties, for transport (2.95) and permanent storage (2.95), followed by temporary storage (2.83) and production (2.39). Gyeongju residents, where a low-to-intermediate level radioactive waste disposal facility is currently under construction, were likely to perceive the risk of low-to-intermediate level radioactive waste management as somewhat high (3.26). Additionally, their risk perception for permanent storage (3.60) was quite high, and the risk of transport (3.54) was also perceived. Power plant workers residing in nearby towns perceived low-to-intermediate level radioactive waste management as not risky (1.62). The higher risk perception for temporary storage stage than other stages of low-to-intermediate level radioactive waste management might reflect the effect of the question which did not distinguish this temporary stage from the temporary storage stage of used fuel, which is SNF.

Comparing stakeholders' risk perception of low-to-intermediate level radioactive waste management, NGOs (4.35) showed the highest level, followed by citizens (3.46), media circles (3.38), Gyeongju residents (3.26) and the National Assembly (3.19), whose level of risk perception was somewhat high. Meanwhile, the government (2.78) and the residents of sites of nuclear power plants (2.78) did not show a high level of risk perception, and nuclear circles (2.16) and power plant workers residing in nearby towns (1.62) perceived management as almost not risky.

Comparing the level of risk perception for used fuel management, high-level radioactive waste management and low-to-intermediate level radioactive waste management, the level for high-level radioactive waste management was highest, while the level for low-to-intermediate level radioactive waste management was lowest. Local residents of sites of nuclear power plants, Gyeongju residents and power plant workers residing in nearby towns, who are all related to nuclear power plants directly or indirectly, showed the highest risk perception for the management of SNF, which is used fuel. The existence of SNF, used fuel, stored temporarily in the power plant might be reflected in this result.

Table 2-35 Citizens' Risk Perception of Low-to-Intermediate Level Radioactive Waste Management for Different Stages

(n=329)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	4.0%	28.3%	34.7%	26.1%	7.0%	3.04	0.99
Temporary Storage	2.4%	8.5%	26.1%	44.7%	18.2%	3.68	0.95
Transport	1.8%	10.6%	32.2%	38.0%	17.3%	3.58	0.96
Permanent Storage	2.1%	10.9%	31.6%	40.4%	14.9%	3.55	0.95
Low-to-Intermediate Level RWM	2.6%	14.6%	31.2%	37.3%	14.4%	3.46	0.81

Table 2-36 Nuclear circles' Risk Perception of Low-to-Intermediate Level Radioactive Waste Management for Different Stages

(n=191)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	22.5%	50.3%	18.3%	8.9%	0%	2.14	0.87
Temporary Storage	24.6%	42.4%	17.3%	14.7%	1.0%	2.25	1.02
Transport	29.3%	42.9%	17.3%	8.9%	1.6%	2.10	0.98
Permanent Storage	35.1%	41.4%	12.0%	10.5%	1.0%	2.01	0.99
Low-to-Intermediate Level RWM	27.9%	44.3%	16.2%	10.8%	0.9%	2.16	0.82

Table 2-37 Comparison of Risk Perception of Low-to-Intermediate Level Radioactive Waste Management for Different Stages

5-Point Scale

	Research Sector (n=50)	Regulatory Sector (n=48)	NPP Sector (n=50)	RWM Sector (n=43)	Entire Nuclear circles (n=191)
Production	2.20	2.35	1.72	2.30	2.14
Temporary Storage	2.42	2.31	1.92	2.37	2.25
Transport	2.22	2.17	1.98	2.05	2.10
Permanent Storage	2.14	2.10	1.84	1.95	2.01
Low-to-Intermediate Level RWM	2.25	2.23	1.87	2.17	2.16

Table 2-38 National Assembly's Risk Perception of Low-to-Intermediate Level Radioactive Waste Management for Different Stages
(n=50)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	2.0%	46.0%	32.0%	20.0%	0%	2.70	0.81
Temporary Storage	0%	16.0%	28.0%	42.0%	14.0%	3.54	0.93
Transport	0%	14.0%	52.0%	26.0%	8.0%	3.28	0.81
Permanent Storage	0%	18.0%	44.0%	34.0%	4.0%	3.24	0.80
Low-to-Intermediate Level RWM	0.5%	23.5%	39.0%	30.5%	6.5%	3.19	0.66

Table 2-39 NGO′ Risk Perception of Low-to-Intermediate Level Radioactive Waste Management for Different Stages
(n=50)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	0%	8.0%	2.0%	50.0%	40.0%	4.22	0.84
Temporary Storage	0%	2.0%	4.0%	38.0%	56.0%	4.48	0.68
Transport	0%	2.0%	6.0%	46.0%	46.0%	4.36	0.69
Permanent Storage	0%	2.0%	10.0%	42.0%	46.0%	4.32	0.74
Low-to-Intermediate Level RWM	0%	3.5%	5.1%	44.0%	47.0%	4.35	0.67

Table 2-40 Media Circles' Risk Perception of Low-to-Intermediate Level Radioactive Waste Management for Different Stages
(n=63)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	1.6%	31.7%	39.7%	23.8%	3.2%	2.95	0.87
Temporary Storage	0%	9.5%	20.6%	55.6%	14.3%	3.75	0.82
Transport	0%	14.3%	28.6%	52.4%	4.8%	3.48	0.80
Permanent Storage	1.6%	17.5%	23.8%	57.1%	0%	3.37	0.83
Low-to-Intermediate Level RWM	0.8%	18.3%	28.2%	47.2%	5.6%	3.38	0.68

Table 2-41 Comparison of Media Circles' Risk Perception of Low-to-Intermediate Level Radioactive Waste Management for Different Stages

5-Point Scale

	Journalists (n=41)	PDs (n=22)	Entire Media Circles (n=63)
Production	2.88	3.09	2.95
Temporary Storage	3.56	4.09	3.75
Transport	3.29	3.82	3.48
Permanent Storage	3.15	3.77	3.37
Low-to-Intermediate Level RWM	3.22	3.69	3.38

Table 2-42 Local Residents' Risk Perception of Low-to-Intermediate Level Radioactive Waste Management for Different Stages

(n=218)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	26.6%	32.6%	17.4%	22.0%	1.4%	2.39	1.14
Temporary Storage	18.8%	27.5%	17.0%	24.8%	11.9%	2.83	1.32
Transport	16.5%	25.2%	18.8%	26.1%	13.3%	2.95	1.31
Permanent Storage	16.5%	22.5%	22.9%	25.7%	12.4%	2.95	1.28
Low-to-Intermediate Level RWM	19.6%	27.0%	19.0%	25.6%	9.8%	2.78	1.13

Table 2-43 Government's Risk Perception of Low-to-Intermediate Level Radioactive Waste Management for Different Stages

(n=51)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	5.9%	49.0%	33.3%	9.8%	2.0%	2.53	0.83
Temporary Storage	7.8%	23.5%	31.4%	31.4%	5.9%	3.04	1.06
Transport	5.9%	29.4%	43.1%	17.6%	3.9%	2.84	0.92
Permanent Storage	13.7%	19.6%	45.1%	19.6%	2.0%	2.76	1.00
Low-to-Intermediate Level RWM	8.3%	30.2%	38.2%	19.6%	3.5%	2.79	0.81

Table 2-44 Comparison of Residents' Risk Perception of Low-to-Intermediate Level Radioactive Waste Management for Different Stages

5-Point Scale

	Gori Residents (n=45)	Wolseong Residents (n=60)	Yeonggwang Residents (n=63)	Uljin Residents (n=50)	Local Residents (n=218)	Gyeongju Residents (n=52)	Power Plant Workers Residing in Nearby Towns (n=111)
Production	2.71	2.68	2.35	1.80	2.39	2.73	1.59
Temporary Storage	3.42	3.47	2.35	2.16	2.83	3.19	1.62
Transport	3.64	3.55	2.30	2.40	2.95	3.54	1.74
Permanent Storage	3.53	3.57	2.38	2.40	2.95	3.60	1.54
Low-to-Intermediate Level RWM	3.33	3.32	2.35	2.19	2.78	3.26	1.62

Table 2-45 Risk Perception of Low-to-Intermediate Level Radioactive Waste Management for Different Stages

(n=1115)

	Never Risky	Not Risky	Neutral	Risky	Very Risky	Mean	Standard Deviation
Production	17.3%	35.8%	23.1%	19.4%	4.3%	2.58	1.11
Temporary Storage	14.5%	24.1%	19.5%	29.6%	12.3%	3.00	1.27
Transport	14.3%	24.3%	24.5%	26.1%	10.8%	2.95	1.23
Permanent Storage	17.5%	22.9%	22.8%	27.2%	9.6%	2.88	1.25
Low-to-Intermediate Level RWM	15.9%	26.8%	22.5%	25.6%	9.3%	2.85	1.10

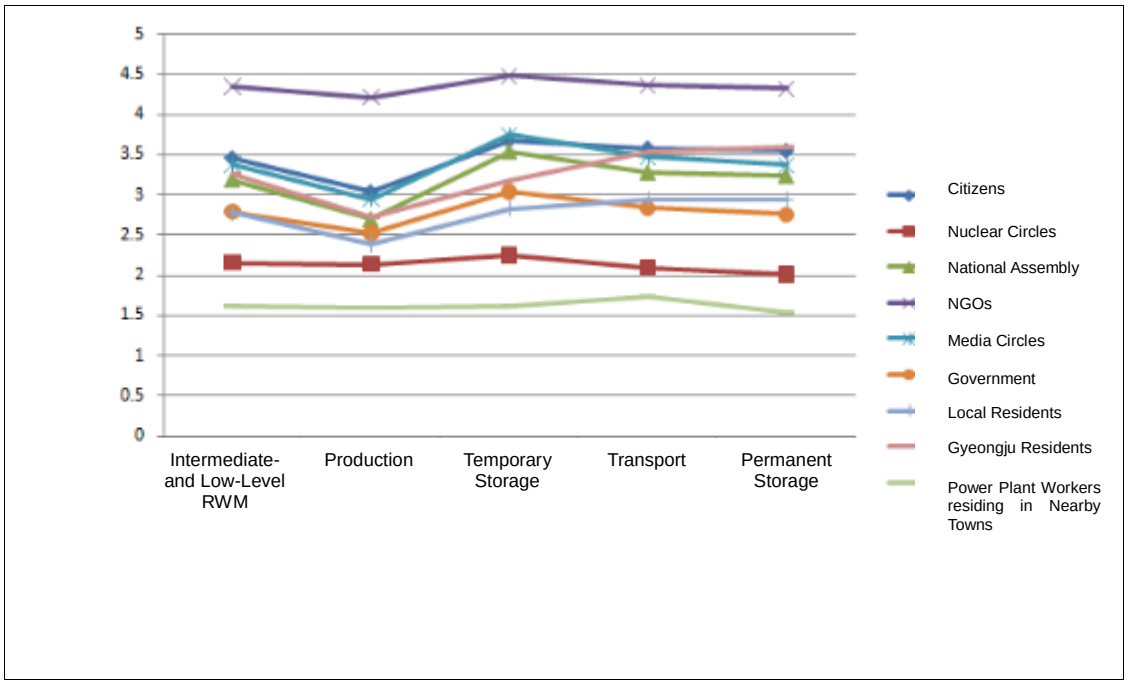

Figure 2-7 Comparison of Stakeholders' Risk Perception of Low-to-Intermediate Level Radioactive Waste Management

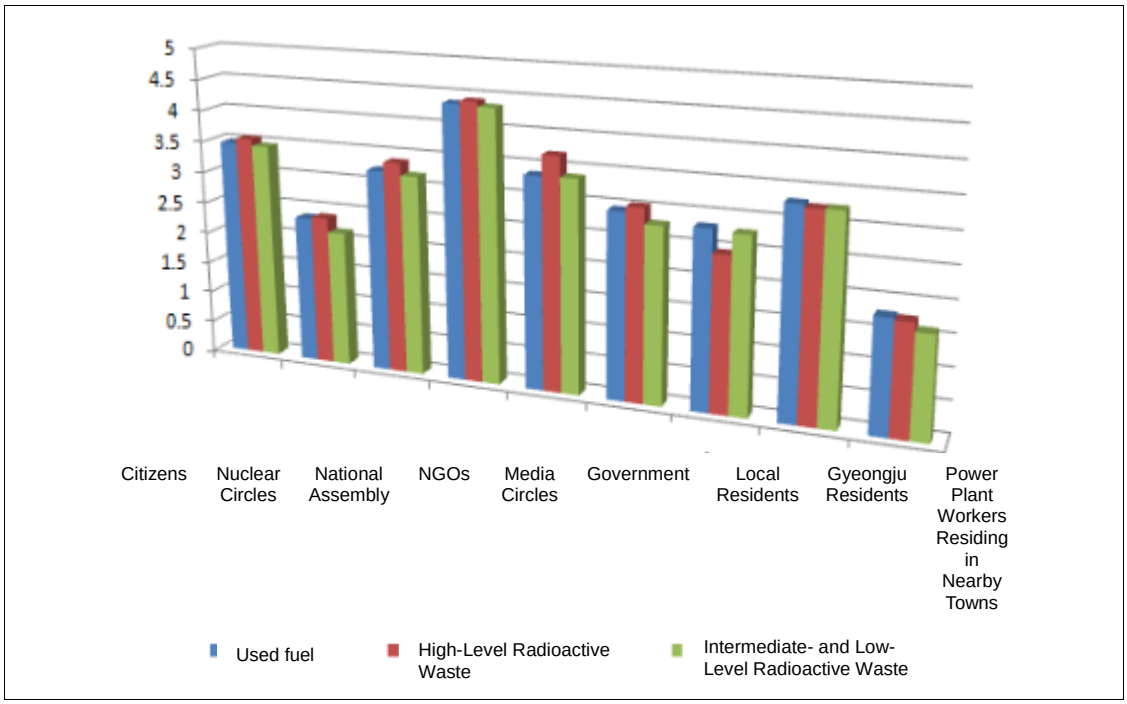

Figure 2-8 Comparison of Stakeholders' Risk Perception of Used Fuel Management, High-Level Radioactive Waste Management and Low-to-Intermediate Level Radioactive Waste Management

2.3.2 Risk Perception of Low-to-Intermediate Level Radioactive Waste

The following questionnaire item and Likert scale were used to measure the level of risk perception for low-to-intermediate level radioactive waste:

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
①	②	③	④	⑤

· Low-to-intermediate level radioactive waste is risky.

Comparing the risk perception level for low-to-intermediate level radioactive waste, NGOs (4.40) showed a distinctly higher level, followed by the residents in Gyeongju (3.60), where a low-to-intermediate level radioactive waste disposal facility is under construction. Citizens (3.59) also showed the same level as Gyeongju residents, and media circles (3.48) and the National Assembly (3.40) revealed a relatively high risk perception. The residents of sites of nuclear power plants (2.97) and the government (2.86) did not show a high level of risk perception for low-to-intermediate level radioactive waste, and nuclear circles (2.09) perceived low-to-intermediate level radioactive waste as almost not risky.

Meanwhile, the risk perception of used fuel, high-level radioactive waste and low-to-intermediate level radioactive waste differed from the risk perception for their management, respectively. First, citizens, the National Assembly, NGOs, media circles and the government were likely to perceive high-level radioactive waste as most risky. However, nuclear circles perceived used fuel as most risky, unlike their respective sector's risk perception of radioactive waste. Residents of sites of nuclear power plants showed the same tendency as they did for radioactive waste. That is, they perceived the risk of used fuel as relatively high. However, power plant workers residing in nearby towns showed the highest risk perception for high-level radioactive waste. This result might reflect the fact that power plant workers residing in nearby towns can directly experience low-to-intermediate level radioactive waste and used fuel but not high-level radioactive waste. What should be noted is the level of risk perceived by Gyeongju residents. They showed a higher risk perception for low-to-intermediate level radioactive waste than for used fuel or high-level radioactive waste. Gyeongju residents perceived low-to-intermediate level radioactive waste management to be more risky than high-level radioactive waste management though the gap is very slight compared to other stakeholders. This result confirms that the level of risk perception rises when confronted with the problem.

Table 2-46 Comparison of Risk Comparison of Low-to-Intermediate Level Radioactive Waste

		Never Risky		Not Risky		Neutral		Risky		Very Risky		Mean		Standard Deviation	
All (n=1115)		15.1%		22.4%		24.3%		29.2%		9.0%		2.94		1.22	
Citizens (n=329)		1.8%		9.7%		30.7%		43.2%		14.6%		3.59		0.92	
Nuclear Circles	Research (n=50)	34.0%	36.0%	36.6%	26.0%	16.8%	18.0%	11.5%	20.0%	1.0%	0%	2.09	2.22	1.03	1.15
	Regulatory (n=48)		22.9%		45.8%		18.8%		10.4%		2.1%		2.23		0.99
	NPP (n=50)		42.0%		40.0%		8.0%		8.0%		2.0%		1.88		1.00
	RWM (n=43)		34.9%		34.9%		23.3%		7.0%		0%		2.02		0.94
National Assembly (n=50)		0%		12.0%		40.0%		44.0%		4.0%		3.40		0.76	
NGOs (n=50)		0%		0%		10.0%		40.0%		50.0%		4.40		0.67	
Media Circles	Journalists (n=41)	0%	0%	17.5%	26.8%	31.7%	39.0%	47.6%	31.7%	3.2%	2.4%	3.48	3.10	0.81	0.83
	PDs (n=22)		0%		22.7%		45.5%		31.8%		0%		3.86		0.75
Government (n=51)		7.8%		21.6%		49.0%		19.6%		2.0%		2.86		0.89	
Local Residents	Gori (n=45)	11.5%	2.2%	28.0%	20.0%	21.1%	20.0%	30.7%	33.3%	8.7%	24.4%	2.97	3.58	1.18	1.14
	Wolseong (n=60)		1.7%		11.7%		26.7%		50.0%		10.0%		3.55		0.89
	Yeonggwang (n=63)		19.0%		44.4%		19.0%		17.5%		0%		2.35		1.00
	Uljin (n=50)		22.0%		34.0%		18.0%		22.0%		4.0%		2.52		1.18
Gyeongju Residents (n=52)		0%		9.6%		34.6%		42.3%		13.5%		3.60		0.85	
Power Plant Workers Residing in Nearby Towns (n=111)		53.2%		32.4%		11.7%		2.7%		0%		1.64		0.80	

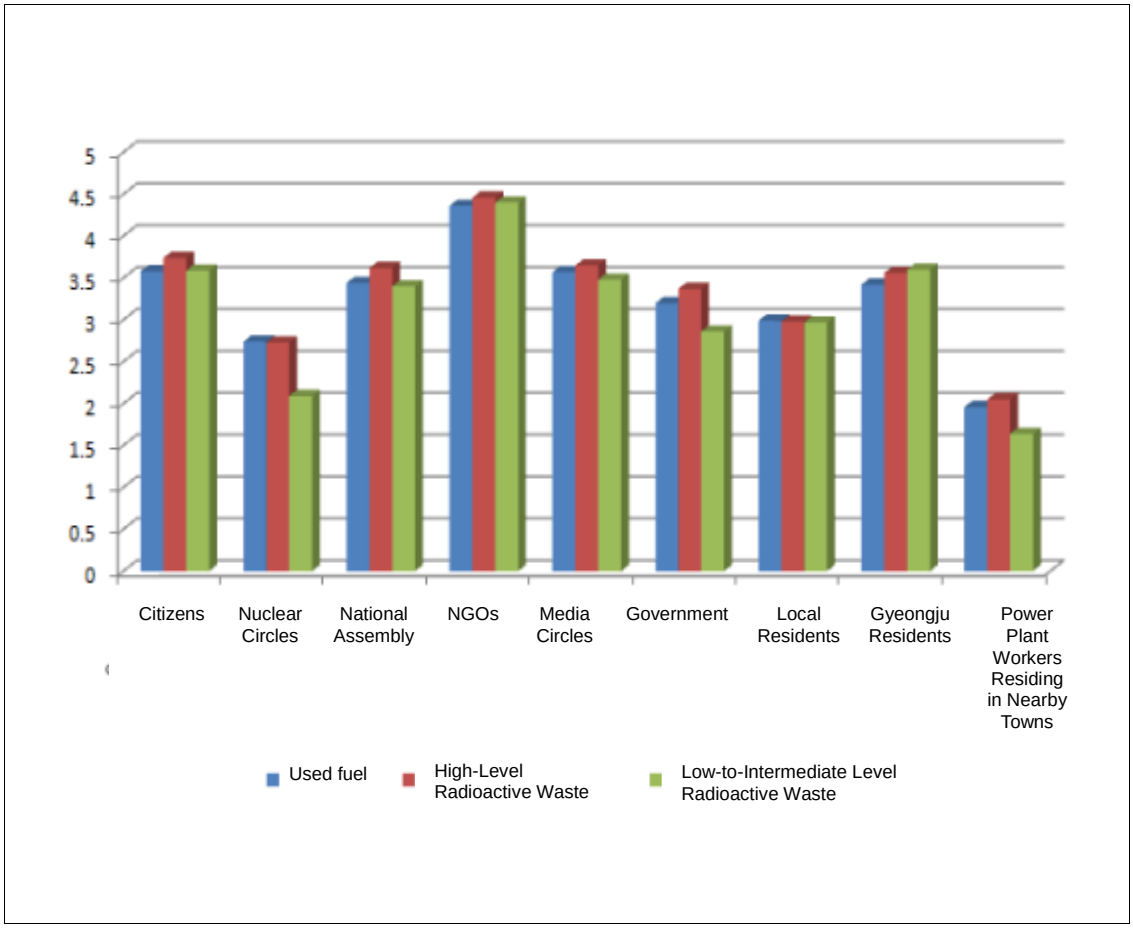

Figure 2-9 Comparison of Stakeholders' Risk Perception of Used Fuel, High-Level Radioactive Waste and Low-to-Intermediate Level Radioactive Waste

2.4 Risk Perception of Radioactive Waste

2.4.1 Stakeholders' Risk Perception of Radioactive Waste

Stakeholders' risk perception of radioactive waste, incorporating used fuel, high-level radioactive waste and low-to-intermediate level radioactive waste, has been discussed. The risk perception of radioactive waste is the mean of the values of risk perception for these 3 types of waste and the radioactive waste stored temporarily in nuclear power plants. NGOs (4.36) showed a distinctively higher risk perception than other stakeholders, followed by media circles (3.62). Citizens (3.58) revealed a somewhat higher level of risk perception for radioactive waste, and the National Assembly (3.44) and residents in Gyeongju (3.42) also showed a little higher risk perception. However, the risk of radioactive waste perceived by nuclear circles (2.74) was not high, and the regulatory sector (3.02) showed a relatively high risk perception. The residents of sites of nuclear power plants (2.99) were likely to perceive the risk of radioactive waste to be not serious. However, a big difference was found among the regions. The residents in Wolseong (3.73) and Gori (3.60) showed a relatively high risk perception, while the residents in Yeonggwang (2.27) and Uljin (2.46) perceived radioactive waste to be almost without risk. The higher risk perception by the residents in Wolseong and Gori might reflect their understanding of radioactive waste management.

Given these results, it is evident that risk perception of radioactive waste incorporating used fuel, high-level radioactive waste and low-to-intermediate level radioactive waste can differ depending on the relationship between the respective party and the type of radioactive waste and the closeness of the relationship.

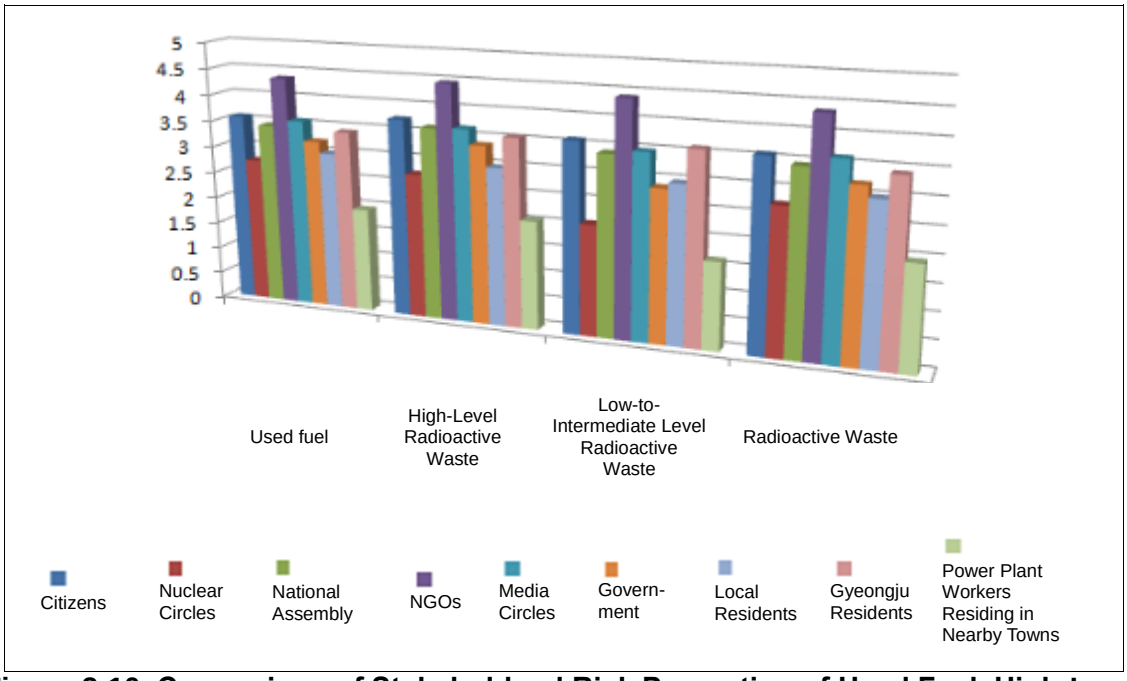

Figure 2-10 Comparison of Stakeholders' Risk Perception of Used Fuel, High-Level Radioactive Waste, Low-to-Intermediate Level Radioactive Waste and Radioactive Waste

Table 2-47 Comparison of Risk Perception of Radioactive Waste

		Never Risky		Not Risky		Neutral		Risky		Very Risky		Mean		Standard Deviation	
All (n=1115)		10.1%		21.6%		23.4%		34.2%		10.7%		3.14		1.17	
Citizens (n=329)		1.8%		11.2%		28.6%		43.8%		14.6%		3.58		0.93	
Nuclear Circles	Research (n=50)	14.1%	12.0%	31.4%	26.0%	24.1%	28.0%	26.7%	30.0%	3.7%	4.0%	2.74	2.88	1.11	1.10
	Regulators (n=48)		4.2%		33.3%		22.9%		35.4%		4.2%		3.02		1.02
	NPP (n=50)		30.0%		36.0%		16.0%		16.0%		2.0%		2.24		1.12
	RWM (n=43)		9.3%		30.2%		30.2%		25.6%		4.7%		2.86		1.10
National Assembly (n=50)		0%		12.0%		36.0%		48.0%		4.0%		3.44		0.76	
NGOs (n=50)		0%		2.0%		8.0%		42.0%		48.0%		4.36		0.72	
Media Circles	Journalists (n=41)	0%	0%	9.5%	14.6%	27.0%	29.3%	60.3%	51.2%	3.2%	4.9%	3.62	3.46	0.71	0.81
	PDs (n=22)		0%		0%		22.7%		77.3%		0%		3.77		0.43
Government (n=51)		0%		19.6%		45.1%		31.4%		3.9%		3.20		0.80	
Local Residents	Gori (n=45)	15.1%	4.4%	26.1%	20.0%	15.6%	13.3%	30.7%	35.6%	12.5%	26.7%	2.99	3.60	1.30	1.21
	Wolseong (n=60)		1.7%		11.7%		15.0%		55.0%		16.7%		3.73		0.94
	Yeonggwang (n=63)		22.2%		44.4%		19.0%		12.7%		1.6%		2.27		1.00
	Uljin (n=50)		32.0%		26.0%		14.0%		20.0%		8.0%		2.46		1.34
Gyeongju Residents (n=52)		0%		26.9%		17.3%		42.3%		13.5%		3.42		1.03	
Power Plant Workers Residing in Nearby Towns (n=111)		39.6%		34.2%		18.9%		4.5%		2.7%		1.96		1.01	

2.4.2 Science & Technology/Socio-Cultural/Positive-Negative Frameworks Regarding Radioactive Waste

Typically, nuclear experts and citizens are known to have distinctively different perceptions regarding radioactive waste. This tendency was confirmed through the results of the analyses. If so, do they have differences in their framework of understanding radioactive waste? The respondents were asked to present three words that came to mind when thinking of radioactive waste. The words collected in this way were categorized as either positive or negative.

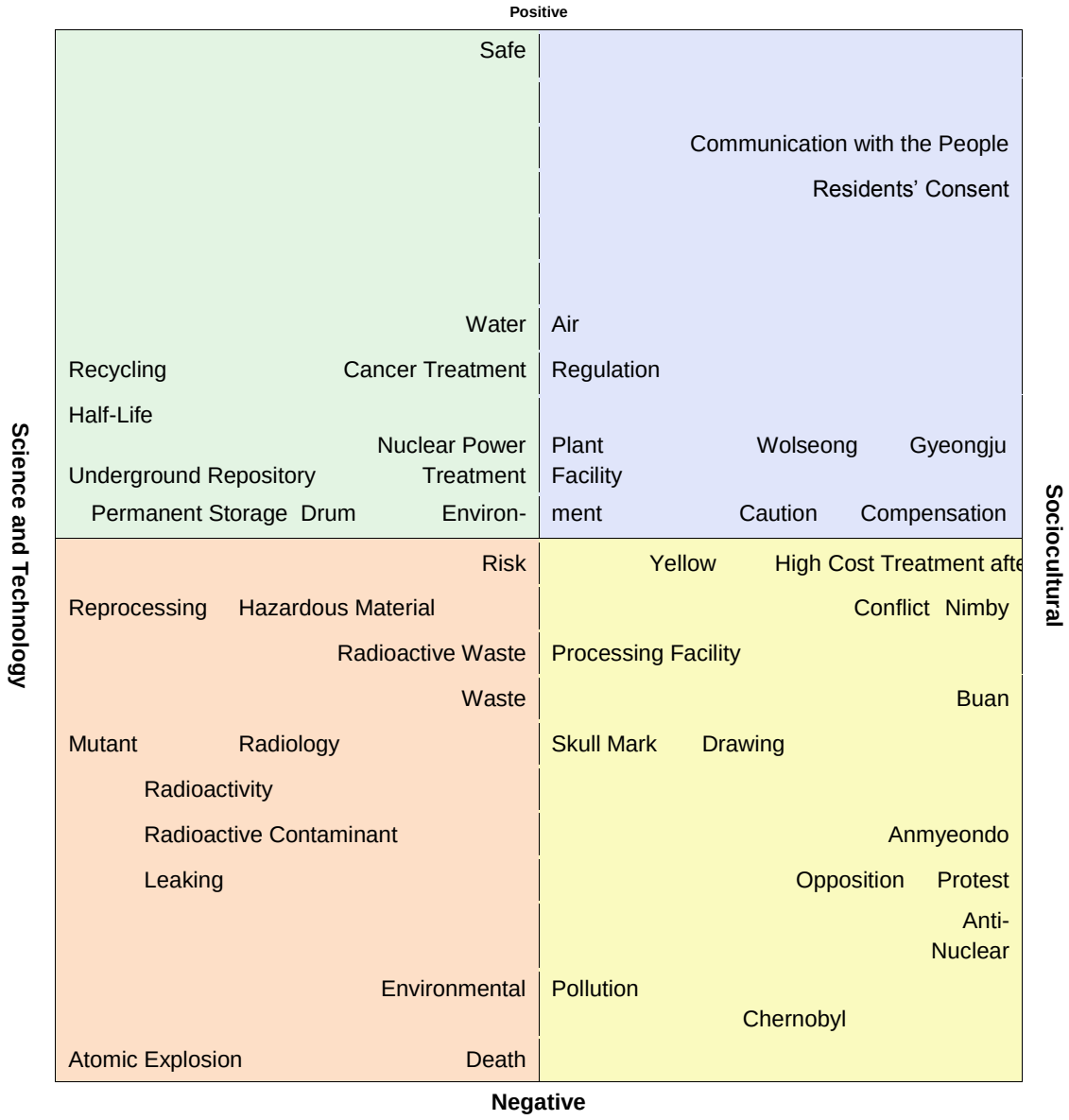

Figure 2-11 Citizens' Science & Technology/Society and Culture/Positivity-Negativity Frameworks Regarding Radioactive Waste

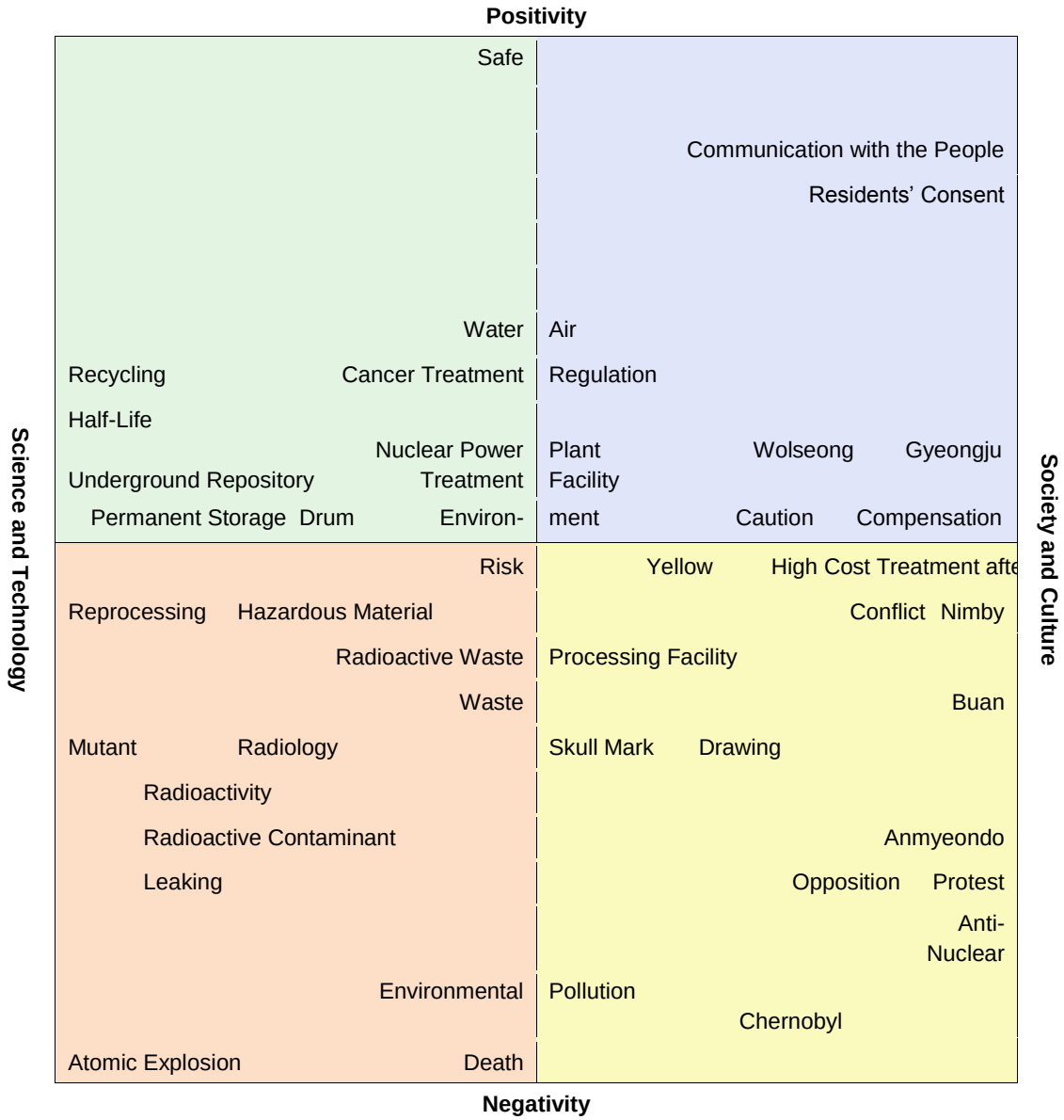

Figure 2-12 Nuclear circles' Science & Technology/Society and Culture/Positivity-Negativity Frameworks Regarding Radioactive Waste

It was found that citizens and nuclear circles have similar perception frameworks. More specifically, they were likely to perceive radioactive waste more negatively than positively, while the science-technology and socio-cultural aspects were more balanced. The reason why citizens and nuclear circles have similar perceptions might be attributed to the social conflicts regarding radioactive waste disposal facilities over the past 20 years including the selection of Gyeongju as the site for a low-to-intermediate level radioactive waste disposal facility in 2005.

3. PERCEPTION OF THE RADIOACTIVE WASTE MANAGEMENT POLICY AND ITS DECISION PROCESS

3.1 Perception of the Importance of Radioactive Waste Management Policy

To learn about perception of the importance of the radioactive waste management policy, issues currently emerging as social risks were sorted out and their weights measured. The following questionnaire items and Likert scale were used:

Please indicate how important you think the government's policy for each of the following risks is.

Strongly Unimportant	Unimportant	Neutral	Important	Strongly Important
①	②	③	④	⑤

1. Climate change
2. Terror
3. SNF
4. War
5. Nuclear power generation
6. Water shortage
7. Mad cow disease
8. GMO (Genetically Modified Object)
9. Nuclear proliferation (nuclear weapon)
10. New emerging epidemic
11. Shooting accident
12. Sexual crime
13. Radioactive waste
14. Science & technology
15. Poverty
16. Wrongful/Inaccurate media coverage

In general, the risk management policy for war (4.47) was perceived most important, followed by SNF/used fuel (4.33) and radioactive waste (4.32). The importance of the risk management policy for nuclear proliferation (nuclear weaponry) (4.30) was also highly perceived, followed by water shortage (4.28), new emerging epidemic (4.13) and nuclear power generation (4.13) in that

order. The risk management policy for war (4.30) was also perceived as most important by citizens, followed by radioactive waste (4.27), water shortage (4.27), SNF/used fuel (4.25), nuclear proliferation (nuclear weaponry) (4.22) and sexual crimes (4.16). The government put the priority on a policy for reducing the risk of water shortage (4.39) higher than for the risk of war (4.37), followed by nuclear proliferation (nuclear weaponry) (4.20), newly emerging epidemic (4.16), climate change (4.14), radioactive waste (4.10), and SNF/used fuel (4.10). The importance of risk management policies as perceived by nuclear circles were in the order of war (4.40), nuclear proliferation (nuclear weaponry) (4.25), SNF/used fuel (4.23), and climate change (4.21). It is noteworthy that they stress the policy for nuclear power generation (4.19) higher than the policy for radioactive waste (4.17). This result reconfirms that nuclear-related research and studies are more focused on nuclear power generation than on radioactive waste management. Among news media circles, war (4.63) was also indicated as a target for the most important risk management policy, followed by SNF/used fuel (4.50), climate change (4.27), nuclear proliferation (nuclear weaponry) (4.41), radioactive waste (4.39), and water shortage (4.34). The National Assembly also gave a high priority for a policy to prevent war (4.52) and indicated their priorities in the order of radioactive waste (4.34), sexual crimes (4.32), SNF/used fuel (4.28), water shortage (4.28), and terror (4.24). NGOs perceived the policy for managing radioactive waste (4.64) as most important and stressed in the order of SNF/used fuel (4.62), war (4.62), climate change (4.58), nuclear proliferation (nuclear weaponry) (4.50), sexual crimes (4.34). Given all these results, it is assumed that policies for nuclear proliferation (nuclear weaponry), SNF/used fuel and for radioactive waste management were perceived as very important, while nuclear policy focused on nuclear energy generation is regarded as relatively less important.

Table 3-1 Perception Comparison for the Importance of Risk Management Policy

5-Point Scale

	Citizens	Govern-ment	Nuclear Circles				Media Circles		National Assembly	NGOs
			Research Sector	Regulatory Sector	NPP Sector	RWM Sector	Journalists	PDs		
Climate Change 4.27	4.10	4.14	4.21				4.43		4.18	4.58
			4.23	3.91	4.38	4.33	4.49	4.36		
Terror 4.09	4.09	3.98	4.04				4.31		4.24	3.90
			3.71	4.00	4.31	4.14	4.29	4.32		
SNF/Used Fuel 4.33	4.25	4.10	4.23				4.50		4.28	4.62
			4.35	3.98	4.35	4.24	4.44	4.55		
War 4.47	4.30	4.37	4.40				4.63		4.52	4.62
			4.35	4.26	4.54	4.43	4.61	4.64		
Nuclear Power Generation 4.13	4.03	4.08	4.19				4.17		4.04	4.26
			4.32	3.89	4.31	4.24	4.24	4.09		
Water Shortage 4.28	4.27	4.39	4.11				4.34		4.28	4.30
			4.10	3.91	4.48	3.93	4.32	4.36		
Mad Cow Disease 3.83	3.85	3.73	3.66				3.90		3.78	4.08
			3.45	3.52	3.85	3.81	3.76	4.00		

5-Point Scale

	Citizens	Govern-ment	Nuclear Circles				Media Circles		National Assembly	NGOs
			Research Sector	Regulatory Sector	NPP Sector	RWM Sector	Journalists	PDs		
GMO 4.03	4.01	4.00	3.80				4.10		3.96	4.30
			3.61	3.67	4.02	3.88	3.93	4.18		
Nuclear Proliferation (Nuclear Weaponry) 4.30	4.22	4.20	4.25				4.41		4.22	4.50
			4.13	4.09	4.44	4.33	4.37	4.45		
New Emerging Epidemic 4.13	4.12	4.16	4.00				4.25		4.08	4.14
			3.77	3.87	4.27	4.19	4.17	4.32		
Shooting Incident 3.23	3.77	3.86	3.80				3.88		3.84	3.82
			3.48	3.70	4.12	3.90	3.76	4.00		
Sexual Crime 4.16	4.16	4.08	3.96				4.10		4.32	4.34
			3.74	3.78	4.25	4.05	4.10	4.05		
Radioactive Waste 4.32	4.27	4.10	4.17				4.39		4.34	4.64
			4.06	3.96	4.33	4.33	4.37	4.41		
Science and Technology 4.01	3.94	3.86	4.04				4.21		4.02	4.08
			4.13	3.76	4.21	4.07	4.00	4.41		
Poverty 4.09	3.97	3.98	3.89				4.22		4.08	4.38
			3.77	3.76	4.23	3.79	4.02	4.41		
Media Coverage 4.04	4.10	3.92	4.04				4.03		3.96	4.20
			3.97	3.98	4.19	4.00	3.61	4.45		

3.1.1 Perception of the Importance of Radioactive Waste Management Policy

To compare stakeholders' perception of the radioactive waste management policy, the perception level for the importance of the policy was converted into a standard score (Z-score)[6]. It was found that NGOs (0.77) perceived radioactive waste management policy as most important, followed by the National Assembly (0.53), media circles (0.38), citizens (0.36) and nuclear circles (0.22). However, local residents (0.07) and the government (0.08) perceived radioactive waste management policy as less important. Meanwhile, nuclear circles showed significant differences in perceiving the importance of radioactive waste management policy among the sectors. The radioactive waste management sector (0.37) saw the importance of the policy at a

[6] The standard score (Z-score) allows comparison of disparate types of data. The formula is as follows:

$$Z - Score = \frac{X(Score) - X(Mean)}{SD(Standard\ Deviation)}$$

similar level shown by media circles or citizens, while the NPP sector (0.08) revealed the lowest level for its importance. Journalists (0.47) stressed the importance of the radioactive waste management policy far more than PDs (0.23).

Table 3-2 Perception Comparison for the Importance of Radioactive Waste Management Policy

5-Point Scale

		Importance Perception Level		Standardized Importance Perception Level		SD	
Citizens		4.27		0.36		0.51	
Government		4.10		0.08		0.51	
Nuclear Circles	Research	4.17	4.06	0.22	0.24	0.55	0.58
	Regulatory		3.96		0.12		0.52
	NPP		4.33		0.08		0.52
	RWM		4.33		0.37		0.59
Local Residents		4.16		0.07		0.61	
Media Circles	Journalists	4.39	4.37	0.38	0.47	0.45	0.47
	PDs		4.41		0.23		0.43
National Assembly		4.34		0.53		0.40	
NGOs		4.64		0.77		0.44	

3.1.2 Perception of the Importance of SNF/Used Fuel Management Policy

Comparing the standard scores (Z scores) for the importance of a used fuel management policy, NGOs (0.71) had the highest perception level, followed by media circles (0.55), nuclear circles (0.29), the National Assembly (0.27), citizens (0.25) and finally residents at the sites of nuclear power plants (0.14). Regarding the importance of a used fuel management policy, nuclear circles did not show large differences among the sectors. The research sector (0.75) perceived the used fuel management policy as important more highly than other stakeholders. The NPP sector can be seen to perceive the used fuel management policy as very important at an equal level to the research sector (4.35). When using standard scores for comparison, however, this sector showed the lowest level (0.10) for the importance of this policy. This result can also be found among the residents of the sites of nuclear power plants. Their perception of the importance of a used fuel management policy (4.27) was considerably high but became quite low (0.14) when the perception was compared based on standard scores.

Table 3-3 Perception Comparison for the Importance of SNF/Used Fuel Management Policy

5-Point Scale

		Importance Perception Level		Standardized Importance Perception Level		SD	
Citizens		4.25		0.25		0.56	
Government		4.10		0.07		0.60	
Nuclear Circles	Research	4.23	4.35	0.29	0.75	0.63	0.61
	Regulatory		3.98		0.14		0.57
	NPP		4.35		0.10		0.58
	RWM		4.24		0.17		0.75
Local Residents		4.27		0.14		0.71	
Media Circles	Journalists	4.50	4.44	0.55	0.62	0.49	0.47
	PDs		4.55		0.42		0.55
National Assembly		4.28		0.27		0.56	
NGOs		4.62		0.71		0.45	

3.1.3 Perception of the Importance of Nuclear Energy Policy

Stakeholders' perception levels for the importance of a nuclear energy policy were converted into standard scores for comparison. Results revealed that this policy was perceived to be not so important as compared to risk management by the National Assembly (-1.71), citizens (-0.13), the residents of sites of nuclear power plants (-0.06) and NGOs (-0.05). The government (0.33) perceived its importance most highly, followed by nuclear circles (0.19). Especially, the research sector (0.53) regarded nuclear energy policy more highly than other stakeholders. Speaking of media circles, journalists (0.20) saw nuclear energy policy to be important, while PDs (-0.55) perceived it as not so important.

Table 3-4 Perception Comparison for the Importance of Nuclear Energy Policy

5-Point Scale

		Importance Perception Level		Standardized Importance Perception Level		SD	
Citizens		4.03		-0.13		0.62	
Government		4.08		0.33		0.60	
Nuclear Circles	Research	4.19	4.32	0.19	0.53	0.67	0.57
	Regulatory		3.89		0.06		0.62
	NPP		4.31		0.06		0.72
	RWM		4.24		0.17		0.78
Local Residents		4.15		-0.06		0.65	
Media Circles	Journalists	4.17	4.24	-0.04	0.20	0.45	0.45
	PDs		4.09		-0.55		0.40
National Assembly		4.04		-1.71		0.55	
NGOs		4.26		-0.05		0.75	

3.1.4 Perception Comparison for the Importance of the Nuclear Non-Proliferation Policy

Stakeholders' perception levels for the importance of the nuclear non-proliferation policy were converted into standard scores for comparison. It was found that NGOs (0.41) showed the highest level, followed by media circles (0.40) and then nuclear circles (0.30). The government (0.28) perceived it as important at a similar level to nuclear circles, while the National Assembly (0.18) showed a lower level. Citizens (0.08) and residents of sites of nuclear power plants (0.02) were not likely to perceive the importance of a nuclear non-proliferation policy as a risk management policy. Meanwhile, there was a very distinctive difference between journalists (0.53) and PDs (0.09). Nuclear circles also showed differences among sectors. The radioactive waste management sector (0.42) perceived the importance of the nuclear non-proliferation policy more highly than NGOs. The regulatory sector (0.20), however, was likely to perceive the nuclear non-proliferation policy as less important.

Table 3-5 Perception Comparison Regarding the Importance of Nuclear Non-Proliferation

5-Point Scale

		Importance Perception Level		Standardized Importance Perception Level		SD	
Citizens		4.22		0.08		0.57	
Government		4.20		0.28		0.50	
Nuclear Circles	Research	4.25	4.13	0.30	0.30	0.65	0.67
	Regulatory		4.09		0.21		0.76
	NPP		4.44		0.28		0.58
	RWM		4.33		0.42		0.57
Local Residents		4.18		0.02		0.63	
Media Circles	Journalists	4.41	4.37	0.40	0.53	0.47	0.40
	PDs		4.45		0.09		0.59
National Assembly		4.22		0.18		0.51	
NGOs		4.50		0.41		0.49	

3.1.5 Summary of the Perceived Importance of Radioactive Waste-Related Policies

The levels of importance perceived by stakeholders regarding radioactive waste-related policies, including the radioactive waste management policy, the used fuel management policy, the nuclear energy policy and the nuclear non-proliferation policy, were all compared. It was the radioactive waste management policy that was perceived as the most important by the largest number of stakeholders, including the National Assembly, citizens and NGOs. The importance of the used fuel policy was most highly perceived by residents at sites of nuclear power plants and media circles. Nuclear circles saw the importance of the non-proliferation policy and nuclear energy policy at an almost equal level while the government saw nuclear energy policy as most important. Given all these results, it can be interpreted that stakeholders perceive the importance of the policies differently depending on their interest. Considering this, it is necessary in the future to adjust the level of discussion and the level of participation when forming a radioactive waste management policy. It is desirable to include the various views of the stakeholders from the beginning of the policy making process. Stakeholder acceptance of the scope of the discussions, and their participation in the process is key to minimizing conflict and dissatisfaction with the final conclusions of the policy making process.

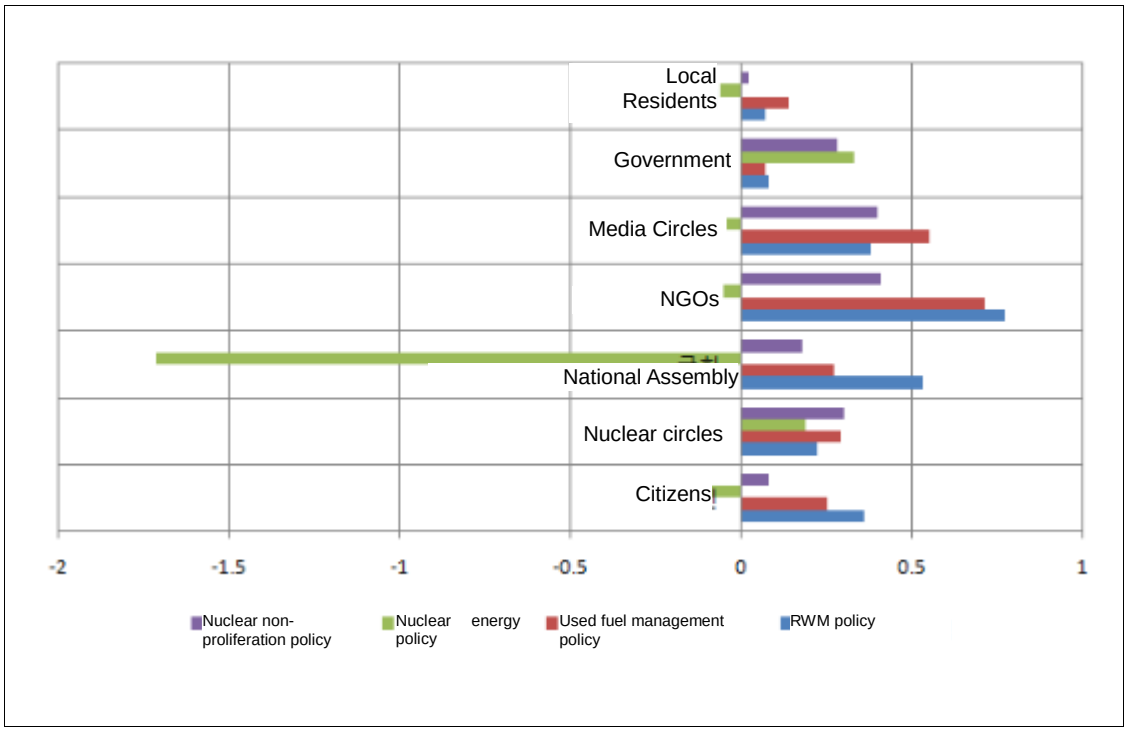

Figure 3-1 Comparison of Stakeholders' Perceived Importance of the Radioactive Waste-Related Policy

3.1.6 Perception of National Priorities for Solving the Radioactive Waste Problem

The perception of national priorities for solving the radioactive waste problem was investigated. The following questionnaire items and Likert scale were used:

Check your answer for the weight of each national priority for solving the radioactive waste problem.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
①	②	③	④	⑤

1. Reduction of nuclear power plants
2. Strengthening of the safety regulations
3. Development of new nuclear reactors
4. Development of radioactive waste disposal technology
5. Technology development of for reprocessing (recycling) of SNF
6. Securing trust with regards nuclear non-proliferation

7. **Preparation of international radioactive waste disposal facilities**
8. **Political decisions**
9. **Listening to public opinions**
10. **Consent of the people**
11. **Amendment of Agreement for Cooperation between the Government of the Republic of Korea and the Government of the United States of America concerning Civil Uses of Atomic Energy**

According to the results of the analyses, all stakeholders, except the government and NGOs, gave top priority to the development of radioactive waste disposal technology for solving the problem of radioactive waste. Meanwhile, looking into respective sectors of nuclear circles, the NPP sector placed the top priority on technology development for reprocessing (recycling) of used fuel. However, the research sector, the NPP sector and the radioactive waste management sector each gave the top priority at similar levels to the development for radioactive waste disposal technology and technology development for reprocessing (recycling) of SNF. What they stressed is the need for 'technology development.' Meanwhile, NGOs saw the consent of the people to be most important. The government placed top priority on the strengthening of the safety regulations and then the consent of the people. However, the government's perception of these areas as top priorities for solving the radioactive waste problem does not necessarily mean that the government's policy for these areas has the priority. Nevertheless, the government's priority with regards to the 'consent of the people' supports the argument that the government should listen to stakeholders, including citizens, to better understand their utmost needs. Additionally, the government needs to let citizens know that it places top priority on the 'consent of the people' for solving the radioactive waste problem.

Table 3-6 Comparison of Stakeholders' Priority Perception for Solving the Radioactive Waste Problem

5-Point Scale

	All	Citizens	Govern-ment	Nuclear Circles				Media Circles		National Assembly	NGOs	Local Residents
				Research Sector	Regula-tory Sector	NPP Sector	RWM Sector	Journ-alists	PDs			
Reduction of NPPs	2.90	3.02	2.94	2.25				3.02		2.80	4.44	3.42
				2.02	2.38	2.22	2.42	2.98	3.09			
Strengthening of Safety Regulations	4.04	4.19	4.10	4.05				4.22		4.20	4.52	3.77
				4.12	4.17	4.06	3.81	4.20	4.27			
Development of new Nuclear Reactors	3.80	3.78	3.60	3.95				3.48		3.46	2.54	3.96
				4.12	3.67	3.96	4.07	3.44	3.55			
Development of Radioactive Waste Disposal Technology	4.24	4.24	4.06	4.42				4.19		4.28	3.86	4.06
				4.58	4.23	4.44	4.42	4.17	4.23			
Technology Development for Reprocessing (Recycling) of SNF	4.17	4.21	3.94	4.39				4.27		4.24	3.52	3.91
				4.56	4.15	4.46	4.40	4.24	4.32			
Securing trust on Nuclear Non-Proliferation	3.98	3.97	3.88	4.05				4.13		3.96	4.00	3.77
				4.12	3.90	4.06	4.12	4.07	4.23			
Preparation of International Radioactive Waste Disposal Facilities	3.85	3.99	3.61	3.70				4.00		3.98	3.32	3.84
				3.90	3.46	3.70	3.74	3.93	4.14			
Political Decision	3.78	3.63	3.45	3.97				3.68		3.62	4.16	3.79
				4.22	3.69	3.90	4.07	3.66	3.73			
Listening to Public Opinions	3.97	3.86	3.98	4.05				4.11		3.90	4.58	3.87
				4.12	3.69	4.16	4.26	4.07	4.18			
Consent of the People	4.07	3.97	4.10	4.15				4.13		4.00	4.64	3.94
				4.14	3.94	4.22	4.33	4.05	4.27			
Amendment of Agreement for Cooperation between the Government of the Republic of Korea and the Government of the United States of America concerning Civil Uses of Atomic Energy	3.78	3.61	3.59	3.85				3.67		3.56	3.64	3.90
				3.64	3.77	3.94	4.09	3.61	3.77			

3.2 Trust in the Radioactive Waste Management Policymakers

3.2.1 Level of Trust in Policymakers

The following questionnaire items and Likert scale were used for citizens and residents at sites of nuclear power plants to measure the level of their trust in policymakers:

Indicate the level of your trust in each of the following groups asserting their opinions in the process of deciding radioactive waste management policy.

Strongly Distrust	Distrust	Neutral	Trust	Strongly Trust
①	②	③	④	⑤

1. Nuclear Energy Experts (Researchers)
2. Nuclear Energy Experts (Professors)
3. Government
4. Nuclear Energy Provider
5. Radioactive Waste Management Corporation
6. Environment Experts (Researchers)
7. Environment Experts (Professors)
8. Environmental NGO
9. NGO (Environmental NGO excluded)
10. IAEA (International Atomic Energy Agency)
11. Ministry of Knowledge Economy
12. Ministry of Education, Science and Technology
13. Ministry of the Environment
14. Residents at sites of nuclear power plants
15. Acquaintances
16. Newspapers
17. Broadcasters
18. Blogosphere
29. Internet Chat Zones
20. The Blue House (Korean President)

Environment experts (researchers) (3.67) won the highest trust from citizens, followed by the IAEA (3.66) and environmental experts (professors) (3.65). They also showed a relatively high

trust in nuclear energy experts (researchers: 3.64, professors: 3:57). It can be said that citizens were likely to trust experts. Meanwhile, their higher trust in environmental NGOs (3.41) and NGOs (3.21) (excluding environmental NGOs) rather than in the government (2.74) needs to be taken into account when policies are formed in the future. Their lower trust in newspapers (2.78) and broadcasters (2.79) than in the blogosphere (2.85), Internet chat zones (2.86) and acquaintances (2.80) should be investigated to identify the reason and to prepare a response to it. Their trust was not higher for nuclear energy providers (2.83) or radioactive waste management companies (2.88).

The IAEA (3.66) won the highest trust from the citizens, followed by environmental experts (researchers) (3.62) and nuclear energy experts (researchers) (3.59). Radioactive waste management companies (3.56) and nuclear energy providers (3.54) also received a relatively high trust. These results are understandable because residents at sites of nuclear power plants interrelate with the nuclear energy provider or the radioactive waste management corporation directly or indirectly. Compared to citizens, residents showed a higher trust in the government (3.06). Their trust was especially high for the Ministry of Knowledge Economy (3.49), the Ministry of Education, Science and Technology (3.54) and the Ministry of the Environment (3.38). What is noticeable is that residents at sites of nuclear power plants showed a high trust in themselves (3.41) and a relatively high trust in acquaintances (3.27). These results need to be carefully considered in the process of making the policy for radioactive waste management.

What should be seriously considered is the trust in government. As stated, citizens' trust in government was 2.74, neither high nor unreliable, while residents' trust was 3.06, a relatively reliable level. However, citizens' trust in the government ranked 15th out of 16 groups involved in the decision making of policies, while residents' trust in the government was last (16th out of 16). It is important to seek out the reason for this low level of trust and to prepare a specific alternative. The relatively high trust in nuclear energy experts should be noted and considered when communicating with citizens and residents at sites of nuclear power plants.

Table 3-7 Level of Trust in the Policymakers for Radioactive Waste Management

5-Point Scale

	Citizens		Local Residents	
	Trust Level	SD	Trust Level	SD
Nuclear Energy Experts (Researchers)	3.63	0.76	3.59	0.81
Nuclear Energy Experts (Professors)	3.57	0.78	3.53	0.91
Government	2.74	0.95	3.06	1.07
Nuclear Energy Provider	2.83	0.95	3.54	0.89
RWM Company	2.88	0.99	3.56	0.96
Environment Experts (Researchers)	3.67	0.85	3.62	0.89
Environment Experts (Professors)	3.65	0.85	3.50	0.88

5-Point Scale

	Citizens		Local Residents	
	Trust Level	SD	Trust Level	SD
Environmental NGOs	3.41	0.96	3.45	0.91
NGOs (Environmental NGO excluded)	3.21	0.94	3.48	0.90
IAEA	3.66	0.85	3.66	0.96
Ministry of Knowledge Economy	2.79	0.85	3.49	0.90
Ministry of Education, Science and Technology	2.94	0.90	3.54	0.90
Ministry of Environment	3.03	0.92	3.38	0.84
Residents at sites of NPPs	3.07	0.93	3.41	0.94
Acquaintances	2.80	0.88	3.27	0.97
Newspapers	2.78	0.86	3.44	0.90
Broadcasters	2.79	0.82	3.47	0.87
Blogs	2.85	0.86	3.45	0.90
Internet Chat Zone	2.86	0.89	3.37	0.87
The Blue House	2.57	1.02	3.44	0.89

3.2.2 Factors Influencing Trust in Policymakers

What are the factors influencing trust in the policymakers? To answer this question, the factors deemed influencing trust in the policymakers (the government, nuclear energy provider, radioactive waste management corporation, nuclear energy experts, and information providers) during the policy-making process were all investigated using simple regression analysis.

- **Education**
- **Environment First over Economic Development**
- **Seriousness of the Environmental Problem**
- **Need of Political Participation**
- **Willingness to Participate in the Policy-Making Process**
- **Perception of Media Bias**

According to the results of analyzing the factors influencing trust in the government, trust was higher as belief in the ‘environment first over economic development’ factor was lower, the environmental problem was considered less seriously, political participation was regarded as necessary and media coverage was viewed as biased. The factors influencing citizens’ trust in the

nuclear energy provider and radioactive waste management corporation showed a different pattern from their trust in the government. The trust in the provider and the radioactive waste management corporation was likely to go up as the 'environment first over economic development' factor was less stressed, the environmental problem was considered to be serious, political participation was regarded as necessary and media coverage was perceived as being biased. Additionally, trust in the provider and the radioactive waste management corporation tended to go up as willingness to participate in the policy-making process was lower. Trust in nuclear energy experts (researchers) was affected only by the need of political participation and the perception of media bias. However, education was found to not influence trust in the policymakers.

Table 3-8 Factors Influencing Citizens' Trust in the Government (n=329)

	Trust in the Government (β)	T	Degree of Freedom	F	p-value	R^2
Education	-0.005	-0.084	1,327	0.007	0.933	0.000
Environment First over Economic Development	-0.152	-2.773		7.692	0.006*	0.023
Seriousness of the Environmental Problem	-0.142	-2.599		6.755	0.010*	0.020
Need of Political Participation	0.154	2.813		7.915	0.005*	0.024
Willingness to Participate in the Policy-Making Process	-0.069	-1.251		1.564	0.212	0.005
Perception of Media Bias	0.347	6.685		44.693	0.000*	0.120

When p-value < 0.05 * is denoted.

Table 3-9 Factors Influencing Citizens' Trust in the Nuclear Energy Provider (n=329)

	Trust in the Nuclear Energy Provider (β)	t	Degree of Freedom	F	p-value	R^2
Education	0.079	1.431	1,327	2.047	0.153	0.006
Environment First over Economic Development	-0.139	-2.540		6.453	0.012*	0.019
Seriousness of the Environmental Problem	-0.135	-2.470		6.099	0.014*	0.018
Need of Political Participation	0.136	2.480		6.148	0.014*	0.018
Willingness to Participate in the Policy-Making Process	-0.167	-3.071		9.429	0.002*	0.028
Perception of Media Bias	0.383	7.494		56.164	0.000*	0.147

When p-value < 0.05 * is denoted.

Table 3-10 Factors Influencing Citizens' Trust in the Radioactive Waste Management corporation (n=329)

	Trust in the RWM Company (β)	t	Degree of Freedom	F	p-value	R^2
Education	0.060	1.094	1,327	1.198	0.275	0.004
Environment First over Economic Development	-0.148	-2.704		7.313	0.007*	0.022
Seriousness of the Environmental Problem	-0.126	-2.288		5.233	0.023*	0.016
Need of Political Participation	0.111	2.022		4.087	0.044*	0.012
Willingness to Participate in the Policy-Making Process	-0.129	-2.357		5.554	0.019*	0.017
Perception of Media Bias	0.377	7.357		54.129	0.000*	0.142

When p-value < 0.05 * is denoted.

Table 3-11 Factors Influencing Citizens' Trust in the Nuclear Energy Experts-Researchers (n=329)

	Trust in Nuclear Energy Experts (Researchers) (β)	t	Degree of Freedom	F	p-value	R^2
Education	-0.050	-.954	1,327	0.910	0.341	0.003
Environment First over Economic Development	0.091	1.651		2.726	0.100	0.008
Seriousness of the Environmental Problem	0.059	1.063		1.130	0.289	0.003
Need of Political Participation	0.196	3.611		13.037	0.000*	0.038
Willingness to Participate in the Policy-Making Process	0.034	0.609		0.370	0.543	0.001
Perception of Media Bias	0.180	3.312		10.972	0.001*	0.032

When p-value < 0.05 * is denoted.

For residents at sites of nuclear power plants (local residents), education was the prime factor influencing their trust in the government. As education was lower, trust in the government was higher. However, the factors influencing local residents' trust in the nuclear energy provider and radioactive waste management corporation differed. Trust in the provider was higher as education was lower, the environmental problem was considered less seriously and the belief in media coverage bias was higher. However, the seriousness of the environmental problem was found to not be influencing trust in the radioactive waste management corporation. Local

residents' trust in nuclear energy experts (researchers) was likely to rise as they stressed environmental conservation more than economic development and regarded media coverage as biased.

Table 3-12 Factors Influencing Local Residents' Trust in the Government (n=218)

	Trust in the Government (β)	t	Degree of Freedom	F	p-value	R^2
Education	-0.138	-2.049	1,216	4.197	0.042*	0.019
Environment First over Economic Development	0.036	0.523		0.274	0.601	0.001
Seriousness of the Environmental Problem	0.008	0.115		0.013	0.909	0.000
Need of Political Participation	-0.083	-1.217		1.481	0.225	0.007
Willingness to Participate in the Policy-Making Process	-0.040	-0.589		0.347	0.557	0.002
Perception of Media Bias	0.101	1.497		2.241	0.136	0.010

When p-value < 0.05 * is denoted.

Table 3-13 Factors Influencing Local Residents' Trust in the Nuclear Energy Provider (n=218)

	Trust in the Nuclear Energy Provider (β)	t	Degree of Freedom	F	p-value	R^2
Education	-0.194	-2.905	1,216	8.440	0.004*	0.038
Environment First over Economic Development	0.021	0.309		0.095	0.758	0.000
Seriousness of the Environmental Problem	-0.138	-2.051		4.205	0.042*	0.019
Need of Political Participation	-0.057	-0.839		0.704	0.402	0.003
Willingness to Participate in the Policy-Making Process	-0.077	-.1.136		1.290	0.257	0.006
Perception of Media Bias	0.267	4.075		16.608	0.000*	0.071

When p-value < 0.05 * is denoted.

Table 3-14 Factors Influencing Local Residents' Trust in the Radioactive Waste Management corporation (n=218)

	Trust in the RWM Company (β)	t	Degree of Freedom	F	p-value	R^2
Education	-0.196	-2.939	1,216	8.639	0.004	0.038
Environment First over Economic Development	0.063	0.932		0.869	0.352	0.004
Seriousness of the Environmental Problem	-0.078	-1.153		1.330	0.250	0.006
Need of Political Participation	0.048	0.705		0.497	0.482	0.002
Willingness to Participate in the Policy-Making Process	-0.061	-0.895		0.801	0.372	0.004
Perception of Media Bias	0.174	2.591		6.712	0.010*	0.030

When p-value < 0.05 * is denoted.

Table 3-15 Factors Influencing Local Residents' Trust in Nuclear Energy Experts-Researchers (n=218)

	Trust in the Nuclear Energy Experts (Researcher) (β)	t	Degree of Freedom	F	p-value	R^2
Education	-0.101	-1.486	1,216	2.209	0.139	0.010
Environment First over Economic Development	0.158	2.352		5.534	0.020*	0.025
Seriousness of the Environmental Problem	0.087	1.289		1.661	0.199	0.008
Need of Political Participation	0.075	1.109		1.230	0.269	0.006
Willingness to Participate in the Policy-Making Process	-0.032	-0.474		0.224	0.636	0.001
Perception of Media Bias	0.304	4.698		22.068	0.000*	0.093

When p-value < 0.05 * is denoted.

3.3 Influence of the Policymakers on the Policy-Making Process

The strength of policymakers' influence on radioactive waste management policy was measured by polling citizens, residents at sites of nuclear power plants, the government and media circles (journalists) using the following questionnaire items and Likert scale:

How much do you think each of the following groups influences the policy-making process for creating a radioactive waste management policy?

Strongly Uninfluential	Uninfluential	Neutral	Influential	Strongly Influential
①	②	③	④	⑤

1. Nuclear Energy Experts (Researchers)
2. Nuclear Energy Experts (Professors)
3. Government
4. Nuclear Energy Providers
5. Radioactive Waste Management corporation
6. Environment Experts (Researchers)
7. Environment Experts (Professors)
8. Environmental NGOs
9. NGOs (Environmental NGOs excluded)
10. IAEA (International Atomic Energy Agency)
11. Ministry of Knowledge Economy
12. Ministry of Education, Science and Technology
13. Ministry of Environment
14. Residents at sites of nuclear power plants
15. Newspapers
16. Broadcasters
17. Blogosphere
28. Internet Chat Zones
19. The Blue House (President)

Citizens (3.91), residents at sites of nuclear power plants (4.15), the government (4.12) and media circles (4.22) thought that the government has the strongest influence in deciding radioactive waste management policy. Of note, the fact that the government sees itself as the strongest influencer means that it should take the strongest responsibility for the policy.

Citizens responded that they believe that the policy-making process is most influenced by the government (3.91), followed by the IAEA (3.63), the Blue House (3.61), nuclear energy experts (researchers) (3.57), the nuclear energy experts (professors) (3.57) and nuclear energy providers (3.48) in that order. Residents at sites of nuclear power plants saw the strength of influence in the order of the government (4.15), the Blue House (3.94), nuclear energy providers (3.87), NGOs (3.87) (excluding environmental NGOs), and nuclear energy experts (professors). Media circles were likely to perceive the government (4.22) as the strongest influencer, followed by the Blue House (3.78), nuclear energy experts (professors) (3.76), nuclear energy experts (researchers) (3.73), and the Ministry of Knowledge Economy (3.66). The government saw the ranking of influence in the order of the government (4.12), the Blue House (4.02), nuclear energy experts (professors) (3.86), the Ministry of Knowledge Economy (3.98), IAEA (3.84), and the Ministry of Education, Science and Technology (3.84).

It was confirmed that the government and the Blue House were perceived as the most influential among citizens, residents at sites of nuclear power plants, the government and media circles (journalists). Especially, the government acknowledged its high influence and saw the Blue House as the strongest influencer. Additionally, the group indicated that the Ministry of Knowledge Economy, the Ministry of Education, Science and Technology, the IAEA and nuclear energy experts as the key influencers. Since the government regards 'nationwide consent' as one of the most important factors to be considered in solving the radioactive waste problem, remarkable political means must be developed. Though the influence of professors and researchers was viewed inconsistently among the responders, nuclear energy experts were perceived as having a relatively strong influence on the policy-making process. It is also noteworthy that the three stakeholders, except media circles (journalists), saw the IAEA as a key influencer. Of course, media circles also perceive the influence of the IAEA (3.63) as very high. These results indirectly stress that radioactive waste management should not be discussed as only a domestic problem.

Table 3-16 Stakeholders' Perception of Influence

5-Point Scale

	Citizens		Local Residents		Government		Media Circles (Journalists)	
	Level of Perceived Influence	SD	Level of Perceived Influence	SD	Level of Perceived Influence	SD	Level of Perceived Influence	SD
Nuclear Energy Experts (Researchers)	3.57	0.77	3.81	0.67	3.86	0.49	3.73	0.59
Nuclear Energy Experts (Professors)	3.57	0.77	3.86	0.93	3.80	0.53	3.76	0.54
Government	3.91	0.91	4.15	0.86	4.12	0.62	4.22	0.76
Nuclear Energy Provider	3.48	0.87	3.87	0.83	3.61	0.64	3.59	0.84
RWM Company	3.34	0.88	3.74	0.80	3.61	0.64	3.41	0.81
Environment Experts (Researchers)	3.37	0.81	3.80	0.87	3.51	0.61	3.20	0.56

5-Point Scale

	Citizens		Local Residents		Government		Media Circles (Journalists)	
	Level of Perceived Influence	SD	Level of Perceived Influence	SD	Level of Perceived Influence	SD	Level of Perceived Influence	SD
Environment Experts (Professors)	3.35	0.83	3.86	0.79	3.45	0.64	3.17	0.67
Environmental NGOs	3.22	0.90	3.84	0.82	3.24	0.79	2.98	0.91
NGOs (Environmental NGOs excluded)	3.05	0.95	3.83	0.81	3.16	0.81	2.90	0.83
IAEA	3.63	0.94	3.87	0.88	3.84	0.67	3.63	0.77
Ministry of Knowledge Economy	3.30	0.84	3.78	0.85	3.98	0.65	3.66	0.76
Ministry of Education, Science and Technology	3.40	0.83	3.81	0.85	3.84	0.73	3.49	0.75
Ministry of Environment	3.44	0.84	3.74	0.80	3.37	0.85	3.34	0.91
Residents at sites of the NPPs	2.97	1.01	3.66	1.02	3.57	0.78	3.24	1.02
Newspapers	3.09	0.88	3.70	0.80	3.31	0.62	3.49	0.68
Broadcasters	3.14	0.89	3.80	0.82	3.45	0.64	3.54	0.75
Blogs	2.66	0.94	3.63	0.92	2.80	0.66	2.51	0.75
Internet Chat Zone	2.66	0.96	3.68	0.81	2.80	0.75	2.44	0.74
The Blue House	3.61	1.05	3.94	0.68	4.02	0.84	3.78	1.06

3.4 Trust in Policymakers and Their Influence upon the Decision Making Process

Is the policymaker who gains the highest trust as a participant in the policymaking process necessarily the strongest influencer? According to the analysis of the answers given by citizens and residents at sites of nuclear power plants, the government, the strongest influencer upon the decision making process, was viewed as the 19th trust winner out of 20 groups by citizens and as the 20th (dead last) by residents at sites of nuclear power plants. The Blue House was seen as the #2 influencer but 20th trust winner by citizens, and as the #3 influencer but 14th trust winner by residents at sites of nuclear power plants. As with the government, the Blue House was among the lowest in winning trust. On the other hand, the IAEA was regarded as the 2nd and 3rd influencer by citizens and residents at sites of nuclear power plants, respectively. The agency also received high trust from both stakeholders, being 2nd and 1st out of 20 groups, respectively. Given these results, it can be assumed that citizens and residents at sites of nuclear power plants neither trust the government nor the Blue House even though seeing them as top influencers, however, they were likely to highly trust in the IAEA. It is true that radioactive waste management neither can nor should be treated as only a domestic problem. Nevertheless, it should be noted that if the IAEA exercises its influence while the Blue House, the final decision maker, and the government fail to win trust, new problems in relation to nuclear usage rights and energy security might emerge. Meanwhile, nuclear energy and environment experts enjoyed relatively high levels of both trust and influence. Considering these results, radioactive waste management policy should be taken very seriously and designed and executed carefully.

Table 3-17 Comparison of Trust and Influence of Policymakers Regarding Radioactive Waste Management

Order

	Citizens		Local Residents	
	Trust	Influence	Trust	Influence
Nuclear Energy Experts (Researchers)	4	4	3	8
Nuclear Energy Experts (Professors)	5	4	7	5
Government	19	1	20	1
Nuclear Energy Providers	14	6	5	3
RWM Company	11	11	4	13
Environment Experts (Researchers)	1	9	2	10
Environment Experts (Professors)	3	10	8	5
Environmental NGOs	6	13	12	6
NGOs (Environmental NGOs excluded)	7	16	10	7
IAEA	2	2	1	3
Ministry of Knowledge Economy	16	12	9	12
Ministry of Education, Science and Technology	10	8	5	8
Ministry of Environment	9	7	17	13
Residents at Sites of NPPs	8	17	16	17
Acquaintances	15	-	19	-
Newspapers	18	-15	14	15
Broadcasters	16	14	11	10
Blogs	13	18	12	18
Internet Chat Zones	12	19	18	16
The Blue House	20	3	14	2

4. KNOWLEDGE ABOUT RADIOACTIVE WASTE AND INFORMATION PROCESSING

4.1 Knowledge about Radioactive Waste

The risk source of radioactive waste is radioactivity, which generally refers to the release of radiation. How well do people understand the effects of radiation? In an attempt to ascertain this, people were asked to answer the questions below. The questions aimed at measuring knowledge about the characteristics and effects of radiation. Since the extent of knowledge tested by a question is limited, it must be noted that the level of knowledge measured is more suggestive than conclusive as an exploratory variable.

There are a lot of arguments regarding the effect of radioactive materials or radiation upon humans or the environment. Please answer if you agree or disagree with each of the following statements:

Agree **Disagree**

- **The most serious problem regarding radioactive waste is that radiation has a much longer lifespan than people.**
- **Since the first atomic bomb was dropped, new plant and animal species have emerged as a result.**
- **If time and strength are equal between two radiation types, if exposed to artificial radiation or natural radiation, their effect might be the same.**
- **The human body can self-repair cell tissues damaged by exposure to radiation.**

The questions have answers meeting scientific theories. First, radiation from nuclear power sources has a lifespan many times longer than the average span of a human. There is no evidence that artificial radiation has spawned new plant or animal species. Given the same strength and duration, both artificial radiation and natural radiation have an equal effect upon humans and animals. As our body can heal burnt skin by itself, it can also self-heal cell tissues damaged by exposure to radiation.

Stakeholders' levels of knowledge were converted into a 100-point score for comparison. It was found that nuclear circles (63.8) and power plant workers residing in nearby towns (63.8) had the highest knowledge level. Nuclear circles showed similar levels among the sectors, but experts belonging to the regulatory sector (64.5) had the highest level of knowledge. However, the absolute score reveals that the level is still far below the generally expected level. The absolute score is not discussed anymore because it could show a different level if the questions dealt with their specialty. The party showing the highest level of knowledge regarding radioactive waste

was residents at sites of nuclear power plants (51.8). The residents of Uljin (47.5) showed a relatively lower level of knowledge than those of Yeonggwang (57.3), Wolseong (56.8) and Gori (55.0). After them, Gyeongju residents (51.5) and the government (50.5) had a high level of knowledge. The government's knowledge was measured with the Ministry of Knowledge Economy, the Ministry of Education, Science and Technology and the Ministry of Environment, related to radioactive waste either directly or indirectly. Seeing the results, it is necessary to produce measures to improve their knowledge. The National Assembly (46.5) and NGOs (40.5) had levels of knowledge lower than those of citizens (48.8).

Table 4-1 Comparison of Levels of Knowledge regarding Radioactive Waste

4-Point Score

<table>
<tr><th colspan="2"></th><th colspan="2">Mean (100-Point Score)</th><th colspan="2">SD</th></tr>
<tr><td colspan="2">All (n=1115)</td><td colspan="2">2.18 (54.5)</td><td colspan="2">0.99</td></tr>
<tr><td colspan="2">Citizens (n=329)</td><td colspan="2">1.95 (48.8)</td><td colspan="2">0.85</td></tr>
<tr><td rowspan="4">Nuclear Circles (n=191)</td><td>Research (n=50)</td><td rowspan="4">2.55 (63.8)</td><td>2.54 (63.5)</td><td rowspan="4">1.02</td><td>1.01</td></tr>
<tr><td>Regulatory (n=48)</td><td>2.58 (64.5)</td><td>1.23</td></tr>
<tr><td>NPP (n=50)</td><td>2.54 (63.5)</td><td>0.91</td></tr>
<tr><td>RWM (n=43)</td><td>2.53 (63.3)</td><td>1.05</td></tr>
<tr><td colspan="2">National Assembly (n=50)</td><td colspan="2">1.86 (46.5)</td><td colspan="2">0.86</td></tr>
<tr><td colspan="2">NGOs (n=50)</td><td colspan="2">1.62 (40.5)</td><td colspan="2">0.75</td></tr>
<tr><td rowspan="2">Media Circles (n=63)</td><td>Journalists (n=41)</td><td rowspan="2">1.77 (44.3)</td><td>1.90 (47.5)</td><td rowspan="2">1.07</td><td>1.09</td></tr>
<tr><td>PDs (n=22)</td><td>1.64 (41.0)</td><td>1.05</td></tr>
<tr><td colspan="2">Government (n=51)</td><td colspan="2">2.02 (50.5)</td><td colspan="2">0.95</td></tr>
<tr><td rowspan="4">Local Residents (n=218)</td><td>Gori (n=45)</td><td rowspan="4">2.17 (51.8)</td><td>2.20 (55.0)</td><td rowspan="4">0.95</td><td>1.04</td></tr>
<tr><td>Wolseong (n=60)</td><td>2.27 (56.8)</td><td>0.88</td></tr>
<tr><td>Yeonggwang (n=63)</td><td>2.29 (57.3)</td><td>0.96</td></tr>
<tr><td>Uljin (n=50)</td><td>1.90 (47.5)</td><td>0.91</td></tr>
<tr><td colspan="2">Gyeongju Residents (n=52)</td><td colspan="2">2.06 (51.5)</td><td colspan="2">0.98</td></tr>
<tr><td colspan="2">Power Plant Workers Residing in Nearby Towns (n=111)</td><td colspan="2">2.55 (63.8)</td><td colspan="2">1.02</td></tr>
</table>

4.2 Self-Evaluation of Knowledge Related to Radioactive Waste

To see the level of knowledge about radioactive waste when it was measured by the subjects, the following questionnaire items and Likert scale were used:

How much do you think you know about radioactive materials or radiation compared to ordinary people?

Know Nothing	Don't Know	Neutral	Know	Know Very Well
①	②	③	④	⑤

According to the results of self-evaluated knowledge about radioactive waste, power plant workers residing in nearby towns (4.07) showed the highest level, followed by nuclear circles (3.73) though there were differences among the sectors. The NPP (4.06) and the regulatory sector (4.00) had a very high level, while the radioactive waste management sector (3.60) and research sector (3.24) showed a relatively low level. The following high scores were in the order of residents at sites of nuclear power plants (3.12), Gyeongju Residents (3.12), the government (2.82), media circles (2.62), citizens (2.61), the National Assembly (2.54) and NGOs (2.29).

Comparing the self-evaluated level and actual level, the self-evaluation results were high in the order of power plant workers residing in nearby towns, nuclear circles, residents at sites of nuclear power plants, Gyeongju residents, the government, media circles, citizens, the National Assembly and NGOs. The level of actual knowledge was high in the order of power plant workers residing in nearby towns, nuclear circles, residents at sites of nuclear power plants, Gyeongju residents, the government, citizens, the National Assembly, media circles and NGOs, showing almost the same order as the self-evaluated level.

Table 4-2 Comparison of Stakeholders' Self-Evaluation of Knowledge about Radioactive Waste

5-Point Scale

		Mean		SD	
All (n=1115)		3.17		1.12	
Citizens (n=329)		2.61		1.00	
Nuclear Circles (n=191)	Research (n=50)	3.73	3.24	1.04	1.01
	Regulatory (n=48)		4.00		0.97
	NPP (n=50)		4.06		0.98
	RWM (n=43)		3.60		1.01
National Assembly (n=50)		2.54		0.81	
NGOs (n=50)		2.29		0.97	
Media Circles (n=63)	Journalists (n=41)	2.65	2.66	0.63	0.69
	PDs (n=22)		2.59		0.50
Government (n=51)		2.82		0.82	
Local Residents (n=218)	Gori (n=45)	3.12	3.18	0.90	0.78
	Wolseong (n=60)		3.07		0.92
	Yeonggwang (n=63)		3.24		0.89
	Uljin (n=50)		3.28		0.99
Gyeongju Residents (n=52)		3.12		0.90	
Power Plant Workers Residing in Nearby Towns (n=111)		4.07		0.93	

4.3 Processing of Information about Radioactive Waste

4.3.1 Level of Confirming Information about Radioactive Waste

How often information about radioactive waste is confirmed for accuracy was investigated. For this measure, the following questionnaire items and Likert scale were used:

Never Confirm	Unlikely to Confirm	Neutral	Likely to Confirm	Always Confirm
①	②	③	④	⑤

- **When you obtain information about radioactive waste, how often do you confirm the information for accuracy?**

Power plant workers residing in nearby towns (3.43) most frequently confirmed information about radioactive waste when they obtained it. NGOs (3.26) were likely to confirm it, and nuclear circles (3.21) also tended to confirm it. However, it was found that the research sector (2.98) was more unlikely to confirm the information. The government (3.18) also tended to confirm the information, but citizens (2.52) were unlikely to confirm it. Residents at sites of nuclear power plants showed different patterns among the regions. The residents in Yeonggwang (3.60) were quite likely to confirm the information, and this tendency was also found in Uljin (3.06). However, the residents in Gori (2.56) and Wolseong (2.45) were more unlikely to confirm the information. An interesting result was found among media circles (2.98). Journalists (3.00) and PDs (2.95) were less likely to confirm the information. Since journalists and PDs usually get information from selected sources, the information they obtain can be regarded as reliable. Nevertheless, it must be indicated that they need to confirm the information more thoroughly.

Table 4-3 Comparison of the Level of Confirming Information about Radioactive Waste

5-Point Scale

		Mean		SD	
All (n=1115)		2.96		1.03	
Citizens (n=329)		2.52		0.93	
Nuclear Circles (n=191)	Research (n=50)	3.21	2.98	1.12	1.08
	Regulatory (n=48)		3.21		1.27
	NPP (n=50)		3.32		1.04

5-Point Scale

		Mean		SD	
	RWM (n=43)		3.34		1.09
National Assembly (n=50)		3.04		0.88	
NGOs (n=50)		3.26		0.83	
Media Circles (n=63)	Journalists (n=41)	2.98	3.00	0.73	0.74
	PDs (n=22)		2.95		0.72
Government (n=51)		3.18		0.84	
Local Residents (n=218)	Gori (n=45)	2.95	2.56	1.04	1.01
	Wolseong (n=60)		2.45		0.95
	Yeonggwang (n=63)		3.60		0.83
	Uljin (n=50)		3.06		0.96
Gyeongju Residents (n=52)		2.65		0.99	
Power Plant Workers Residing in Nearby Towns (n=111)		3.43		1.02	

4.3.2 Information Processing Types Regarding Radioactive Waste

The pattern of deciding the weight of information can be investigated by analyzing the filtering process of new information about radioactive waste. When people obtain information regarding radioactive waste, on which do they place more weight between the risk-amplifying information and the risk-attenuating information? To investigate whether an information filter exists in the individual's perception process, the following questionnaire items and Likert scale were used:

Absolutely Will Not Change	**Will Not Change**	**Neutral**	**Will Change**	**Absolutely Will Change**
①	②	③	④	⑤

- **You obtained new information about the risk of radioactive waste (radioactive waste) from a person, a group or a media source that you believe has kept a neutral position regarding the issue. According to the information, the risk of radioactive waste is more serious than you have known. Will you change your opinion?**

- **Now you obtained new information about the risk of radioactive waste (radioactive waste) from a person, a group or a media source that you believe has kept a neutral position regarding the issue. According to the information, the risk of radioactive waste is less serious than you have known. Will you change your opinion?**

According to the results of the analysis, nuclear circles (-0.25), in general, were likely to attenuate the risk. Looking into the sectors, however, the research sector (-0.24) and the NPP (-0.22) tended to attenuate the risk, while the regulatory sector (0.21) and radioactive waste management (0.29) were likely to amplify the risk. Besides nuclear circles, the power plant workers residing in nearby towns (-0.15), Gyeongju Residents (-0.12), and residents at sites of nuclear power plants (-0.11) were inclined to attenuate the risk. However, residents in Yeonggwang (0.01) showed a tendency to amplify the risk, while the government (-0.04) was found to attenuate the risk. NGOs (1.10) strongly amplified the risk, and media circles (0.32) and the National Assembly (0.16) tended to do so as well. Given all these results, it can be presumed that stakeholders prefer information meeting their beliefs. Accordingly, it would be helpful to know about the beliefs of the respective stakeholders before starting a discussion about the issue.

Table 4-4 Comparison of Tendencies of Amplifying or Attenuating Risk Depending on the Information Supplied

5-Point Scale

<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="2">Attenuation Mean</th><th colspan="2">Attenuation SD</th></tr>
<tr><th colspan="2">Amplification Mean</th><th colspan="2">Amplification SD</th></tr>
<tr><td colspan="2" rowspan="2">All (n=1115)</td><td colspan="2">3.18</td><td colspan="2">0.86</td></tr>
<tr><td colspan="2">3.26</td><td colspan="2">0.91</td></tr>
<tr><td colspan="2" rowspan="2">Citizens (n=329)</td><td colspan="2">3.23</td><td colspan="2">0.80</td></tr>
<tr><td colspan="2">3.48</td><td colspan="2">0.79</td></tr>
<tr><td rowspan="8">Nuclear Circles (n=119)</td><td rowspan="4">Research (n=50)
Regulatory (n=48)</td><td rowspan="4">2.95</td><td>3.22</td><td rowspan="4">0.94</td><td>0.84</td></tr>
<tr><td>2.98</td><td>0.92</td></tr>
<tr><td>2.58</td><td>0.94</td></tr>
<tr><td>2.77</td><td>1.06</td></tr>
<tr><td rowspan="4">NPP (n=50)
RWM (n=43)</td><td rowspan="4">2.82</td><td>3.10</td><td rowspan="4">1.00</td><td>0.91</td></tr>
<tr><td>2.88</td><td>0.94</td></tr>
<tr><td>2.88</td><td>0.98</td></tr>
<tr><td>2.60</td><td>1.07</td></tr>
<tr><td colspan="2" rowspan="2">National Assembly (n=50)</td><td colspan="2">3.36</td><td colspan="2">0.60</td></tr>
<tr><td colspan="2">3.52</td><td colspan="2">0.65</td></tr>
<tr><td colspan="2" rowspan="2">NGOs (n=50)</td><td colspan="2">2.80</td><td colspan="2">0.73</td></tr>
<tr><td colspan="2">3.90</td><td colspan="2">0.65</td></tr>
</table>

5-Point Scale

		Attenuation Mean		Attenuation SD	
		Amplification Mean		Amplification SD	
Media Circles (n=63)	Journalists (n=41)	3.23	3.22	0.61	0.61
					0.67
	PD (n=22)	3.55	3.23	0.67	0.61
					0.67
Government (n=51)		3.24		0.62	
		3.20		0.66	
Local Residents (n=218)	Gori (n=45)	3.45	3.40	0.81	0.78
			3.13		0.73
	Wolseong (n=60)		3.32		0.79
			3.25		0.80
	Yeonggwang (n=63)	3.34	3.62	0.85	0.81
			3.63		0.85
	Uljin (n=50)		3.44		0.84
			3.28		0.95
Gyeongju Residents (n=52)		3.54		0.67	
		3.42		0.64	
Power Plant Workers Residing in Nearby Towns (n=111)		3.10		1.04	
		2.95		1.08	

Meanwhile, the third person effect, which means ‘the third person is affected, but I am not,’ was measured using the following questionnaire items and Likert scale:

Absolutely Will Not Change	**Will Not Change**	**Neutral**	**Will Change**	**Absolutely Will Change**
①	②	③	④	⑤

- **If a person, a group or a media source that people believe has kept a neutral position regarding the risk of radioactive waste says that the risk of radioactive waste is more serious, do you think other people, not you, will change their opinions?**
- **If a person, a group or a media source that people believe has kept a neutral position regarding the risk of radioactive waste says that the risk of radioactive waste is less serious, do you think other people, not you, will change their opinions?**

According to the results of analyzing the third person effect, it was found that the stakeholders perceived that others have a similar information filtering system to theirs. Nuclear circles, residents at sites of nuclear power plants, Gyeongju residents, power plant workers residing in nearby towns and the government tended to think that others process the information in a manner that attenuated the risk. On the contrary, citizens, the National Assembly, NGOs and media circles were likely to perceive that others process the information in a manner that amplified the risk. These results confirm that stakeholders see the third person's position toward the risk of radioactive waste from their point of view. Accordingly, they might believe that others will view the issue in the same way when the same information is provided to them during the decision-making process. Therefore, the manner in which information is provided must be considered very carefully, especially when the information deals with the risk.

Table 4-5 Comparison of the Third Person Effect Regarding the Attenuation and Amplification of the Risk Depending on the Information

5-Point Scale

		Attenuation Mean		Attenuation SD	
		Amplification Mean		Amplification SD	
All (n=1115)		3.17		0.86	
		3.34		0.87	
Citizens (n=329)		3.15		0.80	
		3.53		0.77	
Nuclear Circles (n=191)	Research (n=50)	2.93	3.08	0.90	0.80
			2.90		0.89
	Regulatory (n=48)		2.60		0.87
			2.88		1.04
	NPP (n=50)	2.89	3.10	0.98	0.84
			3.00		0.90
	RWM (n=43)		2.91		1.02
			2.77		1.11
National Assembly (n=50)		3.34		0.72	
		3.62		0.57	
NGOs (n=50)		3.08		0.70	
		3.80		0.54	
Media Circles (n=68)	Journalists (n=41)	3.13	3.17	0.58	0.63
			3.54		0.64
	PD (n=22)	3.55	3.09	0.66	0.53
			3.55		0.67
Government (n=51)		3.25		0.63	
		3.29		0.64	

5-Point Scale

		Attenuation Mean		Attenuation SD	
		Amplification Mean		Amplification SD	
Local Residents (n=218)	Gori (n=45)	3.46	3.40	0.81	0.75
			3.22		0.77
	Wolseong (n=60)		3.33		0.76
			3.27		0.76
	Yeonggwang (n=63)	3.39	3.62	0.82	0.83
			3.67		0.78
	Uljin (n=50)		3.46		0.84
			3.32		0.91
Gyeongju Residents (n=52)		3.58		0.67	
		3.44		0.64	
Power Plant Workers Residing in Nearby Towns (n=111)		3.04		1.10	
		3.13		1.05	

5. MEDIA INVOLVEMENT WITH RADIOACTIVE WASTE MANAGEMENT

5.1 Level of Media Use, Media Exposure and Media Preference

5.1.1 Level of Media Use as an Information Source

This study investigated where the stakeholders obtained information about radioactive waste including nuclear energy generation. Especially, the level of use of newspapers, broadcasters and the Internet, which are media categories, was stressed. The following questionnaire items and Likert scale were used:

Check your answer for the use of the source from which you get information about radioactive waste including nuclear energy generation.

Never Use	Unlikely to Use	Neutral	Likely to Use	Absolutely Use
①	②	③	④	⑤

1. **Newspapers**
2. **Broadcasters**
3. **Internet**
4. **Acquaintances**
5. **Government Data (Internet websites included)**
6. **Related Agency's Data (Internet websites included)**
7. **Experts**

According to the results of the analysis, experts (3.52) were most frequently used by citizens as an information source for radioactive waste, followed by the Internet (3.47), related agency's data (3.37) and broadcasters (3.36). They also used newspapers (3.13) as a source less frequently. Nuclear circles used the sources in the order of experts (3.98), related agency's data (3.85), government data (3.39), and the Internet (3.26). They used newspapers (3.08), broadcasters (3.08) and acquaintances (3.08) as information sources with equal but the lowest frequency. Nuclear engineering related researchers, the NPP and radioactive waste management sectors showed similar patterns. In contrast, the regulatory sector showed less frequent use of acquaintances (3.23), the 4th choice in frequency, newspapers (2.88) and broadcasters (2.85). Sources of information that the National Assembly used were in the order of experts (3.62), related agency's data (3.48), the Internet (3.48), newspapers (3.42), broadcasters (3.40) and government data (3.26). Acquaintances (2.74) were used infrequently as an information source. Experts (3.98) were used mostly frequently as an information source by the NGOs, followed by the Internet (3.78), related agency's data (3.76), newspapers (3.56) and broadcasters (3.46). Government data (3.28) was used most infrequently as with acquaintances (3.28). Related agency's data (3.57)

was most frequently used by the government as an information source, followed by experts (3.51), broadcasters (3.49), the Internet (3.49), newspapers (3.43) and government Data (3.39). Experts (3.57) were used most frequently as an information source by media circles, followed by newspapers (3.52), broadcasters (3.49), the Internet (3.49), related agency's data (3.30) and government data (3.11). Residents at sites of nuclear power plants showed a different pattern of media use from other parties. Broadcasters (3.97) were mostly frequently used by them as an information source, followed by the Internet (3.74), acquaintances (3.60), experts (3.49), government data (3.48), related agency's data (3.47) and newspapers (3.32). Gyeongju residents used the Internet (4.27) and broadcasters (4.23) quite frequently, and other sources were used in the order of acquaintances (3.98), experts (3.94), government data (3.92), related agency's data (3.90) and newspapers (3.73). Local residents' frequent use of broadcasters and the Internet as information sources suggests how information should be provided. Their relatively high reliance on acquaintances as an information source must also be reflected in the manner of providing information.

Table 5-1 Comparison of Media Use as an Information Source

5-Point Scale

Classification		Newspapers		Broadcasters		Internet		Acquaintances		Government Data		Related Agency's Data		Experts	
All (n=1115)		3.29 (0.97)		3.48 (0.99)		3.55 (1.01)		3.15 (1.05)		3.32 (1.00)		3.62 (0.95)		3.73 (1.05)	
Nuclear Circles	Citizens (n=329)	3.13 (1.04)		3.36 (0.96)		3.47 (0.98)		2.89 (1.05)		2.97 (1.09)		3.37 (1.02)		3.52 (1.17)	
	Research (n=50)	3.08 (0.89)	3.22 (0.98)	3.08 (0.87)	3.22 (0.93)	3.26 (0.90)	3.42 (0.81)	3.08 (0.89)	3.18 (0.92)	3.39 (0.83)	3.34 (0.82)	3.85 (0.87)	3.88 (1.04)	3.98 (1.15)	4.08 (1.12)
	Regulatory (n=48)		2.88 (0.82)		2.85 (0.83)		3.10 (0.81)		3.23 (0.63)		3.38 (0.70)		3.67 (0.86)		3.88 (0.84)
	NPP (n=50)		3.06 (0.91)		3.04 (0.88)		3.14 (1.07)		2.84 (0.91)		3.44 (0.99)		4.00 (0.86)		4.04 (1.51)
	RWM (n=43)		3.19 (0.82)		3.23 (0.81)		3.37 (0.85)		3.07 (1.01)		3.42 (0.76)		3.84 (0.62)		3.93 (1.03)
National Assembly (n=50)		3.42 (0.61)		3.40 (0.61)		3.48 (0.74)		2.74 (0.88)		3.26 (0.88)		3.48 (0.79)		3.62 (0.78)	
NGOs (n=50)		3.56 (0.73)		3.46 (0.76)		3.78 (0.74)		3.28 (0.81)		3.28 (0.88)		3.76 (0.69)		3.98 (0.69)	
Media Circles	Journalists (n=41)	3.52 (0.59)	3.49 (0.55)	3.49 (0.62)	3.44 (0.59)	3.49 (0.67)	3.44 (0.67)	2.71 (0.91)	2.63 (0.94)	3.11 (0.83)	3.22 (0.76)	3.30 (0.84)	3.32 (0.79)	3.57 (0.88)	3.61 (0.80)
	PD (n=22)		3.59 (0.67)		3.59 (0.67)		3.59 (0.67)		2.86 (0.83)		2.91 (0.92)		3.27 (0.94)		3.50 (1.01)
Government (n=51)		3.43 (0.61)		3.49 (0.67)		3.49 (0.78)		2.86 (0.72)		3.39 (0.72)		3.57 (0.70)		3.51 (0.81)	
Local Residents	Gori (n=45)	3.32 (0.96)	3.56 (0.97)	3.97 (0.88)	3.96 (0.82)	3.74 (1.10)	4.13 (0.87)	3.60 (1.03)	3.82 (0.98)	3.48 (0.92)	3.60 (0.92)	3.47 (0.90)	3.62 (0.91)	3.49 (0.80)	3.60 (0.81)
	Wolseong (n=60)		3.15 (0.92)		3.68 (0.85)		4.03 (0.88)		3.70 (0.87)		3.48 (0.89)		3.58 (0.74)		3.47 (0.75)
	Yeonggwang (n=63)		2.92 (0.89)		4.25 (0.72)		3.05 (1.08)		3.03 (0.98)		2.97 (0.78)		2.79 (0.83)		3.02 (0.66)
	Uljin (n=50)		3.80 (0.86)		3.96 (1.03)		3.92 (1.18)		3.98 (1.04)		4.00 (0.78)		4.06 0.59)		4.02 (0.65)
Gyeongju Residents (n=52)		3.73 (0.56)		4.23 (0.76)		4.27 (0.97)		3.98 (0.78)		3.92 (0.84)		3.90 (0.80)		3.94 (0.70)	
Power Plant Workers Residing in Nearby Towns (n=111)		3.49 (1.04)		3.50 (1.12)		3.70 (1.12)		3.22 (1.10)		3.76 (0.74)		4.08 (0.74)		4.00 (1.23)	

- The figure in ( ) is the standard deviation.

5.1.2 Level of Media Exposure

The media exposure of stakeholders was measured. Here, "the media" refers to the traditional categories of newspapers and broadcasters. The following questionnaire items and Likert scale were used:

Less Than 1 Day/Week	1-2 Days/Week	3-4 Days/Week	5-6 Days/Week	Everyday
①	②	③	④	⑤

· How often do you watch TV?

· How often do you read the newspaper (daily)?

According to the results of analyzing media exposure of the stakeholders, about 46 to 64 % of residents at sites of nuclear power plants (except those in Gori) do not read the newspapers, whereas almost all stakeholders are watching TV news.

Table 5-2 Comparison of Stakeholders' Media Exposure

Day, %

		Newspapers						Broadcasters					
		Less than 1	1-2 Days	3-4 Days	5-6 Days	Every -day	None	Less than 1 Day	1-2 Days	3-4 Days	5-6 Days	Every -day	None
All (n=1115)		13.0	15.4	18.4	10.7	28.3	13.9	4.6	14.5	22.5	15.9	42.3	0
Citizens (n=329)		23.7	24.6	18.5	7.9	25.2	0	2.4	12.2	25.5	14.3	45.6	0
Nuclear Circles	Research (n=50)	12.0	20.0	28.0	18.0	22.0	0	8.0	24.0	24.0	18.0	26.0	0
	Regulatory (n=48)	12.5	14.6	12.5	12.5	47.9	0	6.3	16.7	20.8	14.6	41.7	0
	RWM (n=50)	0	12.0	18.0	16.0	52.0	0	4.0	10.0	28.0	16.0	42.0	0
	RWM (n=43)	16.3	11.6	41.9	2.3	25.6	0	16.3	11.6	14.0	20.9	37.2	0
n= (191)		9.9	14.7	24.6	12.6	37.2	1.0	8.4	15.7	22.0	17.3	36.6	0
National Assembly (n=50)		4.0	2.0	18.0	22.0	54.0	0	2.0	12.0	22.0	22.0	42.0	0
NGOs (n=50)		8.0	14.0	32.0	10.0	36.0	0	22.0	16.0	32.0	8.0	22.0	0
Media Circles	Journalists (n=41)	2.4	4.9	14.6	7.3	70.7	0	0	19.5	9.8	14.6	56.1	0
	PD (n=22)	22.7	36.4	9.1	9.1	22.7	0	0	31.8	18.2	18.2	31.8	0
(n=63)		9.5	15.9	12.7	7.9	54.0	0	0	23.8	12.7	15.9	47.6	0
Government (n=51)		17.6	25.5	25.5	3.9	27.5	0	0	31.4	23.5	9.8	35.3	0

Day, %

		Newspapers						Broadcasters					
		Less than 1	1-2 Days	3-4 Days	5-6 Days	Every -day	None	Less than 1 Day	1-2 Days	3-4 Days	5-6 Days	Every -day	None
Local Residents	Gori (n=45)	2.2	0	22.2	8.9	4.4	0	2.2	13.3	24.4	26.7	33.3	0
	Wolseong (n=60)	5.0	5.0	8.3	6.7	13.3	61.7	8.3	20.0	26.7	13.3	31.7	0
	Yeonggwang (n=63)	20.6	3.2	19.0	1.6	9.5	46.0	0	1.6	15.9	22.2	60.3	0
	Uljin (n=50)	2.0	16.0	6.0	10.0	2.0	64.0	2.0	22.0	10.0	10.0	56.0	0
	(n=218)	8.3	6.0	13.8	6.4	7.8	57.8	3.2	13.8	19.3	17.9	45.9	0
Gyeongju Residents (n=52)		0	7.7	1.9	21.2	9.6	59.6	1.9	11.5	21.2	17.3	48.1	0
Power Plant Workers Residing in Nearby Towns (n=111)		6.3	14.4	19.8	19.8	13.3	6.3	4.5	9.0	24.3	14.4	47.7	0

5.1.3 Media Preference Level

What is the stakeholders' favorite newspaper? What is their favorite broadcaster for news programs? Their media choice is important because each newspaper and broadcasting company has its own relatively distinct characteristics and viewpoints. The Chosun Ilbo, Joongang Ilbo and Dong-A Ilbo are politically conservative newspapers, while Hankyoreh and Kyunghyang Sinmun are liberal ones. The Maeil Business and Hankook Economy are the financial press of the nation so they are not driven so much by either conservative or liberal ideologies, but rather are reporting on business, economic and stock market news. KBS is a conservative broadcaster, while MBC is liberal. Compared to these broadcasters, SBS and YTN are less politically oriented.

According to the results of the analysis of stakeholders' preferred newspaper, the Chosun Ilbo was read by the largest number of citizens, followed by the Joongang Ilbo, Maeil Business, others, and Hankyoreh in that order. Internet newspapers belong to the group of others. Nuclear circles preferred newspapers in the order of Chosun Ilbo, Joongang Ilbo, Hankyoreh, Kyunghyang Sinmum and Maeil Business. However, preferences differed among sectors. The research sector's preference was in the order of Chosun Ilbo, Kyunghyang Sinmum, Hankyoreh, Joongang Ilbo and Dong-A Ilbo, while the regulatory sector preferred the Joongang Ilbo, Hankyoreh, Chosun Ilbo, Kyunghyang Sinmum, Hankook Ilbo and Maeil Business in that order. The NPP sector chose in the order of Chosun Ilbo, Joongang Ilbo and Maeil Business, and also read Hankyoreh at a similar preference level. The Chosun Ilbo was most preferred by the radioactive waste management sector, followed by the Joongang Ilbo and Hankyoreh, Dong-A Ilbo and Kyunghyang Sinmum. The Chosun Ilbo was most preferred by 50% of the National Assembly, followed by the Joongang Ilbo, Dong-A Ilbo and Hankyoreh and Maeil Business. NGOs showed a different preference pattern from other groups. For them the Kyunghyang Sinmum was the most preferred, followed by Hankyoreh. These two newspapers were preferred by over 60% of the NGOs, while 14% read the Chosun Ilbo most frequently. Media circles read Hankyoreh most frequently, and over 30% of them preferred the Chosun Ilbo, Joongang Ilbo and Kyunghyang Sinmum. The Dong-A Ilbo was preferred by 17.5% of media circles. The Chosun Ilbo was read most frequently by the government, followed by the Joongang Ilbo, Dong-A Ilbo, Kyunghyang Sinmum and Hankyoreh. Regarding residents at sites of nuclear power plants, most of them did not read newspapers as stated in the section of media exposure. Their preference was in the order of Chosun Ilbo, Joongang Ilbo, Hankyoreh and Dong-A Ilbo. Except for the Chosun Ilbo, other newspapers were read by less than 10% of the residents. Over 50% of Gyeongju residents did not read newspapers. The Chosun Ilbo was preferred by 21.1% of the residents reading newspapers, followed by the Dong-A Ilbo and Joongang Ilbo. Most of the others included local newspapers. Power plant workers residing in nearby towns preferred in the order of Hankyoreh, Chosun Ilbo, Joongang Ilbo, Kyunghyang Sinmum and Maeil Business.

Table 5-3 Comparison of Stakeholders' Newspaper Preference

%, multiple selection allowed

		Chosun Ilbo	Joongang Ilbo	Dong-A Ilbo	Hankyoreh	Kyunghyang Sinmum	Hankook Ilbo	Maeil Business	Hankook Economy	Others	Not Reading
All (n=1115)		23.3	17.7	10.8	18.3	13.2	4.2	11.3	3.3	7.2	15.1
Citizens (n=329)		22.8	16.7	9.1	13.1	8.2	5.2	14.9	4.3	13.7	1.5
Nuclear Circles	Research (n=50)	30.3	24.0	14.0	24.0	26.0	0	6.0	2.0	0	0
	Regulatory (n=48)	18.8	22.9	2.1	20.8	10.4	8.3	8.3	0	6.3	2.1
	NPP (n=50)	26.0	26.0	14.0	24.0	14.0	6.0	26.0	6.0	8.0	0
	RWM (n=43)	37.2	16.3	7.0	16.3	7.0	4.7	7.0	0	2.3	2.3
(n=191)		27.7	22.5	9.4	21.5	14.7	4.7	12.0	2.1	4.1	1.0
National Assembly (n=50)		50.0	38.0	34.0	34.0	30.0	14.0	32.0	8.0	8.0	0
NGOs (n=50)		14.0	8.0	6.0	60.0	64.0	0	2.0	0	4.0	0
Media Circles	Journalists (n=41)	48.8	46.3	22.0	46.3	43.9	17.1	17.1	12.2	2.4	0
	PD (n=22)	18.2	18.2	9.1	31.8	18.2	4.5	0	0	13.6	0
(n=63)		38.1	36.5	17.5	41.3	34.9	11.1	12.7	7.9	6.3	0
Government (n=51)		25.5	21.6	19.6	15.7	17.6	7.8	21.6	5.9	13.8	0
Local Residents	Gori (n=45)	2.2	13.3	4.4	2.2	0	0	2.2	0	13.3	62.2
	Wolseong (n=60)	18.3	3.3	6.7	5.0	5.0	3.3	0	0	0	61.7
	Yeonggwang (n=63)	9.5	7.9	11.1	11.1	6.3	7.9	0	0	0	46.0
	Uljin (n=50)	14.0	10.0	2.0	8.0	2.0	4.0	0	0	0	64.0
(n=218)		11.5	8.3	6.4	6.9	3.2	0	4.1	0.9	2.8	57.8
Gyeongju Residents (n=52)		21.2	5.8	9.6	0	0	0	0	0	3.8	59.6
Power Plant Workers Residing in Nearby Towns (n=111)		22.5	17.1	9.9	24.3	12.6	3.6	11.7	6.3	3.6	8.1

According to the results of the analysis of preferred broadcasters for news programs, most of the citizens reported that they preferred watching MBC and KBS. Nuclear circles were likely to prefer MBC to KBS, and SBS was preferred to YTN. However, regional conditions are deemed reflected in the differences between these two parties. Most of the members of nuclear circles live in Daejon, not Seoul, so their interest in the Seoul-based SBS programs is limited. Their preference for MBC is three times higher than for KBS. In obtaining information, they also preferred MBC to KBS by more than twice. NGO's preference for MBC was about 7 times higher than for KBS.

Table 5-4 Comparison of Stakeholders' Broadcaster Preference

%, multiple selection allowed

		KBS	MBC	SBS	YTN	Other
Nuclear Circles	All (n=1115)	30.7	49.1	7.7	10.8	16.0
	Citizens (n=329)	31.3	49.8	8.8	7.0	2.7
	Research (n=50)	36.0	42.0	4.0	18.0	0
	Regulatory (n=48)	27.1	52.1	4.2	14.6	2.1
	NPP (n=50)	34.0	48.0	6.0	10.0	0
	RWM (n=43)	44.2	30.2	2.3	20.9	2.3
	(n=191)	35.1	43.5	4.2	15.7	1.5
National Assembly (n=50)		22.0	66.0	4.0	8.0	0
NGOs (n=50)		12.0	82.0	2.0	4.0	0
Media Circles	Journalists (n=41)	48.8	46.3	2.4	2.4	0
	PD (n=22)	18.2	68.2	0	13.6	0
	(n=63)	38.1	54.0	1.6	6.3	0
Local Residents	Government (n=51)	23.5	58.8	13.7	3.9	0
	Gori (n=45)	33.3	51.1	8.9	6.7	0
	Wolseong (n=60)	16.7	51.7	16.7	13.3	1.7
	Yeonggwang (n=63)	44.4	38.1	6.3	11.1	0
	Uljin (n=50)	30.0	38.0	20.0	12.0	0
	(n=218)	31.2	44.5	12.8	11.0	0.5
Gyeongju Residents (n=52)		36.5	36.5	17.3	9.6	0
Power Plant Workers Residing in Nearby Towns (n=111)		24.3	49.5	5.4	18.9	1.8

5.2 Perception of Media Coverage

5.2.1 Perception of Accuracy of Media Coverage

The stakeholders' perception of accuracy of media coverage was investigated, using the following questionnaire items and Likert scale:

Do you think that information about radioactive waste including nuclear energy generation provided by the media is accurate?

	Very Inaccurate	Inaccurate	Neutral	Accurate	Very Accurate
	①	②	③	④	⑤
1. Newspapers					
2. TV					

According to the results of the analysis on the perception of the accuracy of media coverage, all stakeholders were likely to perceive the information provided by broadcasters as more accurate than the information provided by newspapers. Gyeongju residents (3.58) perceived the accuracy of coverage provided by newspapers most highly, followed by residents at sites of nuclear power plants (3.36). The accuracy of media coverage perceived by residents in Uljin (3.66) and Gori (3.62) was higher than that by Gyeongju residents. It should be noted that the residents in Wolseong (3.23) and Gyeong (3.53), geographically closely located, showed a difference in perceiving the accuracy of the coverage provided by newspapers. Meanwhile, NGOs (2.80) and the National Assembly (2.94) were somewhat skeptical about the accuracy of newspaper coverage. Nuclear circles (2.96) showed differences among the sectors. The research sector (3.16) and the radioactive waste management sector (3.02) were likely to acknowledge the accuracy of newspaper coverage, while the regulatory sector (2.79) and NPP sector (2.86) were skeptical about it. As for the accuracy of coverage provided by broadcasters, the accuracy perceived by Gyeongju residents (3.69) was highest. Their perceived accuracy of newspaper coverage was also highest. NGOs (2.90) and most sectors of nuclear circles (2.97), except the regulatory sector (2.83) and NPP sector (2.90), perceived the accuracy of the coverage provided by broadcasters as being higher than the normal level.

Table 5-5 Comparison of Stakeholders' Perceived Accuracy of Media Coverage

5-Point Scale

Classification		Newspapers				Broadcasters			
		Mean		SD		**Mean**		SD	
All (n=1115)		3.09		0.73		3.19		0.78	
Citizens (n=329)		2.93		0.79		3.05		0.85	
Nuclear Circles (n=191)	Research (n=50)	2.96	3.16	0.73	0.91	2.97	3.14	0.64	0.54
	Regulatory (n=48)	2.96	2.79	0.73	0.58	2.97	2.83	0.64	0.56
	NPP (n=50)	2.96	2.86	0.73	0.70	2.97	2.90	0.64	0.81
	RWM (n=43)	2.96	3.02	0.73	0.64	2.97	3.02	0.64	0.60
National Assembly (n=50)		2.94		0.37		3.10		0.58	
NGOs (n=50)		2.80		0.50		2.90		0.54	
Media Circles (n=63)	Journalists (n=41)	3.05	3.10	0.52	0.54	3.06	3.10	0.56	0.58
	PD (n=22)	3.05	2.95	0.52	0.49	3.06	3.00	0.56	0.54
Government (n=51)		3.10		0.54		3.16		0.51	
Local Residents (n=218)	Gori (n=45)	3.36	3.62	0.70	0.68	3.53	3.76	0.82	0.74
	Wolseong (n=60)	3.36	3.23	0.70	0.62	3.53	3.28	0.82	0.64
	Yeonggwang (n=63)	3.36	3.29	0.70	0.63	3.53	3.73	0.82	0.88
	Uljin (n=50)	3.36	3.66	0.70	0.72	3.53	3.84	0.82	0.79
Gyeongju Residents (n=52)		3.58		0.67		3.69		0.76	
Power Plant Workers Residing in Nearby Towns (n=111)		3.22		0.71		3.31		0.78	

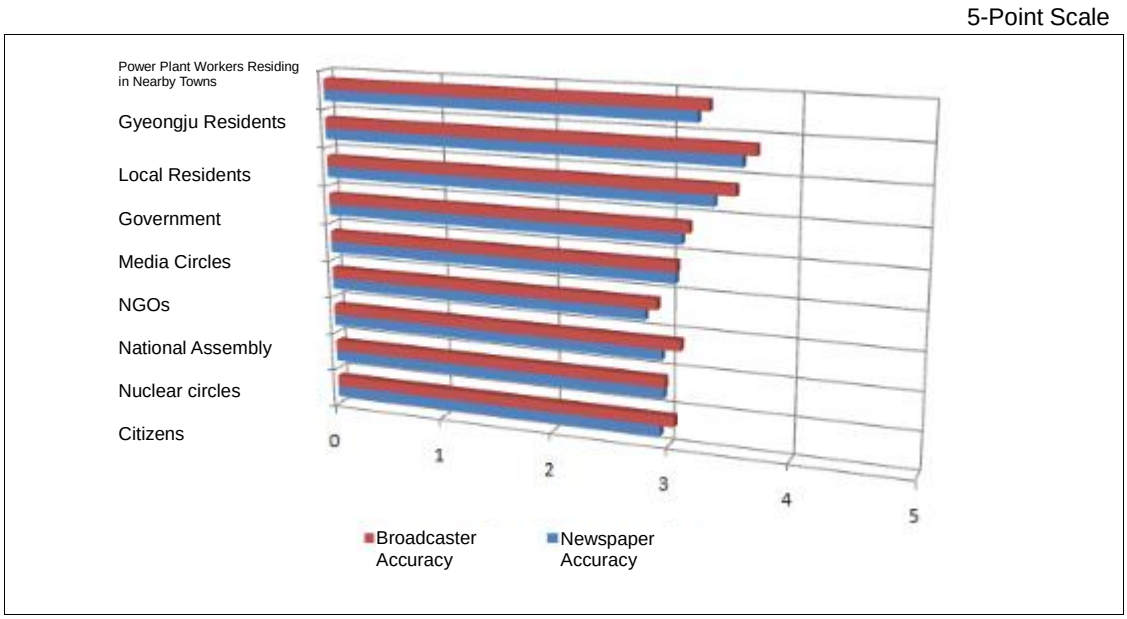

Figure 5-1 Comparison of Stakeholders' Perceived Accuracy of Media Coverage

5.2.2 Level of Perceived Media Bias

This study investigated how the stakeholders evaluated the risk of radioactive waste as covered by newspapers and broadcasters, namely the bias of the news media. The following questionnaire items and Likert scale were used:

Indicate your answer regarding media coverage about the risk of radioactive waste including nuclear energy generation.

Very Underestimated	Underestimated	Neutral	Overestimated	Very Overestimated
①	②	③	④	⑤

1. Newspapers (dailies)

2. TV

According to the results of the analysis on the perception of media bias, NGOs were likely to perceive that newspaper coverage generally attenuated the risk of radioactive waste. Citizens (2.99) were almost neutral in perceiving media bias, and media circles (2.97) also had a similar perception. The National Assembly also perceived that media coverage tended to attenuate the risk. However, nuclear circles (3.48), Gyeongju residents (3.46), residents at sites of nuclear power plants (3.34), power plant workers residing in nearby towns (3.27), and the government (3.20) all tended to perceive that newspapers amplified the risk. Regarding coverage provided by broadcasters, NGOs (2.32) perceived that broadcasters tended to attenuate the risk of radioactive

waste. Media circles (2.98) did not acknowledge media bias. Other stakeholders seemed to perceive that broadcasters amplified the risk.

Table 5-6 Comparison of the Level of Stakeholders' Perceived Media Bias

1-2 Likely to Underestimate the Risk, 3 Neutral, 4-5 Likely to Overestimate the Risk

Classification		Newspapers				Broadcasters			
		M		SD		M		SD	
All (n=1115)		3.19		0.78		3.17		0.73	
Citizens (n=329)		2.99		0.77		3.06		0.73	
Nuclear Circles (n=191)	Research (n=50)	3.48	3.60	0.75	0.70	3.43	3.42	0.65	0.58
	Regulatory (n=48)		3.60		0.77		3.58		0.61
	NPP (n=50)		3.44		0.76		3.40		0.67
	RWM (n=43)		3.26		0.76		3.30		0.74
National Assembly (n=50)		2.90		0.51		3.06		0.47	
NGOs (n=50)		2.24		0.77		2.32		0.84	
Media Circles (n=63)	Journalists (n=41)	2.97	3.05	0.62	0.63	2.98	3.07	0.61	0.65
	PD (n=22)		2.82		0.59		2.82		0.50
Local Residents (n=218)	Government (n=51)	3.20		0.60		3.25		0.52	
	Gori (n=45)	3.34	3.27	0.73	0.72	3.23	3.20	0.72	0.87
	Wolseong (n=60)		2.97		0.71		2.90		0.57
	Yeonggwang (n=63)		3.35		0.70		3.27		0.77
	Uljin (n=50)		3.52		0.76		3.40		0.81
	Gyeongju Residents (n=52)	3.46		0.78		3.31		0.90	
Power Plant Workers Residing in Nearby Towns (n=111)		3.27		0.75		3.18		0.77	

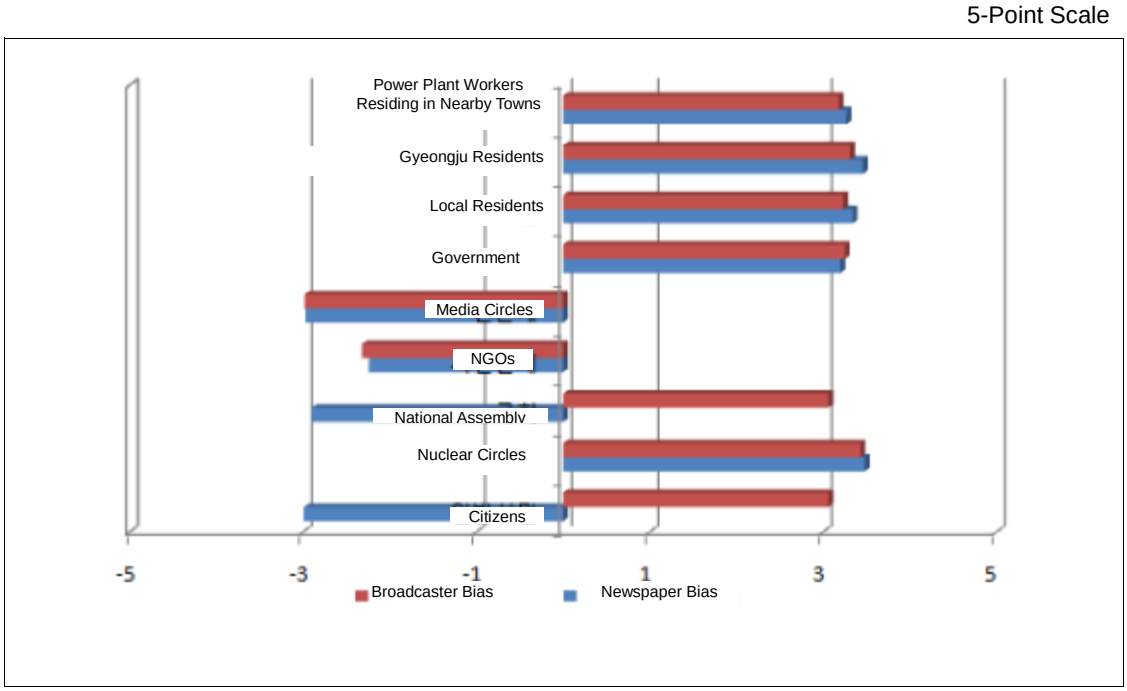

Figure 5-2 Comparison of Stakeholders' Perceived Media Bias

5.2.3 Level of Perceived Media Influence

The influence of media upon the policy-making process was measured by classifying the media into newspapers and broadcasters. All stakeholders perceived that broadcasters had a higher influence than newspapers. Interestingly, journalists perceived the influence of broadcasters (3.54) as being higher than that of newspapers (3.49), while PDs saw the influence of broadcasters (3.36) and newspapers (3.36) as equal. Gyeongju residents (4.02) showed the highest perception level for the influence of newspapers, followed by residents at sites of nuclear power plants (3.71), and power plant workers residing in nearby towns (3.59). The influence of broadcasters was similarly perceived. In general, the influence of newspapers and broadcasters in the policy-making process was highly perceived. However, it must be stressed that this media influence perceived by stakeholders differs from the actual influence of the media.

Table 5-7 Comparison of Stakeholders' Perceived Media Influence

5-Point Scale

Classification		Newspapers				Broadcasters			
		Mean		SD		Mean		SD	
All (n=1115)		3.38		0.84		3.44		0.86	
Citizens (n=329)		3.09		0.88		3.14		0.89	
Nuclear Circles (n=191)	Research (n=50)	3.31	3.30	0.82	0.76	3.33	3.30	0.82	0.81
	Regulatory (n=48)		3.02		0.84		2.98		0.84
	NPP (n=50)		3.56		0.79		3.60		0.78
	RWM (n=43)		3.35		0.87		3.44		0.85
National Assembly (n=50)		3.18		0.75		3.26		0.75	
NGOs (n=50)		3.40		0.73		3.46		0.79	
Media Circles (n=63)	Journalists (n=41)	3.43	3.49	0.74	0.68	3.45	3.54	0.83	0.75
	PD (n=22)		3.36		0.79		3.36		0.90
Government (n=51)		3.31		0.62		3.45		0.64	
Local Residents (n=218)	Gori (n=45)	3.71	3.89	0.78	0.80	3.81	3.93	0.81	0.84
	Wolseong (n=60)		3.48		0.62		3.55		0.68
	Yeonggwang (n=63)		3.68		0.93		3.83		0.94
	Uljin (n=50)		3.80		0.76		3.94		0.77
Gyeongju Residents (n=52)		4.02		0.75		4.10		0.63	
Power Plant Workers Residing in Nearby Towns (n=111)		3.59		0.79		3.63		0.80	

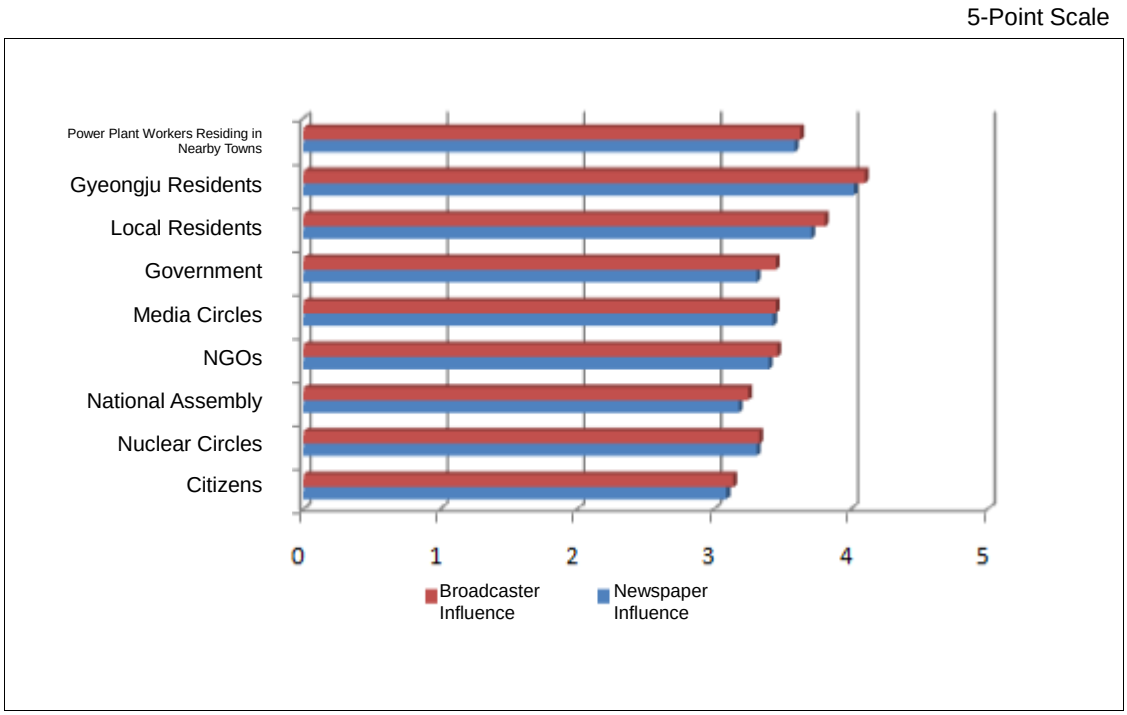

Figure 5-3 Comparison of Stakeholders' Perceived Media Influence

5.2.4 Level of Trust in Media

The level of stakeholders' trust in the media was measured by classifying the media into newspapers and broadcasters. All groups, except the government, tended to trust broadcasters more than newspapers. However, it must be mentioned that the gap between the two categories is very narrow. What is important is that all stakeholders, except Gyeongju residents (3.71) and residents at sites of nuclear power plants (3.50), were unlikely to trust either newspapers or broadcasters. Meanwhile, even media circles showed a relatively low level of trust in both newspapers (2.81) and broadcasters (2.83). This result needs to be further examined and discussed to pinpoint the reason(s) why their trust is so low.

Table 5-8 Comparison of the Level of Stakeholders' Trust in Media

5-Point Scale

Classification		Newspapers				Broadcasters			
		Mean		SD		Mean		SD	
All (n=1115)		2.92		0.87		2.94		0.85	
Citizens (n=329)		2.78		0.86		2.79		0.82	
Nuclear Circles (n=191)	Research (n=50)	2.58	2.72	0.76	0.78	2.62	2.74	0.74	0.72
	Regulatory (n=48)		2.56		0.62		2.60		0.61
	NPP (n=50)		2.44		0.93		2.50		0.91
	RWM (n=43)		2.60		0.73		2.63		0.73
National Assembly (n=50)		2.84		0.65		2.86		0.61	
NGOs (n=50)		2.66		0.63		2.74		0.66	
Media Circles (n=63)	Journalists (n=41)	2.81	2.88	0.72	0.56	2.83	2.93	0.70	0.52
	PD (n=22)		2.73		0.88		2.73		0.88
Government (n=51)		2.98		0.58		2.96		0.56	
Local Residents (n=218)	Gori (n=45)	3.48	3.73	0.85	0.72	3.50	3.91	0.83	0.82
	Wolseong (n=60)		3.13		0.79		3.23		0.67
	Yeonggwang (n=63)		3.32		1.01		3.27		0.88
	Uljin (n=50)		3.72		0.86		3.60		0.93
Gyeongju Residents (n=52)		3.63		0.72		3.71		0.67	
Power Plant Workers Residing in Nearby Towns (n=111)		2.91		0.92		2.92		0.90	

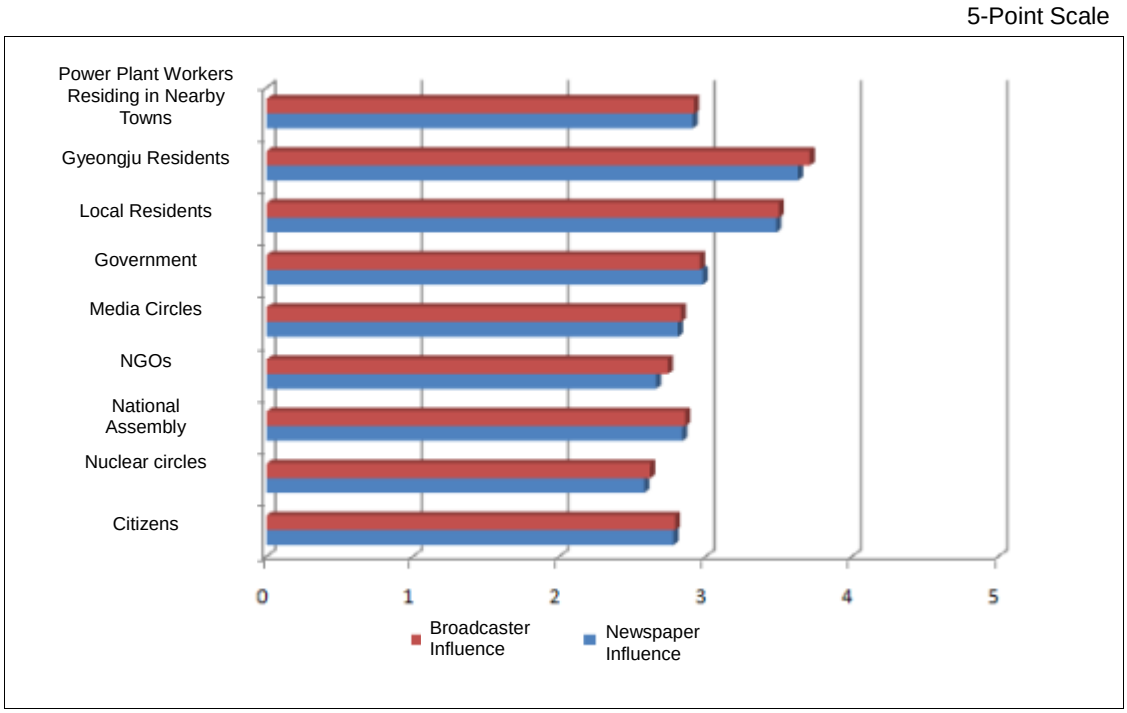

Figure 5-4 Comparison of Stakeholders' Trust in Media

6. RISK PERCEPTION, TRUST, KNOWLEDGE AND MEDIA REGARDING RADIOACTIVE WASTE

6.1 Risk Perception and Trust Level Regarding Radioactive Waste Management

The relationship between the level of trust in policymakers and risk perception was investigated, using simple regression analysis. It was found that as the level of trust in a policymaker was higher, risk perception was lower ($F=112.630$, $df=1, 1113$, $p<0.05$). The effect of trust level on risk perception was also found to be relatively high ($\beta=-0.295$). These results confirm that the level of trust in policymakers must be elevated to mitigate risk perception. These results were obtained by analyzing the effect of trust level, a single influential factor, on risk perception, so it is necessary to further discuss the possibility of change in its relationship when other influential factors are added to the analysis.

Table 6-1 Relationship between Trust Level and Risk Perception

	Risk Perception (β)	t	Degree of Freedom	F	p-value	R^2
Trust Level	-0.295	-10.613	1, 1113	112.630	0.000	0.087

6.2 Risk Perception and Level of Knowledge about Radioactive Waste Management

To investigate how the level of knowledge about radioactive waste impacts risk perception, a simple regression analysis was conducted. It was found that as the knowledge level was higher, risk perception was lower ($F=19.694$, $df=1, 1113$, $p<0.05$). The effect ($\beta=-0.128$) of the knowledge level on risk perception was found. However, its impact was lower compared to the trust level. This tells that it is possible that risk perception can be reduced if the knowledge level about radioactive waste is increased. In this case, the effect of a single factor, the knowledge level, on risk perception was analyzed, so it is necessary to further discuss possible changes if other factors are added to the analysis.

Table 6-2 Relationship between Knowledge Level and Risk Perception

	Risk Perception (β)	t	Degree of Freedom	F	p-value	R^2
Knowledge Level	-0.128	-4.438	1, 1113	19.694	0.000	0.016

6.3 Risk Perception and Media Regarding Radioactive Waste Management

6.3.1 Risk Perception and Media Use

A simple regression analysis was performed to investigate the effect of media use on risk perception regarding radioactive waste. It was found that the use of media did not impact risk perception.

Table 6-3 Relationship between Media Use and Risk Perception

	Risk Perception (β)	t	Degree of Freedom	F	p-value	R^2
Media Use	0.004	0.127	1, 1113	0.016	0.899	0.000

6.3.2 Risk Perception and Media Exposure

A simple regression analysis was used to investigate the effect of the level of media exposure regarding radioactive waste on media exposure. It was found that as the level of media exposure was higher, risk perception was lower ($F=19.288$, $df=1, 1113$, $p<0.05$). Its effect ($\beta=-0.127$) was not inconsequential, either. However, it is necessary to further test whether media exposure directly or indirectly impacts risk perception.

Table 6-4 Relationship between Media Exposure and Risk Perception

	Risk Perception (β)	t	Degree of Freedom	F	p-value	R^2
Media Exposure	-0.127	-4.392	1, 1113	19.288	0.000	0.016

6.3.3 Risk Perception and Perception of the Accuracy of Media Coverage

A simple regression analysis was conducted to investigate the relationship between perception of the accuracy of media coverage and risk perception regarding radioactive waste. It was found that the higher the accuracy of media coverage was perceived to be, risk perception dropped ($F=22.459$, $df=1, 1113$, $p<0.05$). The effect ($\beta=-0.137$) on risk perception was found. However, it is difficult to analyze the reason for the effect at this point. Also, perception of the accuracy of media coverage was analyzed as a single factor influencing risk perception, so it is necessary to further discuss how its effect may change when other factors are included for the analysis.

Table 6-5 Relationship between Perception of the Accuracy of Media Coverage and Risk Perception

	Risk Perception (β)	t	Degree of Freedom	F	p-value	R^2
Perception of Accuracy of Media Coverage	-0.137	-4.739	1, 1113	22.459	0.000	0.019

6.3.4 Risk Perception and Perception of Media Bias

To investigate the effect of the bias of media coverage on risk perception regarding radioactive waste, a simple regression analysis was performed. It was found that as the perception of bias in media coverage became higher, risk perception was also higher ($F=15.330$, $df=1, 1113$, $p<0.05$). The effect on risk perception ($\beta=0.130$) was measured. Accordingly, if the perceived bias in media coverage regarding radioactive waste is lowered, risk perception can be lowered. However, the result of this relationship may change if other influential factors are treated together.

Table 6-6 Relationship between Perception of Media Bias and Risk Perception

	Risk Perception (β)	t	Degree of Freedom	F	p-value	R^2
Perception of Bias of Media Coverage	0.130	3.915	1, 1113	15.330	0.000	0.017

6.3.5 Risk Perception and Media Trust

To find out the correlation between media trust and risk perception, a simple regression analysis was conducted. It was found that media trust did not impact risk perception.

Table 6-7 Relationship between Media Trust and Risk Perception

	Risk Perception (β)	t	Degree of Freedom	F	p-value	R^2
Media Trust	-0.054	-1.869	1, 1113	3.494	0.062	0.003

7. RISK PERCEPTION MODEL FOR RADIOACTIVE WASTE MANAGEMENT

7.1 Risk Perception Model for SNF/Used Fuel Management

To measure the effect of influential factors on risk perception of SNF/used fuel management, a multiple regression analysis was conducted. Specifically, the influential factors include trust, knowledge, media, preferential value, perception of seriousness of the problem, perception of the related science and technology, political efficacy, information processing types, policy importance and attitudes toward the risk. According to the results of the multiple regression analyses, the factors influencing risk perception of used fuel management were trust in the policymakers, knowledge about radioactive waste, media influence, perception of the seriousness of the radioactive waste problem, scientific and technological capabilities to solve the risk, scientific and technological capabilities to solve the radioactive waste problem, the information processing type, and perception of the danger of the radioactive waste problem. It was found that, as trust in the policymaker was higher and knowledge about radioactive waste was higher, risk perception of used fuel was lower. As media exposure was lower and perception of media influence was lower, risk perception was higher. Also, the more serious the radioactive waste problem was perceived, the higher risk perception of used fuel grew. Additionally, the more highly the scientific and technological capabilities to solve the risk and the radioactive waste problem were acknowledged, the more risk perception dropped. Having a risk-amplifying information filter lowered risk perception, and the higher the perception of the importance of risk perception was, the higher the perception of radioactive waste management policy increased. Meanwhile, the perception of the seriousness of the radioactive waste problem (β=0.281) had the highest effect on the risk perception of used fuel.

Meanwhile, a multiple regression analysis was performed to draw the factors influencing risk perception for reprocessing of used fuel. The influential factors include trust, perception of seriousness of the problem, perception of the relevant science and technology, the information processing type and perception of the importance of the policy. As trust in policymakers rose and perception of the seriousness of the radioactive waste problem was lower, risk perception for reprocessing of used fuel decreased. Risk perception for reprocessing of used fuel was also higher when scientific and technological capabilities to solve the risk and radioactive waste problem were perceived as high and a risk-attenuating information filter was in place. Meanwhile, the higher the importance of the radioactive waste management policy was perceived, the risk perception of used fuel was also higher. According to the results of analyzing the effect of respective influential factors, the seriousness of the radioactive waste problem (β=0.248) was found to have a relatively higher effect. Policymakers (β=-0.161) and scientific and technological capabilities to solve the radioactive waste problem (β=-0.124) also lent a certain level of effect to risk perception.

Table 7-1 Analyses of Factors Influencing Risk Perception of SNF/Used Fuel Management

		Risk Perception (β)	t	p-value	Degree of Freedom	F	R^2
Trust	Trust in the Policymaker	-0.174	-6.659	0.000	16, 1098	45.056	0.382
Knowledge	Knowledge about Radioactive Waste	-0.062	-2.559	0.011			
Media	Media Exposure	-0.065	-2.690	0.007			
	Media Trust	0.039	1.411	0.159			
	Media Use	0.022	0.867	0.386			
	Media Influence	-0.068	-2.640	0.008			
Preferential Value	Environment First over Economic Development	0.013	0.489	0.625			
Perception of Seriousness of the Problem	Seriousness of the Environmental Problem	0.044	1.710	0.087			
	Seriousness of the Radioactive Waste Problem	0.281	6.556	0.000			
Perception of Science and Technology	Scientific and Technological Capabilities to Solve the Risk	-0.088	-3.588	0.000			
	Scientific and Technological Capabilities to Solve the Radioactive Waste Problem	-0.131	-3.032	0.002			
Political Efficacy	Need of Political Participation	0.025	1.041	0.298			
	Willingness to Participate in the Policymaking Process	0.004	0.153	0.878			
Information Processing Type	Types of Information Filters	-0.110	-4.365	0.000			
Policy Importance	Perception of Importance of RWM Policy	0.142	5.859	0.000			
Attitude for Risk	Need of Prior Consent for Risk Change	-0.013	-0.496	0.620			

Table 7-2 Analyses of Factors Influencing Risk Perception for Reprocessing of SNF/Used Fuel

		Risk Perception (β)	t	p-value	Degree of Freedom	F	R^2
Trust	Trust in Policymakers	-0.161	-5.635	0.000	16, 1098	26.340	0.265
Knowledge	Knowledge about Radioactive Waste	-0.028	-1.080	0.281			
Media	Media Exposure	0.008	0.302	0.763			
	Media Trust	0.018	0.616	0.538			
	Media Use	0.026	0.967	0.334			
	Media Influence	-0.019	-0.692	0.489			
Preferential Value	Environment First over Economic Development	0.055	1.885	0.060			
Perception of Seriousness of the Problem	Seriousness of the Environmental Problem	0.003	0.104	0.917			
	Seriousness of the Radioactive Waste Problem	0.248	5.319	0.000			
Perception of Science and Technology	Scientific and Technological Capabilities to Solve the Risk	-0.053	-1.979	0.048			
	Scientific and Technological Capabilities to Solve the Radioactive Waste Problem	-0.124	-2.631	0.009			
Political Efficacy	Need of Political Participation	0.027	1.035	0.301			
	Willingness to Participate in the Policy-Making Process	-0.001	-0.032	0.974			
Information Processing Type	Types of Information Filters	-0.101	-3.703	0.000			
Policy Importance	Perception of Importance of RWM Policy	0.104	3.955	0.000			
Attitude for Risk	Need of Prior Consent for Risk Charge	0.018	0.653	0.514			

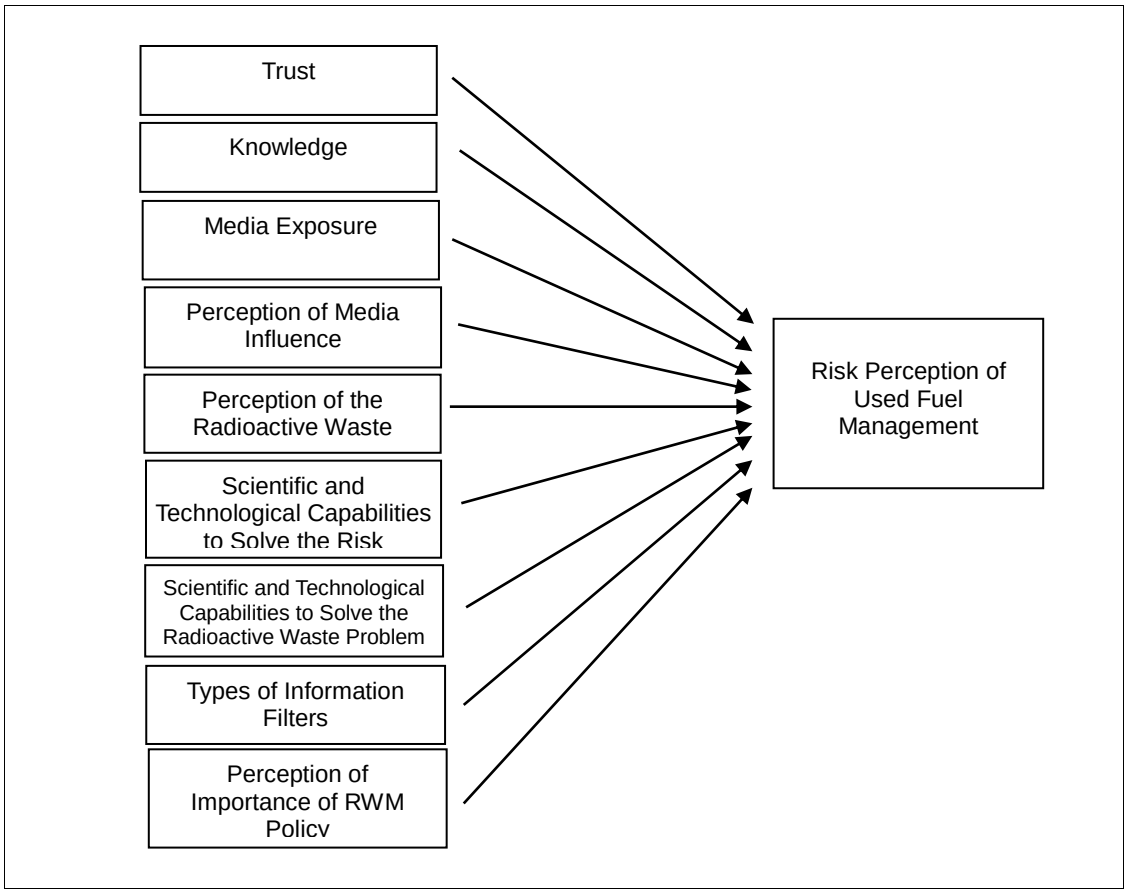

Figure 7-1 Risk Perception Model for SNF/Used Fuel

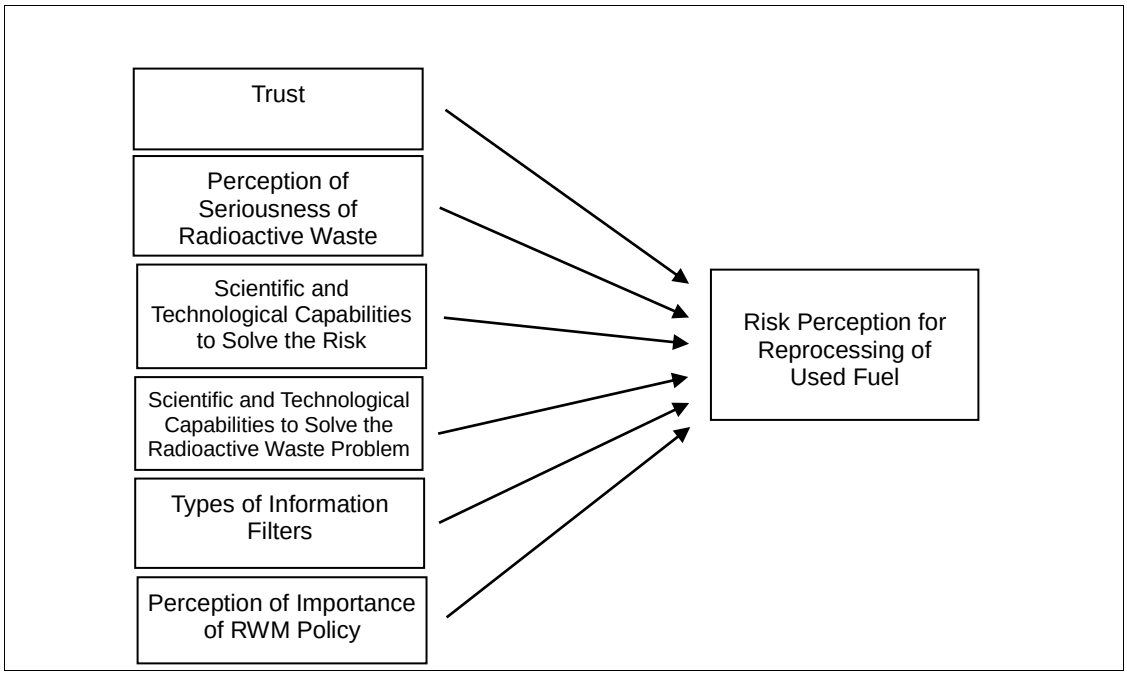

Figure 7-2 Risk Perception Model for Reprocessing of SNF/Used Fuel

Table 7-3 Analyses of Factors Influencing Risk Perception for Recycling of SNF/Used Fuel

		Risk Perception (β)	t	p-value	Degree of Freedom	F	R^2
Trust	**Trust in Policymakers**	-0.173	-6.162	0.000	16, 1098	29.679	0.289
Knowledge	Knowledge about Radioactive Waste	-0.030	-1.144	0.253			
Media	Media Exposure	0.018	0.091	0.490			
	Media Trust	0.072	2.434	0.015			
	Media Use	0.036	1.361	0.174			
	Media Influence	-0.020	-0.709	0.479			
Preferential Value	Environment First over Economic Development	-0.002	-0.057	0.955			
Perception of Seriousness of the Problem	Seriousness of the Environmental Problem	0.023	0.837	0.403			
	Seriousness of Radioactive Waste	0.259	5.632	0.000			
Perception of Science and Technology	Scientific and Technological Capabilities to Solve the Risk	-0.122	-2.627	0.009			
	Scientific and Technological Capabilities to Solve the Radioactive Waste Problem	-0.073	-2.767	0.000			
Political Efficacy	Need of Political Participation	0.003	0.102	0.919			
	Willingness to Participate in the Policy-Making Process	0.016	0.601	0.548			
Information Processing Type	Types of Information Filters	-0.110	-4.072	0.000			
Policy Importance	Perception of Importance of RWM Policy	0.095	3.676	0.000			
Attitude for Risk	Need of Prior Consent for Risk Charge	-0.005	-0.168	0.866			

To identify the factors influencing risk perception for recycling of used fuel, a multiple regression analysis was used. It was found that the factors affecting risk perception include trust, the media, perception of the seriousness of the problem, perception of the relevant science and technology, the information processing type and perception of the importance of the policy. It was found that as trust in policymakers increased, trust in the media decreased, and risk perception for recycling of used fuel was lower. As the perceived seriousness of the radioactive waste problem increased and the perceived importance of radioactive waste management policy was higher, risk perception for recycling of used fuel was also higher. On the contrary, risk perception for recycling of used fuel was likely to go down as scientific and technological capabilities to solve the risk along with radioactive waste problem were perceived highly favorable. However, risk perception rose when a risk-attenuating informing filter was available. Summing up the effect of the influential factors, perception of seriousness of radioactive waste (β =0.259) showed the largest effect, while trust in policymakers (β =-0.173), scientific and technological capabilities to solve the risk (β=-0.122), and types of information filters (β=-0.110) leant a certain level of effect to risk perception for recycling of used fuel.

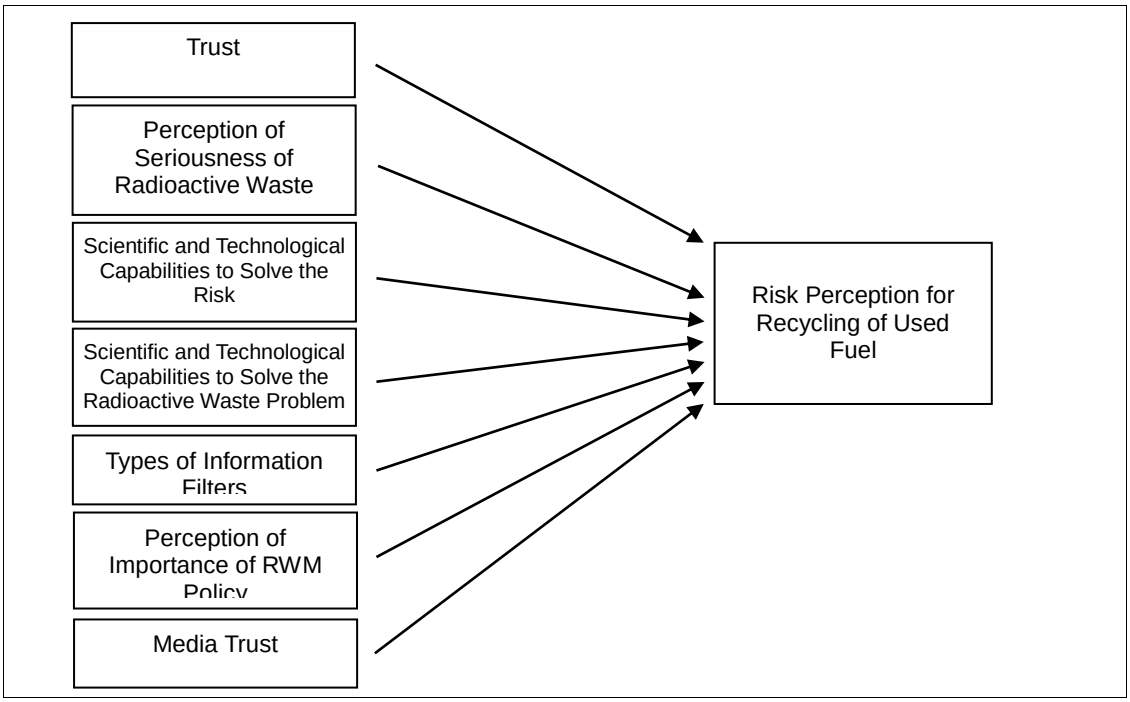

Figure 7-3 Risk Perception Model for Recycling of SNF/Used Fuel

7.2 Risk Perception Model for High-Level Radioactive Waste Management

To identify factors influencing risk perception of high-level radioactive waste management, a multiple regression analysis was conducted. It was found that the factors affecting risk perception include trust, knowledge, media, perception of seriousness of the problem, perception of the relevant science and technology, the information processing type and perception of the importance of the policy. It was found that the seriousness of the radioactive waste problem (β =0.263) had a great effect on risk perception. The other factors giving affecting risk perception of high-lever radioactive waste management include trust in the policymakers (β=-0.176), perception of importance of the radioactive waste management policy (β =0.142), types of information filters (β =-0.122), scientific and technological capabilities to solve the risk (β =-0.129) and media influence (β =-0.102).

Table 7-4 Analyses of the Factors Influencing Risk Perception of High-Level Radioactive Waste Management

		Risk Perception (β)	t	p-value	Degree of Freedom	F	R^2
Trust	Trust in the Policymakers	-0.176	-6.692	0.000	16, 1098	43.463	0.374
Knowledge	Knowledge about Radioactive Waste	-0.061	-2.483	0.013			
Media	Media Exposure	-0.055	-2.233	0.026			
	Media Trust	0.046	1.668	0.096			
	Media Use	0.013	0.052	0.616			
	Media Influence	-0.102	-3.945	0.000			
Preferential Value	Environment First over Economic Development	0.022	0.840	0.401			
Perception of Seriousness of the Problem	Seriousness of the Environmental Problem	0.047	1.845	0.065			
	Seriousness of Radioactive Waste	0.263	6.097	0.000			
Perception of Science and Technology	Scientific and Technological Capabilities to Solve the Risk	-0.129	-2.960	0.003			
	Scientific and Technological Capabilities to Solve the Radioactive Waste Problem	-0.078	-3.144	0.002			

		Risk Perception (β)	t	p-value	Degree of Freedom	F	R^2
Political Efficacy	Need of Political Participation	0.017	0.715	0.475			
	Willingness to Participate in the Policymaking Process	0.023	0.943	0.346			
Information Processing Type	Types of Information Filters	-0.122	-4.837	0.000			
Policy Importance	Perception of Importance of RWM Policy	0.142	5.834	0.000			
Attitude for Risk	Need of Prior Consent for Risk Charge	-0.013	-0.492	0.623			

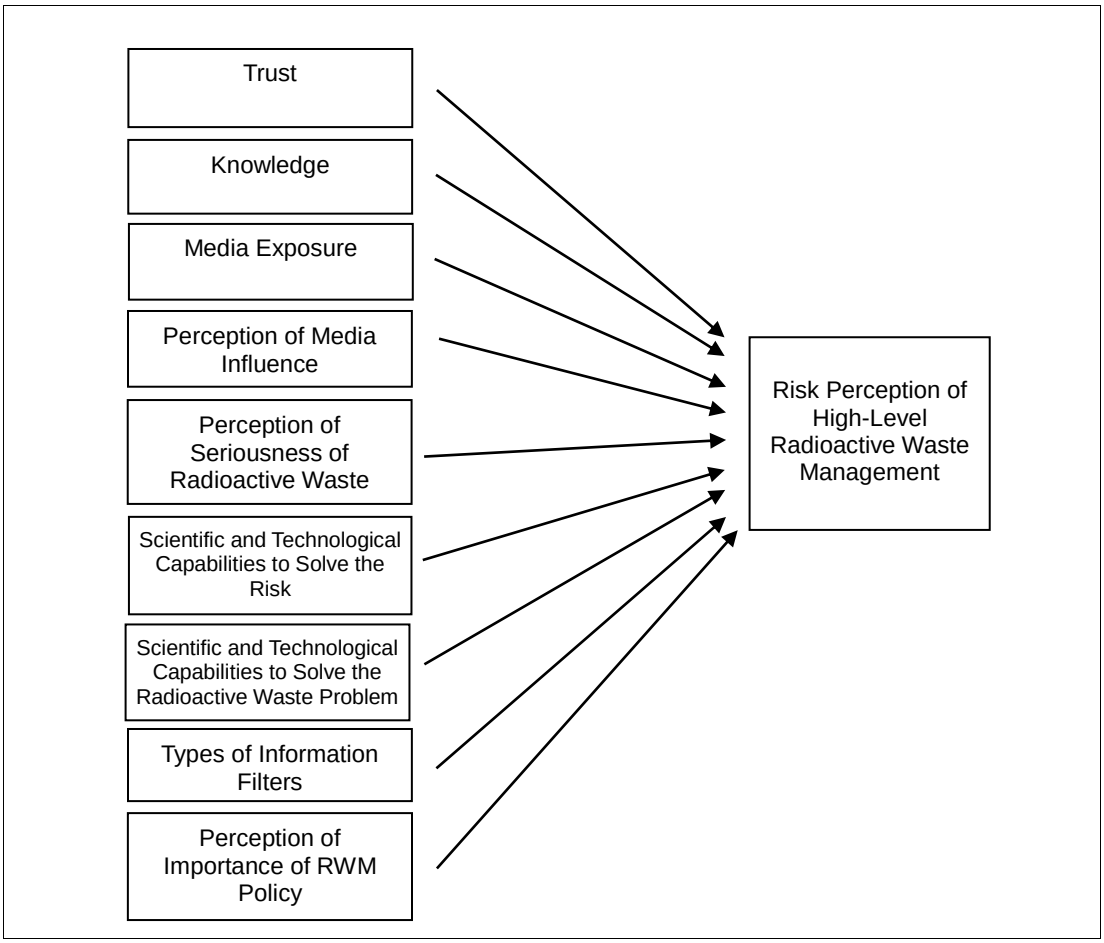

Figure 7-4 Risk Perception Model for High-level Radioactive Waste Management

7.3 Risk Perception Model for Low-to-Intermediate Level Radioactive Waste Management

To identify the factors influencing risk perception of low-to-intermediate level radioactive waste management, a multiple regression analysis was conducted. It was found that the factors affecting risk perception include trust, knowledge, the media, perception of seriousness of the problem, perception of the relevant science and technology, the information processing type and perception of the importance of radioactive management policy.

Results indicated that as trust in policymakers and knowledge about radioactive waste rose, risk perception of low-to-intermediate level radioactive waste was lower. And as media exposure, media trust and perception of media influence were higher, risk perception was lower. As the perceived seriousness of the radioactive waste problem and perceived importance of the radioactive waste management policy became higher, risk perception was also likely to go up. As scientific and technological capabilities to solve the risk and radioactive waste problem were perceived as high and a risk-attenuating information filter possessed, risk perception dropped. As for the level of effect, the perception of the seriousness of the radioactive waste problem (β =0.303) had a high level of effect, while trust in policymakers (β =-0.180) and types of information filters (β =-0.143), perception of the importance of radioactive waste management policy (β =0.127) and the scientific and technological capabilities to solve the radioactive waste problem (β =-0.116) had a significant level of effect.

Table 7-5 Analyses of Factors Influencing Risk Perception of Low-to-Intermediate Level Radioactive Waste Management

		Risk Perception (β)	t	p-value	Degree of Freedom	F	R^2
Trust	Trust in Policymakers	-0.180	-7.052	0.000	16, 1098	51.646	0.415
Knowledge	Knowledge about Radioactive Waste	-0.082	-3.489	0.001	16, 1098	51.646	0.415
Media	Media Exposure	-0.064	-2.688	0.007	16, 1098	51.646	0.415
	Media Trust	0.072	2.708	0.007	16, 1098	51.646	0.415
	Media Use	-0.025	1.032	0.302	16, 1098	51.646	0.415
	Media Influence	-0.085	-3.383	0.001	16, 1098	51.646	0.415
Preferential Value	Environment First over Economic Development	0.016	0.620	0.535	16, 1098	51.646	0.415
Perception of Seriousness of the Problem	Seriousness of the Environmental Problem	0.055	2.218	0.027	16, 1098	51.646	0.415
	Seriousness of Radioactive Waste	0.303	7.267	0.000	16, 1098	51.646	0.415
Perception of Science and Technology	Scientific and Technological Capabilities to Solve the Risk	-0.071	-2.985	0.003	16, 1098	51.646	0.415

		Risk Perception (β)	t	p-value	Degree of Freedom	F	R^2
	Scientific and Technological Capabilities to Solve the Radioactive Waste Problem	-0.116	-2.765	0.000	16, 1098	51.646	0.415
Political Efficacy	Need of Political Participation	0.015	1.141	0.254	16, 1098	51.646	0.415
	Willingness to Participate in the Policy-Making Process	0.009	0.380	0.703	16, 1098	51.646	0.415
Information Processing Type	Types of Information Filters	-0.143	-5.846	0.000	16, 1098	51.646	0.415
Policy Importance	Perception of Importance of RWM Policy	0.127	5.385	0.000	16, 1098	51.646	0.415
Attitude for Risk	Need of Prior Consent for Risk Charge	-0.002	-0.074	0.941	16, 1098	51.646	0.415

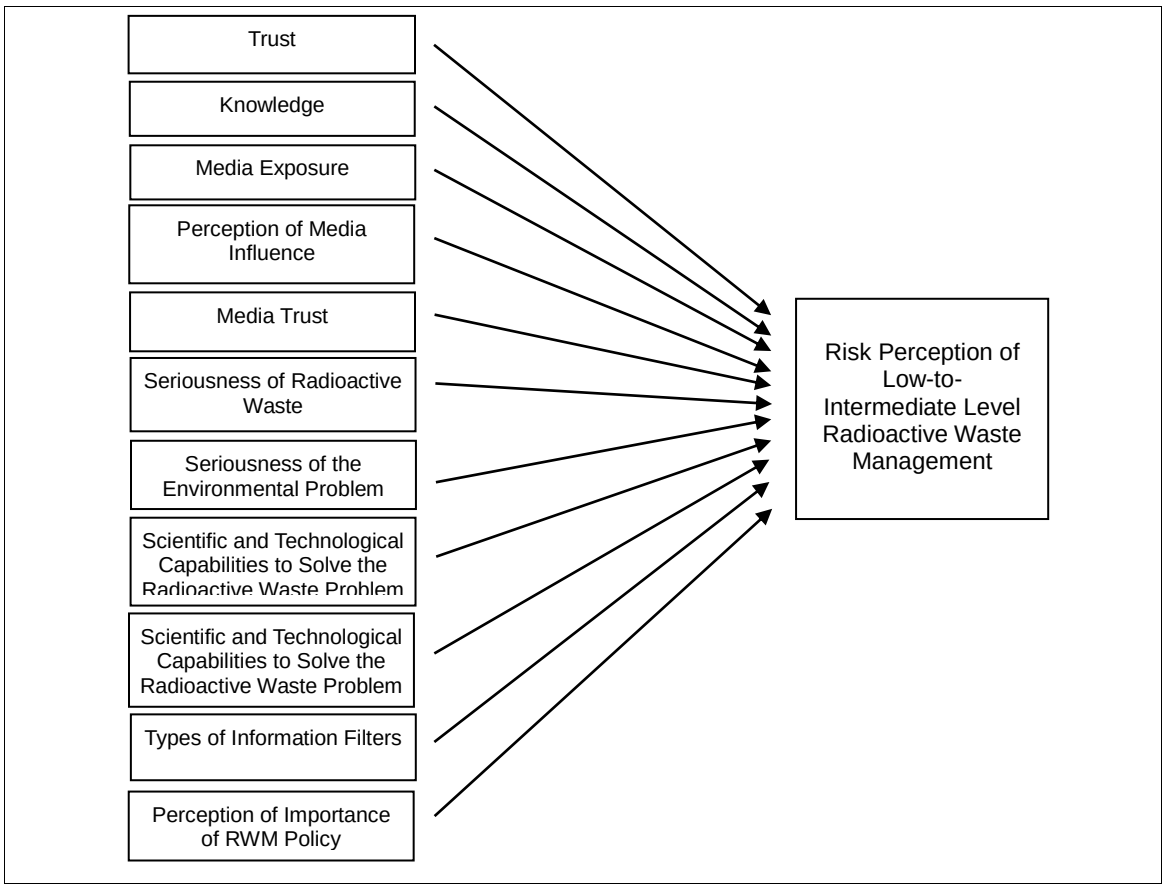

Figure 7-5 Risk Perception Model for Low-to-Intermediate Level Radioactive Waste Management

7.4 Risk Perception Model for Radioactive Waste Management

A multiple regression analysis was used to draw the factors influencing risk perception of radioactive waste management. The factors affecting risk perception include trust, knowledge, the media, perception of the seriousness of the problem, perception of the science and technology, the information processing type and perception of the importance of the policy. Regarding the level of effect, the perception of the seriousness of the radioactive waste problem (β =0.289) was very high, followed by trust in the policymakers (β =-0.188), perception of the importance of the radioactive waste management policy (β =0.142), the types of information filters (β =-0.136) and scientific and technological capabilities to solve the radioactive waste problem (β =-0.117).

Table 7-6 Analyses of the Factors Influencing Risk Perception of Radioactive Waste Management

		Risk Perception (β)	t	p-value	Degree of Freedom	F	R^2
Trust	Trust in Policymakers	-0.188	-7.252	0.000	16, 1098	47.897	0.397
Knowledge	Knowledge about radioactive Waste	-0.069	-2.896	0.004			
Media	Media Exposure	-0.044	-1.849	0.065			
	Media Trust	0.056	1.063	0.039			
	Media Use	0.024	0.959	0.348			
	Media Influence	-0.081	-3.190	0.001			
Preferential Value	Environment First over Economic Development	0.015	0.561	0.575			
Perception of Seriousness of the Problem	Seriousness of the Environmental Problem	0.032	1.271	0.204			
	Seriousness of Radioactive Waste	0.289	6.820	0.000			
Perception of Science and Technology	Scientific and Technological Capabilities to Solve the Risk	-0.082	-3.376	0.001			
	Scientific and Technological Capabilities to Solve the Radioactive Waste Problem	-0.117	-2.743	0.006			
Political Efficacy	Need of Political Participation	0.029	1.237	0.216			

		Risk Perception (β)	t	p-value	Degree of Freedom	F	R^2
	Willingness to Participate in the Policymaking Process	0.004	0.146	0.884			
Information Processing Type	Types of Information Filters	-0.136	-5.464	0.000			
Policy Importance	Perception of Importance of RWM Policy	0.142	5.939	0.000			
Attitude for Risk	Need of Prior Consent for Risk Charge	-0.011	-0.452	0.652			

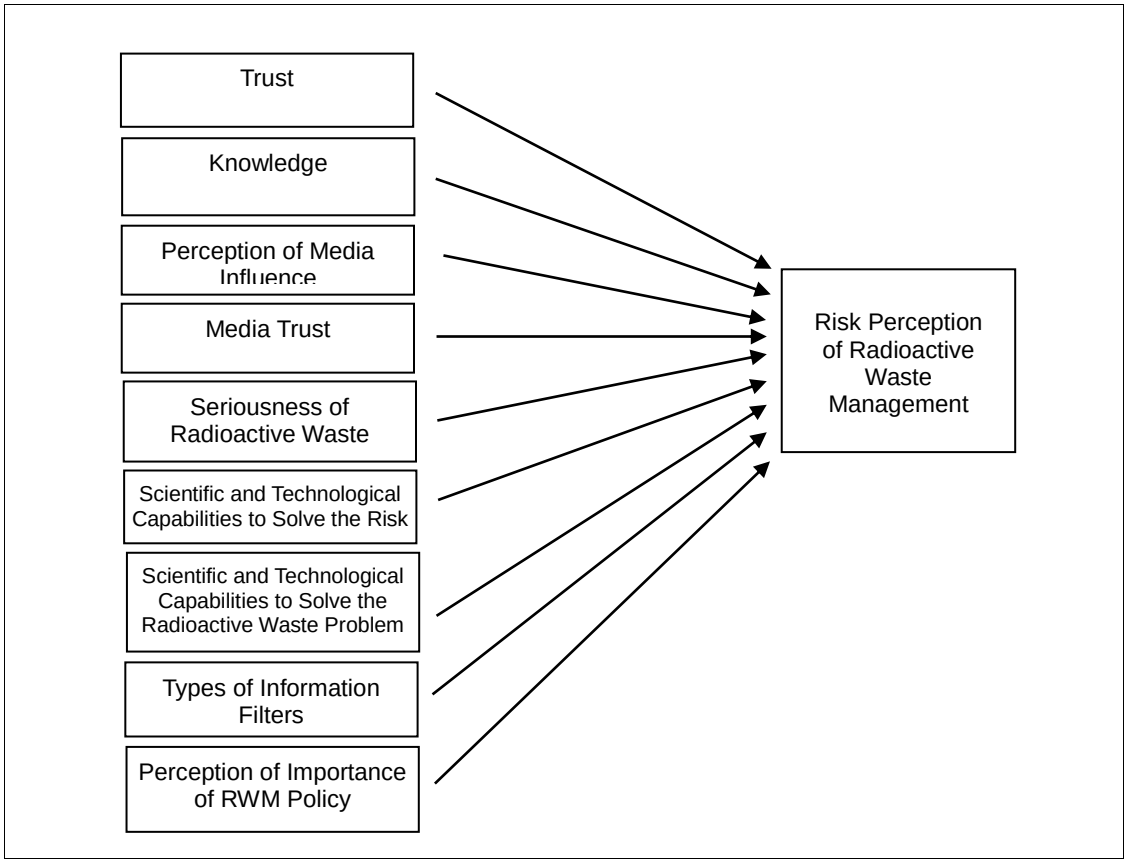

Figure 7-6 Risk Perception Model for Radioactive Waste Management

7.5 Risk Perception Model for Radioactive Waste

To draw the factors influencing risk perception of radioactive waste, a multiple regression analysis was performed. According to the results, the factors affecting risk perception include trust, knowledge, the media, perception of the seriousness of the problem, perception of the relevant science and technology, the information processing type, and perception of the importance of the policy. Regarding the size of the effect, perception of the seriousness of the radioactive waste problem (β =0.303) had a very large effect. Other factors giving a certain level of effect included trust in the policymakers (β =-0.180), types of information filters (β =-0.143), perception of the importance of the radioactive waste management policy (β =-0.127) and the scientific and technological capabilities to solve the radioactive waste problem (β =-0.116).

Table 7-7 Analyses of Factors Influencing Risk Perception of Radioactive Waste

		Risk Perception (β)	t	p-value	Degree of Freedom	F	R^2
Trust	Trust in Policymakers	-0.180	-7.052	0.000	16, 1098	51.646	0.415
knowledge	Knowledge about Radioactive Waste	-0.082	-3.489	0.001	16, 1098	51.646	0.415
Media	Media Exposure	-0.064	-2.688	0.007	16, 1098	51.646	0.415
	Media Trust	0.072	2.708	0.007	16, 1098	51.646	0.415
	Media Use	0.025	1.032	0.302	16, 1098	51.646	0.415
	Media Influence	-0.085	-3.383	0.001	16, 1098	51.646	0.415
Preferential Value	Environment First over Economic Development	0.016	0.620	0.535	16, 1098	51.646	0.415
Perception of Seriousness of the Problem	Seriousness of the Environmental Problem	0.055	2.218	0.027	16, 1098	51.646	0.415
	Seriousness of the Radioactive Waste Problem	0.303	7.267	0.000	16, 1098	51.646	0.415
Perception of Science and Technology	Scientific and Technological Capabilities to Solve the Risk	-0.071	-2.985	0.003	16, 1098	51.646	0.415
	Scientific and Technological Capabilities to Solve the Radioactive Waste Problem	-0.116	-2.765	0.006	16, 1098	51.646	0.415

		Risk Perception (β)	t	p-value	Degree of Freedom	F	R^2
Political Efficacy	Need of Political Participation	0.026	1.142	0.254	16, 1098	51.646	0.415
	Willingness to Participate in the Policy-Making Process	0.009	0.380	0.704	16, 1098	51.646	0.415
Information Processing Type	Types of Information Filters	-0.143	-5.846	0.000	16, 1098	51.646	0.415
Policy Importance	Perception of Importance of RWM Policy	-0.127	5.385	0.000	16, 1098	51.646	0.415
Attitude for Risk	Need of Prior Consent for Risk Charge	-0.002	-0.074	0.941	16, 1098	51.646	0.415

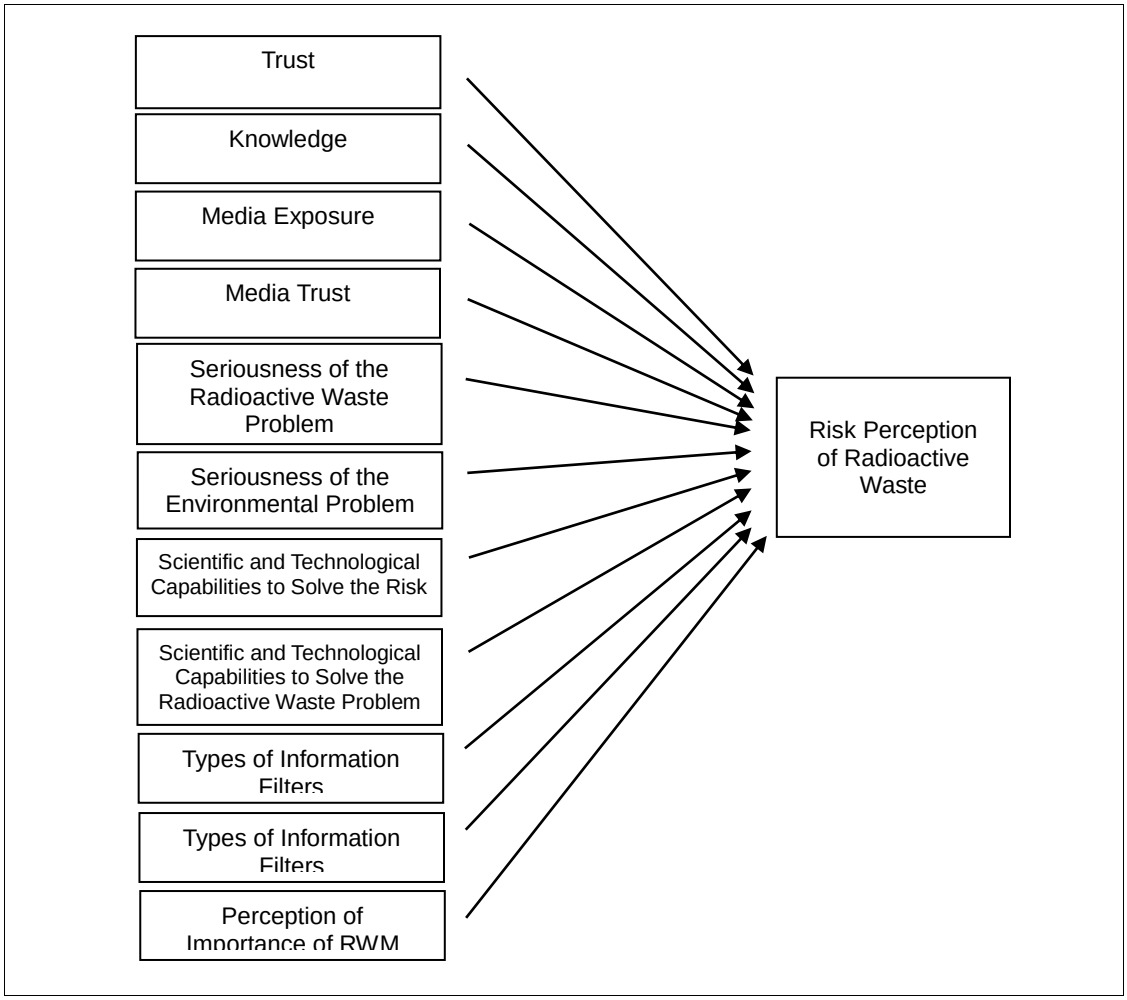

Figure 7-7 Risk Perception Model for Radioactive Waste

8. SOCIAL ACCEPTANCE MODEL FOR RADIOACTIVE WASTE DISPOSAL FACILITIES

8.1 Level of Social Acceptance for Radioactive Waste Disposal Facilities

To measure social acceptance of radioactive waste disposal facilities, the following questionnaire items and Likert scale were used:

Please check (√) the position you will take if a radioactive waste disposal site (radioactive waste disposal facility) is to be constructed in your hometown.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
①	②	③	④	⑤

· Will strongly disagree no matter what happens.

· Will strongly agree.

According to the results of analyzing stakeholders' social acceptance of a radioactive waste disposal facility in their neighborhood, citizens (2.88) were likely to show a relatively low level of acceptance. Residents at sites of nuclear power plants (2.87) revealed their acceptance at a similar level to that of citizens, but their acceptance patterns differ among regions. The residents in Yeonggwang (3.66) showed the highest level of social acceptance while those in Uljin (3.05) seemed to have a little lower level of acceptance. However, the residents in Gori (2.33) and Wolseong (2.29) showed a low level of acceptance. The residents in Gyeongju (2.13), where a low-to-intermediate level radioactive waste disposal facility is under construction, revealed a very low level of social acceptance. Media circles also showed a low level, but PDs (2.50) had a lower level of acceptance than journalists (2.80). Social acceptance of radioactive waste disposal facilities by the National Assembly (2.94) was not so high either. However, the level of social acceptance by the government (3.22) was relatively high, and nuclear circles (3.76) also showed a high level of social acceptance. The level of acceptance by the radioactive waste management sector (3.93) was especially high. Power plant workers residing in nearby towns (4.07) experiencing radioactive waste directly showed a very high level of social acceptance. As expected, NGOs (1.76) revealed a very low level of social acceptance for radioactive waste disposal facilities.

Given all these results, it would be necessary to strive actively and strategically for achieving social acceptance when setting up a concrete plan for constructing a radioactive waste disposal facility. The reason why residents in Yeonggwang and Uljin showed a higher level of acceptance than those in other regions must also be analyzed. If this reason is analyzed correctly, it would be meaningful to reflect the findings when setting up a plan aimed at winning social acceptance.

Table 8-1 Comparison of the Level of Social Acceptance of Radioactive Waste Disposal Facilities

5-Point Scale

		Mean		Standard Deviation	
All (n=1115)		3.12		1.06	
Citizens (n=329)		2.88		0.83	
Nuclear Circles (n=191)	Research (n=50)	3.76	3.68	0.84	0.88
	Regulatory (n=48)		3.63		0.79
	NPP (n=50)		3.84		0.79
	RWM (n=43)		3.93		0.90
National Assembly (n=50)		2.94		0.70	
NGOs (n=50)		1.76		0.96	
Media Circles (n=63)	Journalists (n=41)	2.70	2.80	0.73	0.73
	PDs (n=22)		2.50		0.69
Government (n=51)		3.22		0.48	
Local Residents (n=218)	Gori (n=45)	2.87	2.33	1.12	1.04
	Wolseong (n=60)		2.29		1.08
	Yeonggwang (n=63)		3.66		0.82
	Uljin (n=50)		3.06		0.92
Gyeongju Residents (n=52)		2.13		0.92	
Power Plant Workers Residing in Nearby Towns (n=111)		4.07		0.84	

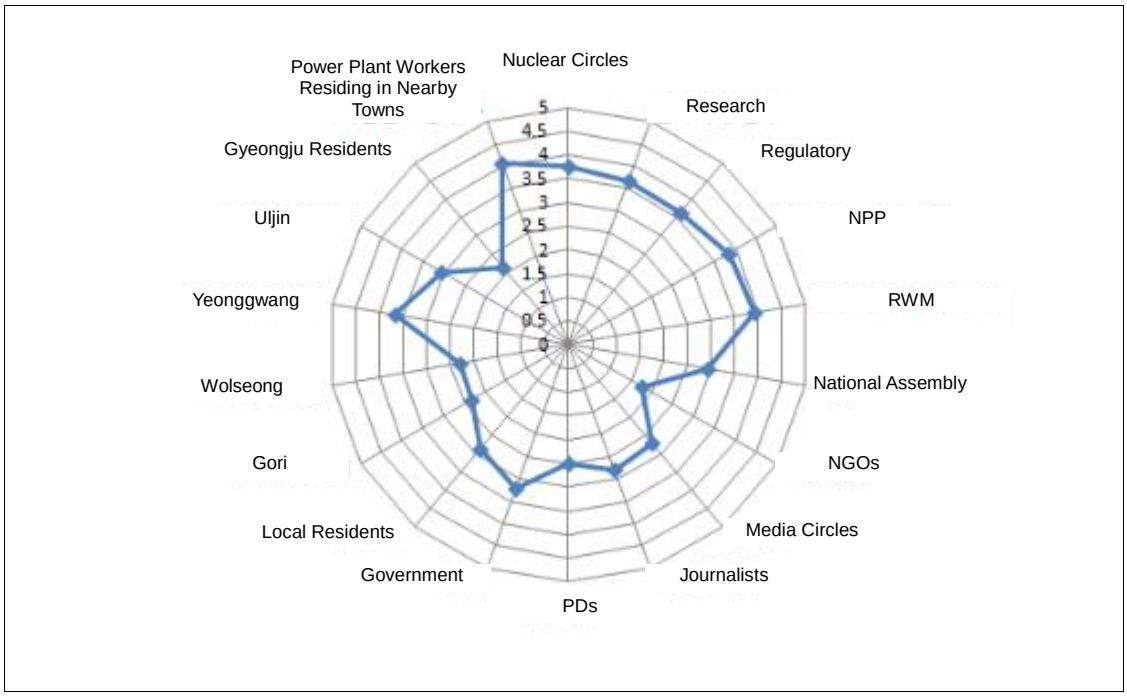

Figure 8-1 Comparison of Stakeholders' Social Acceptance of Radioactive Waste Disposal Facilities

8.2 Attitudes of Consent Concerning Radioactive Waste Disposal Facilities

The following questionnaire items and Likert scale were used to compare attitudes of consent concerning the building of radioactive waste disposal facilities in the respondent's neighborhood:

Please check (√) the position you will take if a radioactive waste disposal site (radioactive waste disposal facility) is to be constructed in your hometown.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
①	②	③	④	⑤

· Will strongly disagree no matter what happens.

· Will strongly agree.

· Will follow majority's opinion after listening to their opinions.

· Will not show my opinion though I have consenting or dissenting opinions.

Comparing the results, the largest number of citizens chose first to follow the majority's opinion (3.09), followed by expressing dissent (2.91), withholding of opinion (2.80) and lastly of consenting (2.67). However, this can be interpreted that only following the majority's opinion has any meaning as a way in which citizens express their opinions. Nuclear circles supported the expression of consenting (3.44) relatively strongly and were likely to support following the majority's opinion (3.16). The research, regulatory and radioactive waste management sectors all showed a weak support for following the majority's opinion. Their support was found in the order of withholding of opinion (2.64), expressing dissent (2.56) and expressing consent (2.44). For the National Assembly, following the majority's opinion is the only attitude practically taken. NGOs strongly supported the expression of dissent (4.10). They showed a very weak support for following the majority's opinion (2.46) and were negative to the withholding of opinion (1.80) and the expression of consent (1.62). Media circles showed weak support for following the majority's opinion (2.86) followed by expressing dissent (2.81), the withholding of opinion (2.46) and expressing consent (2.21). The government revealed a certain level of support for following the majority's opinion (3.22), showing a weak support for withholding of opinion (2.82), expressing consenting (2.75), and a weaker support for expressing dissent (2.31). Residents at sites of nuclear power plants were likely to have strong support for following the majority's opinion (3.33), showing big gaps among the regions. The residents in Gori and Wolseong strongly supported the expression of dissent (3.78/3.65), but those in Yeonggwang showed a strong support for following the majority's opinion (3.76), and the expression of consent (3.62). The residents in Uljin mostly supported following the majority's opinion (3.46) and expressing consent (3.10). Gyeongju residents revealed a strong support for expressing dissent (3.83) and also supported following the majority's opinion (3.35). Power plant workers residing in nearby towns showed a strong support for expressing consent (3.92) and also the possibility of supporting the majority's opinion (3.23).

These results confirm that social acceptance of a radioactive waste disposal facility can differ depending on how the issue is addressed and by whom in the beginning. Accordingly, it is assumed that how the agenda should be set must be deliberated prior to the decision of the policy for a radioactive waste disposal facility.

Table 8-2 Attitudes of Consent regarding Radioactive Waste Management

5-Point Scale

		Following Majority Opinion		Withholding of Opinion		Expression of Dissent		Expression of Consent	
All (n=1115)		3.13 (1.05)		2.61 (0.95)		2.67 (1.22)		2.90 (1.16)	
Citizens (n=329)		3.09 (1.01)		2.80 (0.90)		2.91 (1.10)		2.67 (1.01)	
Nuclear Circles (n=191)	Research (n=50)	3.16 (1.07)	3.10 (1.00)	2.41 (0.97)	2.48 (0.95)	1.91 (0.86)	1.94 (0.84)	3.44 (1.01)	3.30 (1.07)
	Regulatory (n=48)	3.16 (1.07)	3.08 (1.00)	2.41 (0.97)	2.46 (0.92)	1.91 (0.86)	2.04 (0.87)	3.44 (1.01)	3.29 (0.92)
	NPP (n=50)	3.16 (1.07)	3.24 (1.27)	2.41 (0.97)	2.52 (1.07)	1.91 (0.86)	1.92 (0.85)	3.44 (1.01)	3.60 (0.97)
	RWM (n=43)	3.16 (1.07)	3.21 (1.01)	2.41 (0.97)	2.16 (0.90)	1.91 (0.86)	1.72 (0.88)	3.44 (1.01)	3.58 (1.07)

5-Point Scale

		Following Majority Opinion		Withholding of Opinion		Expression of Dissent		Expression of Consent	
National Assembly (n=50)		3.02 (0.87)		2.64 (0.83)		2.56 (0.97)		2.44 (0.76)	
NGOs (n=50)		2.46 (1.15)		1.80 (0.90)		4.10 (1.27)		1.62 (0.90)	
Media Circles (n=63)	Journalists (n=41)	2.86 (0.95)	2.88 (0.95)	2.46 (0.90)	2.49 (0.81)	2.81 (0.95)	2.73 (0.90)	2.21 (0.86)	2.34 (0.83)
	PDs (n=22)	2.86 (0.95)	2.82 (0.96)	2.46 (0.90)	2.41 (1.05)	2.81 (0.95)	2.95 (1.04)	2.21 (0.86)	1.95 (0.90)
Government (n=51)		3.22 (0.78)		2.82 (0.74)		2.31 (0.65)		2.75 (0.63)	
Local Residents (N=218)	Gori (n=45)	3.33 (0.98)	2.93 (1.18)	2.78 (0.87)	2.60 (1.10)	3.13 (1.25)	3.78 (1.11)	2.88 (1.21)	2.44 (1.32)
	Wolseong (n=60)	3.33 (0.98)	3.08 (0.87)	2.78 (0.87)	2.70 (0.70)	3.13 (1.25)	3.65 (1.22)	2.88 (1.21)	2.23 (1.08)
	Yeonggwang (n=63)	3.33 (0.98)	3.76 (0.71)	2.78 (0.87)	2.90 (0.80)	3.13 (1.25)	2.30 (0.99)	2.88 (1.21)	3.62 (0.83)
	Uljin (n=50)	3.33 (0.98)	3.46 (0.99)	2.78 (0.87)	2.90 (0.91)	3.13 (1.25)	2.98 (1.10)	2.88 (1.21)	3.10 (1.11)
Gyeongju Residents (n=52)		3.35 (0.88)		2.98 (0.96)		3.83 (1.00)		2.10 (1.07)	
Power Plant Workers Residing in Nearby Towns (n=111)		3.23 (1.23)		2.50 (1.02)		1.77 (0.88)		3.92 (1.01)	

* The figures in ( ) are the standard deviations.

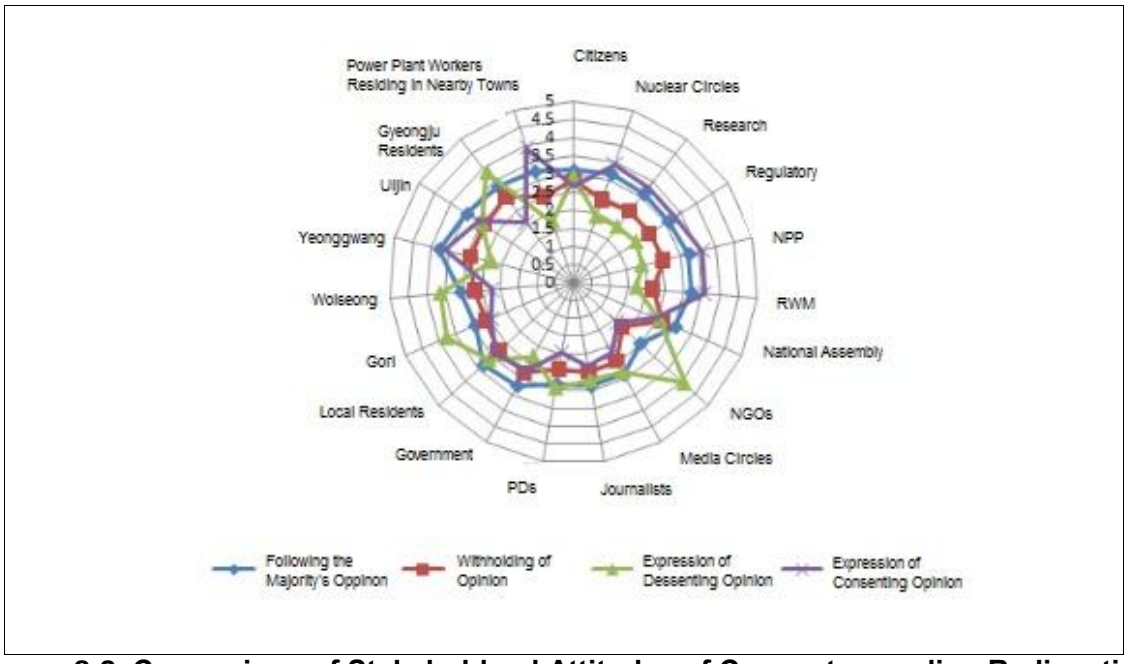

Figure 8-2 Comparison of Stakeholders' Attitudes of Consent regarding Radioactive Waste Disposal Facilities

8.3 Risk Perception and Social Acceptance of Radioactive Waste Disposal Facilities

To see the relationship between risk perception of radioactive waste and social acceptance of radioactive waste disposal facilities, a simple regression analysis was conducted. It was found that social acceptance was higher as risk perception of radioactive waste was lower ($F=623.581$, $df=1, 1113$, $p<0.05$) and the effect of risk perception on social acceptance was very strong ($\beta=-0.588$). For this reason, it is necessary to respond sensitively to risk perception of radioactive waste for achieving social acceptance for a radioactive waste disposal facility, and risk perception must be taken care of prior to social acceptance. However, these results were obtained with a single influential factor, risk perception, on social acceptance. Therefore, different results might be drawn if there are other various influential factors.

Table 8-3 Relationship between Risk Perception of Radioactive Waste and Social Acceptance

	Social Acceptance (β)	t	Degree of Freedom	F	p-value	R^2
Risk Perception	-0.588	-24.972	1, 1113	623.581	0.000	0.346

To see the effect of risk perception of radioactive waste management on social acceptance of radioactive waste disposal facilities, a simple regression analysis was conducted. It was found that social acceptance was higher as risk perception of radioactive waste management was lower ($F=707.170$, $df=1, 1113$, $p<0.05$). The effect of risk perception on social acceptance was very strong ($\beta=-0.612$), relatively stronger than the effect of risk perception of radioactive waste on social acceptance of a radioactive waste disposal facility. For this reason, not only the risk perception of radioactive waste but also the risk perception of radioactive waste management must be taken care of prior to social acceptance.

Table 8-4 Relationship between Risk Acceptance of Radioactive Waste Management and Social Acceptance

	Social Acceptance (β)	t	Degree of Freedom	F	p-value	R^2
Risk Perception	-0.612	-26.593	1, 1113	707.170	0.000	0.375

8.4 Social Acceptance Model for a Radioactive Waste Disposal Facility

To identify the factors influencing social acceptance of radioactive waste disposal facilities, a multiple regression analysis was performed. The factors identified include trust, risk perception, the media, prior value, perception of the seriousness of the problem, understanding of the relevant science and technology, information processing style, and awareness of the importance of the policy and attitude for risk. More specifically, as trust in policymakers was higher and knowledge about radioactive waste higher, social acceptance was also higher. As risk perception of radioactive waste was lower, social acceptance was higher. As media exposure is lower and media trust lower, social acceptance was higher. When environmental conservation was more valued than economic development and understanding of the scientific and technological capabilities to solve the radioactive waste problem was higher, social acceptance was higher. However, social acceptance was higher as the perception of the seriousness of the problem was lower and the importance of the policy for radioactive waste management was lower. As the information processing type aimed at risk reduction was kept, social acceptance was higher. When allowing for risk imposition upon individuals without consent if the risk level was very low, and taking risk for the development of the community was accepted, social acceptance was higher.

All these results convey the message that, to achieve social acceptance, analyses must be performed multi-dimensionally by taking account of rational and emotional areas, values, and understanding of attitudes and beliefs. Accordingly, it is necessary to start from the understanding of respective parties through communication channels rather than attempting to win social acceptance by simply enacting policies.

Table 8-5 Analyses of Influential Factors on Social Acceptance of Radioactive Waste Disposal Facilities

		Social Acceptance (β)	t	p-value	Degree of Freedom	F	R^2
Trust	Trust in Policymakers	0.067	2.847	0.004	18, 1096	70.997	0.523
Knowledge	Knowledge about Radioactive Waste	0.047	2.187	0.029			
Risk Perception	Risk Perception of Radioactive Waste	-0.075	-1.055	0.292			
	Risk Perception of RWM	-0.282	-3.877	0.000			
Media	Media Exposure	-0.045	-2.098	0.036			
	Media Trust	-0.091	-3.751	0.000			
	Media Use	-0.034	-1.553	0.121			
	Media Influence	0.002	0.076	0.939			

		Social Acceptance (β)	t	p-value	Degree of Freedom	F	R^2
Preferential Value	Environment Priority over Economic Development	0.050	2.133	0.033			
Perception of Seriousness of the Problem	Seriousness of the Environmental Problem	0.008	0.353	0.725			
	Seriousness of the Radioactive Waste Problem	-0.253	-6.594	0.000			
Understanding of Science and Technology	Scientific and Technological Capabilities to Solve the Risk	0.037	1.690	0.091			
	Scientific and Technological Capabilities to Solve the Radioactive Waste Problem	0.118	3.098	0.002			
Political Efficacy	Need of Political Participation	0.007	0.346	0.729			
	Willingness to Participate in the Policy-Decision Process	0.031	1.429	0.153			
Information Processing Types	Types of Information Filters	0.070	3.128	0.002			
Policy Importance	Importance of the RWM Policy	-0.051	-2.330	0.020			
Attitude for Risk	Need of Prior Agreement at Risk Charge	0.069	3.081	0.002			

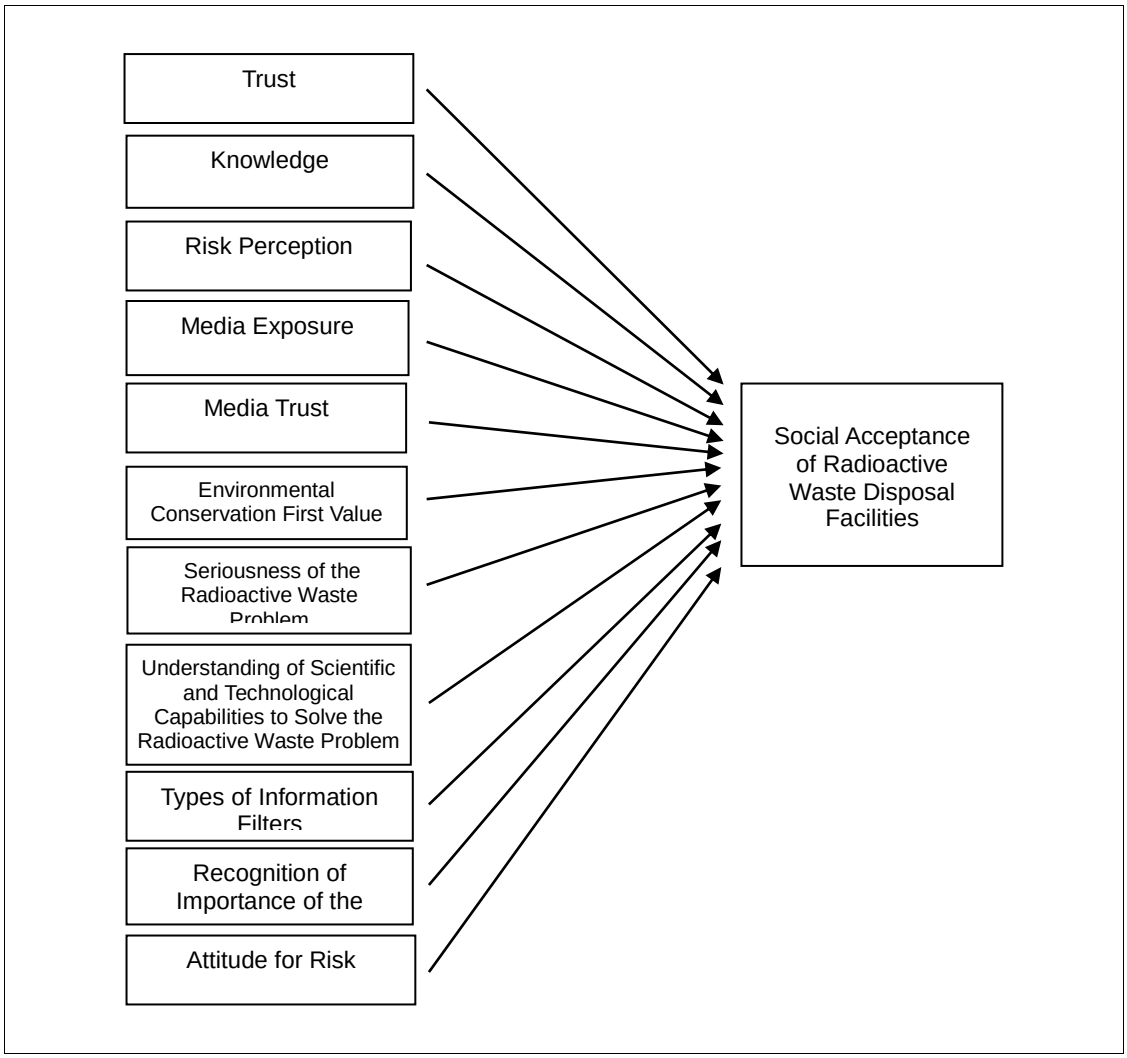

Figure 8-3 Comparison of Stakeholders' Attitudes of Consent regarding Radioactive Waste Disposal Facilities

9. RISK PERCEPTION AND SOCIAL ACCEPTANCE MODEL FOR RADIOACTIVE WASTE MANAGEMENT

Below is the result of the path analysis conducted to present a more elaborate risk perception and social acceptance model for radioactive waste management based on the contents that have so far been discussed.

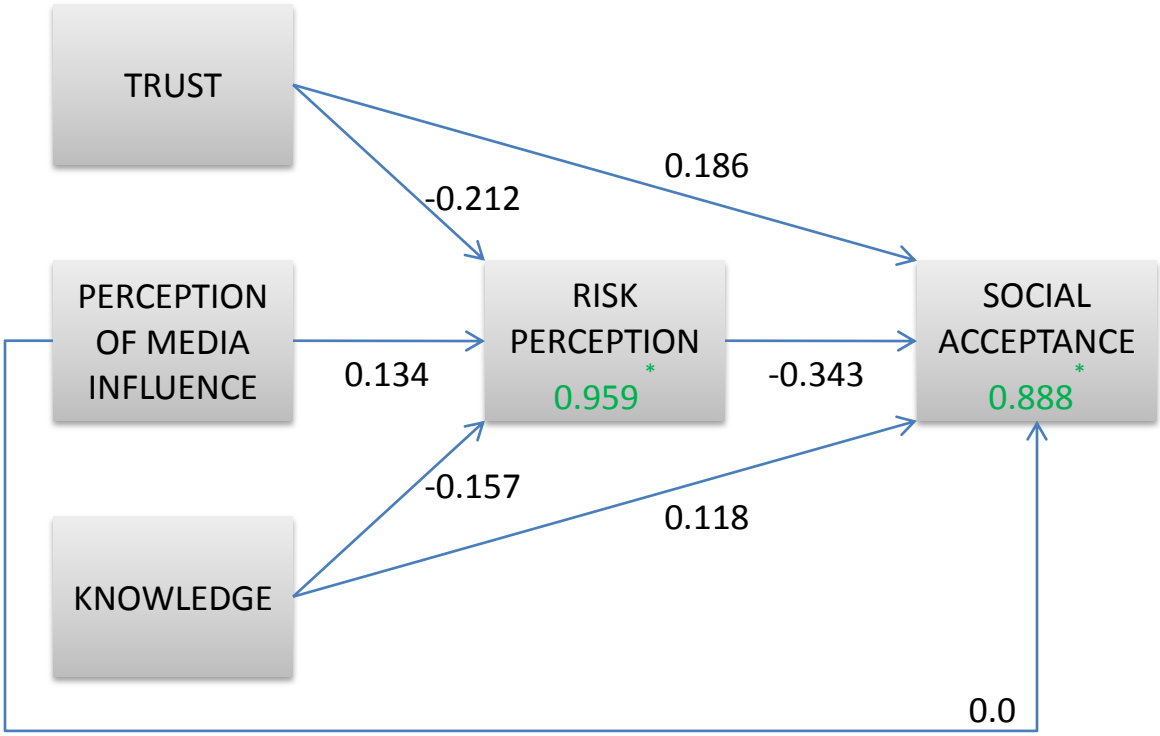

Figure 9-1 Risk Perception and Social Acceptance Model (*-coefficient of alienation)

Table 9-1 Effect Coefficients

Consequence	Effect Type	Trust	Perception of Media Influence	Knowledge	Risk Perception
Risk Perception	Direct (or Total)	-0.212	0.134	-0.157	NA
Social Acceptance	Direct	0.186	0	0.118	-0.343
	Indirect	0.073	-0.046	0.054	NA
	Total (Direct+Indirect)	0.259	-0.046	0.172	-0.343

As shown in Figure 9-1, the three factors affecting risk perception are trust, perception of media influence and knowledge. Regarding trust, those who have a higher trust in policy authorities were likely to have a lower risk perception than those having a low trust (β=-0.212). This reveals that as trust in policy authorities is higher, the risk perception of radioactive waste management is lower. As for perception of media influence, those perceiving a higher media influence on the policy-making process were likely to have a higher risk perception than those perceiving a lower media influence on the process (β=0.134). Regarding knowledge, as knowledge about radioactive waste was higher, risk perception was lower (β=-0.157). Comparing the effects of trust, perception of media influence and knowledge on risk perception, trust in policy authorities had the highest effect, followed by knowledge about radioactive waste and perception of media influence on the policymaking process.

Meanwhile, the effect of trust, perception of media influence, knowledge and risk perception on social acceptance was also investigated. Regarding trust, social acceptance was likely to rise (β=0.186) as trust in policy authorities rose. Perception of media influence was found to not have a direct effect on social acceptance (β=0), but has an indirect effect on social acceptance through risk perception. As for knowledge, social acceptance was likely to grow (β=0.118) as knowledge about radioactive waste was higher. It was also found that social acceptance tended to go down (β=-0.343) as risk perception of radioactive waste management was higher.

As shown in Table 9-1, comparing the effect of trust, perception of media influence, knowledge and risk perception on social acceptance, the risk perception of radioactive waste management had the highest effect on social acceptance of radioactive waste disposal facilities (β =-0.343) followed by trust in policy authorities policy authorities (β =0.259) and knowledge about radioactive waste (β =0.172). The perception of media influence on the policymaking process had the lowest effect (β=-0.046).

As seen in the model, if risk perception (coefficient of alienation=0.959) and social acceptance (coefficient of alienation=0.888) are very high, the coefficient of alienation[7] is also very high. This can be interpreted that there are many other factors influencing risk perception in addition to the factors presented in the model (trust, perception of media influence and knowledge). Social acceptance can be understood in the same way. The model indicates that trust, knowledge and risk perception influence social acceptance, but there are more influencing factors besides these three. Accordingly, it is assumed that identifying other influential factors is a very important task.

Despite this finding, the significance of this model lies in proving the fact that risk perception and social acceptance are very closely related. It also confirms that it is almost impossible to win social acceptance in a short time simply with policies. It also helps to understand the tasks given to us clearly. Once a problem is diagnosed correctly, its solution can be more easily discovered.

[7] The coefficient of alienation can be seen as a numeric value showing that many variables not included in the current model have an influential force. Therefore, its higher value means the higher influential force of the variables not presented in the current model.

10. CONCLUSION: DELIBERATION ON THE DECISION OF A RADIOACTIVE WASTE MANAGEMENT POLICY AND ITS DECISION-MAKING PROCESS

A radioactive waste management policy should not be decided upon lightly, nor can it be determined easily. The Radioactive Waste Management Act of Korea describes some fundamental principles on planning radioactive waste management, stakeholder engagement, financing waste management operations, and a detailed implementation plan or enforcement processes has been formulated into the law as the Enforcement Decree and the Enforcement Regulation of the Act. Nevertheless, it is commonly understood that the policy for radioactive waste management should be decided on the condition that social acceptance first be secured. It is not too much to say that such an implicit agreement has been prevailing in all advanced countries in nuclear energy. If this is true, we have to answer the following questions: what is social acceptance? --and how is social acceptance achieved? To provide clues in a way to answer these questions, a variety of analyses have been attempted.

First, this study has tried to reconfirm the concept of social acceptance. Social acceptance is a type of social behavior agreed upon by its constituents, so they take a supportive or neutral position for the policy that has been determined and acknowledge its legitimacy without opposing or resisting its implementation even when they have negative opinions against it, or it is adverse to their interests. Accordingly, social acceptance depends on the legitimacy of the policy. How can legitimacy be obtained? Jumping to a conclusion, it can be attained through a more transparent and inclusive decision making process. The need of nuclear governance could have been confirmed through discussions on social acceptance. It is the tentative conclusion that nuclear governance is best for integration and management of such factors influencing social acceptance.

Radioactive waste management involves a variety of stakeholders, and it was confirmed that they showed similar tendencies in the areas specific to them depending on their interest. For instance, the sectors of nuclear circles, regarded as one group by laymen, have different attitudes. The regulatory and radioactive management sectors showed similar responses in most areas, and the research and power generation sectors revealed closely similar answers. These results can be interpreted that the former pair are more acutely familiar with safety regulations, while the latter pair are more familiar with means of promotion. Residents at sites of nuclear power plants showed similar patterns. Gori and Wolseong residents must be sensitive to SNF/used fuel management due to their regional characteristics. Indeed, these parties' interest is reflected in their risk perception and social acceptance. Especially the residents of Gyeongju, where a low-to-intermediate level radioactive waste disposal facility is under construction, showed their interest more clearly than other parties. NGOs revealed their position clearly, and it is not necessary to explain their attitudes and motivations. What should be noted is the perception by power plant workers residing in nearby towns. They showed a very positive perception toward radioactive waste and its management. What distinguishes them from other parties? The answer can be found from the fact that they have direct experience with radioactive waste and its management. This needs to be investigated and analyzed more deeply, but it is clear that experience can influence perception.

It is also necessary to discuss policy authorities in depth. Most people assume that the government, the Blue House and IAEA have a strong influence on the policy-making process. However, the level of trust in the government and the Blue House is actually the lowest among the groups. Not surprisingly, the IAEA receives the highest trust. These results confirm that radioactive waste management policy is not regarded simply as a domestic issue. Besides, it is hard to establish the legitimacy of a policy that is decided upon by policy authorities who are not trusted. Therefore, trust in policy authorities is the No.1 priority for achieving social acceptance. This means that policy authorities must actively work either for achieving social acceptance or for winning the legitimacy of the policy. Because the policy authorities plan and control the policy-making process and have the power to produce the best policies, if policy authorities are more flexible and transparent in taking care of the policy-making process, the radioactive waste policy can gain legitimacy, and social acceptance can be achieved.

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