A method for selection of spent nuclear fuel (SNF) transportation route considering socioeconomical cost based on contingent valuation method (CVM)

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Abstract: The transportation of spent nuclear fuel (SNF) can cause radiation exposure to people and the environment. Therefore, the radiological risk should be estimated and managed quantitatively for people who live near the transportation route. Before the SNF transportation takes place, a route selection is generally made based on the radiological risk estimated from the RADTRAN code. Existing methods for route selection are usually based on only the risks of radiological health. However, there are several costs associated with transporting SNF, including socioeconomic costs. In this study, a new method and its numerical formula for route selection related to the transporting SNF are proposed based on these various costs. The total cost consists of radiological health, transportation, and socioeconomics cost. In particular, the contingent valuation method is used to estimate the socioeconomic costs. Consequently, the socioeconomic cost is extremely dominant, so the socioeconomic cost estimation is very important. The route selection regarding SNF transportation can be reasonably supported with the proposed method.

Keyword: spent nuclear fuel; radiological health cost; transportation cost; socioeconomic cost; contingent valuation method

1 Introduction

Transportation of radioactive materials (RAM) including spent nuclear fuel (SNF) may cause an additional radiation exposure risk to human beings and environment. Radiological risk due to SNF transportation arises from exposures to ionizing radiation under both normal and accident conditions. This radiological risk is a primary concern for people who live near, or travel on SNF shipments routes. Therefore, the radiological risk induced by SNF transportation must be estimated and managed quantitatively for human health.

In order to estimate radiological exposures and consequences under both incident-free and accident conditions, the RADTRAN code has been widely used [1]. RADTRAN code was first developed by Sandia National Laboratories for use in the transportation risk assessment which estimates radiological collective dose for SNF transportation. The transportation radiological risks are assessed for several routes using RADTRAN code to decide the SNF transportation route from origin to destination and each risk results are used as the reference materials for the selection of route. Generally, route causing the minimum radiological risk is selected as the optimal path for that transporting SNF from origin to destination.

However, radiological exposure can have damaging health effects, so the radiological risk induced from SNF transportation is a kind of economic loss from an economic point of view. Additionally, transportation of SNF induces the socioeconomic effects, e.g. the loss of properties, reduced economic

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activities, and anxiety associated illness, to the region along the route. It means that the transportation of SNF may cause the socioeconomic cost in a broad way. Accordingly, when there are extra costs due to radiological risk caused by SNF transportation, we need to consider how we can decide the best transportation route.

In the study, a new method for selection of SNF transportation route is suggested and it considers several costs caused by SNF transportation (radiological health cost, transportation cost, and the socioeconomic cost). In particular, contingent valuation method (CVM) is used to determine the socioeconomic cost caused by transportation of SNF.

2 The methods for route selection in SNF transportation

2.1 The existing method for SNF transportation route selection

The current method regarding the route selection for SNF transportation is based on the radiological risk assessment. The method of radiological risk assessment using RADTRAN code is usually applied to decision-making with a transportation route selection of SNF up to now. If there are several possible routes for transportation of SNF, the radiological collective dose risks are assessed for each route and then the risks of each route are compared to select optimal route for the SNF transportation from origin to destination. Thus, when we carry out the SNF transportation, the collective radiological dose risk is the most important factor. That means the existing method for decision of SNF transportation route is based only on the risk related to the radiological health effects.

However, the safety and economic efficiency are also very important factors in decision of nuclear-related policy [2]. The economical analysis of SNF transportation is required in route selection. Economically, the total cost at a region caused from the SNF transportation consists of radiological health cost, transportation cost, and the socioeconomic cost along the route.

2.2 The proposed method for SNF transportation route selection

The proposed method for decision-making regarding route selection considers the total cost originated from SNF transportation. The total cost consists of radiological health cost, transportation cost, and socioeconomic cost. When the route selection for SNF transportation is performed, the decision-making considering several costs follows this simple concept;

The radiological risk assessed using RADTRAN is converted to 'radiological health cost' by multiplying proper conversion factor. And then, sum up the 'radiological health cost', 'transport cost' for the transportation task, and 'socioeconomic cost' caused by SNF transportation to obtain 'total cost'. Among the all alternative routes, the route for minimum total cost is the best option.

The numerical expression for total cost originated from SNF transportation within a region along the route is shown in Equation (1).

$$C_{Total} = C_r + C_t + C_s \qquad (1)$$

Where, C_{Total} is the total cost caused by SNF transportation, C_r is the radiological health cost caused by SNF transportation, C_t is the transport operation cost and C_s is the socioeconomic cost caused by SNF transportation.

The numerical formula of decision-making concept regarding route selection in the proposed method for SNF transportation is expressed in Equation (2).

$$C_{Total}(a) < C_{Total}(1), C_{Total}(2), \cdots, C_{Total}(n) \qquad (2)$$

Each C_{Total} is the total cost generated when the SNF transportation is performed corresponding to each route as shown in the Figure 1. Here, n means the number of possible routes from origin to destination and the $C_{Total}(n)$ means the total cost originated from SNF for route $R(n)$ from origin to destination. If the total cost of route $R(a)$ is the minimum value among the representatives, the route $R(a)$ causing the total cost $C_{Total}(a)$ is the optimal path for the SNF transportation.

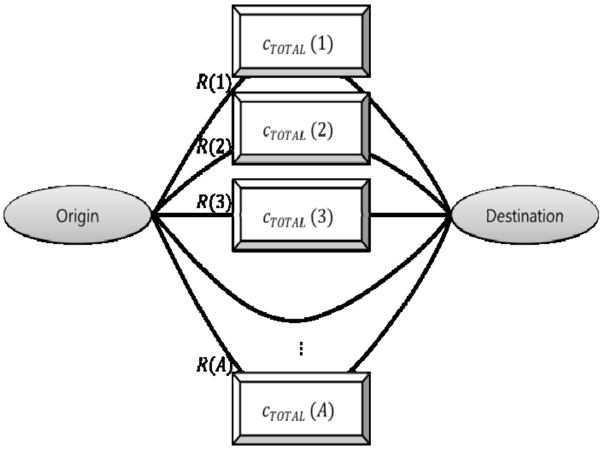

Fig.1 Several alternative routes for SNF transportation.

3 The ways to assess each cost in the proposed method

3.1 Cost analysis

Cost analysis originates from the economic theory of welfare and represents the most straightforward quantitative decision aid in common use for comparing the benefits and harm associated with different courses of action. A principal characteristic of cost analysis is that the factors influencing a decision are commonly expressed in monetary terms. In a broad sense, additional radiological exposure can be expressed as a kind of cost and the optimal decision-making is based on the minimum radiological exposure cost when we consider proposed alternatives causing radiological risk [3, 4]. Thus, when we make a decision regarding route selection for SNF transportation, cost analysis could be applied to select the most cost-effective SNF transportation route.

3.2 Radiological health cost

The health cost of radiological exposure caused by SNF transportation is proportional to the amount of radiation collective dose risk in a simple formulation. The simple cost analysis can be implemented transforming the collective dose into a monetary valuation multiplying the reference value of unit collective dose [3].

$$C_r = \alpha \times R \tag{3}$$

Where, α is monetary conversion factor of radiological dose risk and R is radiological collective dose risk estimated using RADTRAN code. Choi (2001) assessed α for radiological health risk using contingent valuation method (CVM). He conducted web-based online survey questionnaires for *employees* in nuclear power plant and nuclear institutes and for *public* in Korea to determine willingness to pay (WTP). Then, he performed a comparative analysis using WTP to determine α and it is presented for each group in the Table 1 [5].

Table 1 Value of monetary conversion factor for radiation collective dose risk

Group	Monetary conversion factor (Won/person-rem)
Workers	2,750,000
Public	2,960,000

3.3 Transportation cost

Transportation cost means the expense that might be required for transfer, load, or unload of the SNF cask in transporting operation. Generally, the transportation cost consists of link cost and node cost.

3.3.1 Link cost

The link cost is the expenditure for transfer of SNF cask from origin to destination. It can be divided into labor, fuel, and maintenance expenses [6]. If we assume that the transport operation for one cask to transfer from node i to node j is a unit transportation of SNF, then the unit link cost is C_{ij} in which the unit link cost includes labor, fuel, and maintenance cost. Supposing the amount of freight is the X_{ij} from node i to j, the total link cost can be calculated multiplying C_{ij} by X_{ij}.

$$LINK\ COST = C_{ij} \times X_{ij} \tag{4}$$

3.3.2 Node cost

The node cost is produced when cask is loaded or unloaded to/from the transportation vehicle and it is proportional to the amount of freights. The node cost is composed only labor expense. Let's assume that the unit node cost, h, is for one cask to be loaded or unloaded to/from the vehicle and the amount of freights is the X_{ij} at each node, the total node cost is obtained multiplying the h by X_{ij}.

$$NODE\ COST = h \times Xi_j \tag{5}$$

3.3.3 Total transportation cost

The total transportation cost is calculated simply summing up the node cost and the link cost. Therefore, a numerical formula to obtain the total cost is expressed in Equation (6).

$$C_t = C_{ij} \times X_{ij} + h \times X_{ij} = (C_{ij} + h) X_{ij} \qquad (6)$$

3.4 Socioeconomic cost

Risk includes health risks that arise from workers and members of the public being exposed to radiation from shipments of SNF. It also includes social risks that arise from social processes and people's perceptions, even in the absence of radiation exposures [7]. Social risks are associated with the direct social and economic (i.e., socioeconomic impacts) impacts. The routine transport operation of SNF may have direct impacts on quality of life, property values, and/or business activities of the regions along the shipment routes. In the next chapter, the theory and guidelines of contingent valuation method are described and the design of CVM questionnaire is suggested to improve the reliability of socioeconomic cost estimation additionally.

4 Socioeconomic cost estimation in SNF transportation

4.1 Cost and benefic relationship in space

The socioeconomic cost and benefit caused by unwanted facilities or actions leads to cost-benefit imbalance in space, so that a gain as the distance changes from the source of the facilities or actions is unequal [8]. Thus, benefit is evenly distributed along the distance, but socioeconomic cost is concentrated near the source as shown in Figure 2. The inequality of net-benefit is the direct reason of group behavior and NIMBY for the public to be compensated.

When it comes to transporting SNF, the net-benefit is an improvement of the safety of SNF management but the cost caused by transporting SNF could be imputed to the public near the shipments route totally. Therefore, the public affected by the unwanted facilities or actions might want to be provided with proper compensation for transporting operation of SNF. It is required to estimate the socioeconomic cost for the need of compensation to the public and its quantitative valuation. With the socioeconomic estimation, effective SNF transportation-related policy would be implemented properly.

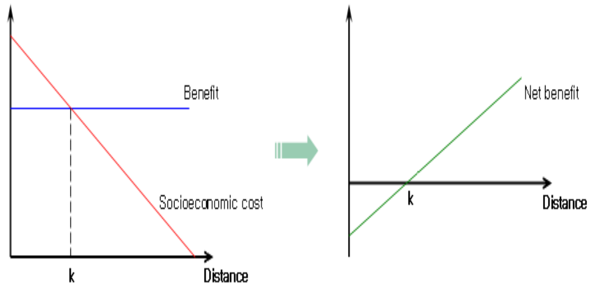

Fig.2 Cost, benefit and net-benefit in space.

4.2 CVM to estimate socioeconomic cost in transporting SNF

There are several methods for non-market valuation. The contingent valuation method (CVM) is the most widely used in the environmental economics [9]. The CVM uses questionnaire to get the compensation cost when the public is charged with unwanted facilities or actions and sum up the each compensation to get the total social willingness to pay (WTP). The total social WTP is the economic value of environmental quality [10-12]. The SNF transportation is a kind of environmental good influencing the conditions of human life therefore the socioeconomic cost originated from transporting SNF could be estimated with the CVM questionnaire method. The socioeconomic cost consists of the loss of property, the anxiety and associated illness, and the reduced economic activities within a region along the shipments route.

The application of CVM is performed according to several steps [13].

1. The first step is to define the valuation problem. This would include determining exactly what services are being valued, and who the relevant population is.
2. The second step is to make preliminary decisions about the survey itself, including whether it will be conducted by mail, phone or in person, how large the sample size will be, who will be surveyed, and other related questions.
3. The third step is the actual survey design. It is accomplished in several steps. In the initial focus groups, the researchers would ask general

questions about peoples' understanding of the issues. In later focus groups, the questions would get more detailed to help develop specific questions for the survey like what kind of background information is needed. Finally, the researchers have reached a point where they have an idea of how to provide background information, describe the hypothetical scenario, and ask the valuation question, they will start pre-testing the survey.

4. The next step is the actual survey implementation. The first task is to select the survey sample. Ideally, the sample should be randomly selected using standard statistical sampling methods. In-person surveys may be conducted with random samples of respondents, or may use "convenience" samples – asking people in public places to fill out the survey.
5. The final step is to compile, analyze and report the results. The data must be entered and analyzed using statistical techniques appropriate for the type of question. In the data analysis, the researchers also attempt to identify any responses that may not express the respondent's value for the transporting SNF. In addition, they can deal with possible nonresponse bias in a number of ways. The most conservative way is to assume that those who did not respond have zero value.

From the analysis, the researchers can estimate the average value for an individual or household in the sample, and extrapolate this to the relevant population in order to calculate the total socioeconomic cost from the SNF transporting operation.

4.3 Design of CVM questionnaire

The national oceanic and atmospheric administration (NOAA) suggested basic guidelines in executing the design of the CVM questionnaire [14]. If a researcher performs the CVM questionnaire for the subject properly as presented in the NOAA reports, the socioeconomic cost can be estimated from the CVM questionnaire reliably. The some guidelines for estimating socioeconomic cost from transporting SNF are shown in the Table 2.

Table 2 Design guidelines of CVM in estimating cost

	Details
1	Conduct personal interviews (Face-to-face is best)
2	Estimate WTP, not willingness to accept (WTA)
3	Accurate description of program of policy
4	Alternative expenditure possibilities provided
5	Checks for understanding
6	Careful pretesting

In order to obtain the socioeconomic cost from transporting SNF in a region, the WTP for the public to escape the transporting SNF is estimated with questionnaire. There are several matters to be attended to get the accurate WTP before the questionnaire is performed. In this case, the notes are described in the next paragraph and the list of questionnaire is presented in Appendix.

- Pretest was carried out for setting up the WTP range in questionnaire
- Visual materials were supplied for a better understanding of the issue
- Inquiry was offered on WTP for the interviewers to avoid the given radiological collective dose from SNF transportation
- Supplementary question is provided to check the understanding of the problem
- Unit: [Won/person-rem]/household

4.4 Socioeconomic cost of transporting SNF

The total socioeconomic cost originated from transporting SNF is calculated from the Equation (7).

$$C_s[Won] = WTP \times N_h \times R \qquad (7)$$

The C_s is a total socioeconomic cost from transporting SNF, the N_h is a number of households in a region along the shipments route, and the R means a radiological collective dose risk calculated with the RADTRAN code.

4.5 Cost estimation for route selection in transporting SNF

The total cost originated from transporting SNF consists of the radiological health cost, transportation cost, and the socioeconomic cost as it is stated in the Equation (1). The Equation (8) describes the Equation (1) with several coefficients and variables for characterizing about transporting SNF in detail.

$$C_{Total}\left[Won\right] = A \times R + (C_{ij} + h) \times X_{ij} + WTP \times N_h \times R \tag{8}$$

Where A is the monetary conversion factor for collective dose risk [Won/person-rem], R is the collective dose risk value calculated with RADTRAN code [person-rem], C_{ij} is the unit transportation cost from node i to node j [Won/cask], h is the unit node cost for one cask to be loaded or unloaded to/from a vehicle [Won/cask], X_{ij} is the amount of freights from node i to node j [cask], WTP is the willingness to pay per household [Won/person-rem/household], and N_h is the number of households of a region. The Equation (8) provides the insight for route selection based on the estimation of total cost originated from transporting SNF.

5 Case study

In order to understand how total cost originated from SNF transportation is estimated, let us assume that there are three routes from Kori to Wolsung as shown in Fig. 3.

Fig.3 SNF transportation from Kori to Wolsung.

For each route, basic information such as the total distance of SNF transportation from Kori to Wolsung, the average population density and the average number of households are shown in Table 3.

Table 3 Basic information for each route

Route	Total distance (km)	Average population density (#/km^2)	Average number of household (#/node)
Route 1	61.6	1,404	6,311
Route 2	78.45	5,330	7,595
Route 3	65.81	1,324	6,087

5.1 Radiological health cost estimation

As mentioned before, the radiological health cost is estimated by multiplying the monetary conversion factor (α) to the radiation collective dose risk (R) as shown in Equation (3). α is presented in Table 1 and the radiological health cost for each route is estimated as shown in Table 4.

Table 4 Radiological health cost estimation for each route

Route	RADTRAN risk (person-rem)		Radiological health cost (won)
	Workers	Public	
Route 1	1.64E-01	8.74E-02	709,704
Route 2	2.09E-01	1.90E-01	1,137,150
Route 3	1.75E-01	1.08E-01	800,930

5.2 Transportation cost estimation

Transportation cost can be estimated by summing up link cost and node cost. Link cost consists of labor, fuel, and maintenance expenses and it is calculated as Equation (4). Here, we assume that labor expense is 1,000,000 [won], fuel expense is 750 [won/km], and maintenance expense is 500,000 [won]. Node cost is composed only labor expense to load or unload the cask and it is calculated as Equation (5). It is assumed that labor expense for loading and unloading the cask is 100,000 [won/node]. Total transportation cost for each route is shown in Table 5.

Table 5 Transportation cost estimation for each route

Route	Link cost (won)	Node cost (won)	Total transportation (won)
Route 1	1,546,203	1,100,000	2,646,203
Route 2	1,558,838	2,000,000	3,558,838
Route 3	1,549,358	1,200,000	2,749,358

5.3 Socioeconomic cost estimation

In order to estimate socioeconomic cost, the WTP is obtained through the CVM questionnaire. The questionnaire survey was conducted with the public who live near the site of nuclear power plant. The sampling is performed randomly regardless of age or sex and the sampling size is 61. A period of survey questionnaire is from 29th on November to 1st on December in 2007. The public suggested their WTP using the method of selection and direct mark. The distribution of WTP of each household is presented in the Fig. 4. The values of WTP for each household are distributed similar to the normal distribution and the mean value of WTP calculated from the data is 23,230 [Won/0.002person-rem/household]. It is 11,615,000 [Won/person-rem/household].

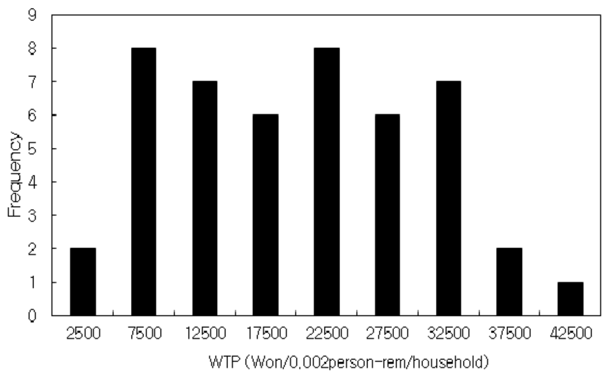

Fig.4 Distribution of WTP.

Using Equation (7), socioeconomic cost can be estimated and the result is presented in Table 6.

Table 6 Socioeconomic cost estimation for each route

Route	Number of households for each node	Public RADTRAN risk for each node (person-rem)	Socioeconomic cost for each route (won)
	3,631	8.62E-03	
	7,462	8.08E-03	
	5,723	8.37E-03	
	8,162	2.84E-03	
	5,620	2.90E-03	
Route 1	6,982	3.16E-03	7,516,810,557
	15,809	8.58E-03	
	9,070	3.04E-02	
	2,070	7.09E-03	
	2,929	5.85E-03	
	1,966	1.50E-03	
	3,631	6.43E-03	
	1,947	5.97E-03	
	26,814	1.09E-01	
	3,797	1.25E-02	
	5,723	3.16E-03	
	21,868	1.78E-02	
	9,346	8.05E-03	
	11,431	1.03E-02	
	7,776	9.41E-03	
	8,285	7.21E-03	
Route 2	3,043	1.86E-03	48,692,017,800
	2681	3.00E-03	
	17,707	1.10E-02	
	17,905	6.30E-03	
	3,782	3.50E-03	
	8,090	9.51E-03	
	1,842	2.14E-02	
	82	3.34E-02	
	83	2.10E-03	
	38	1.17E-04	
	3,631	1.69E-03	
	2,878	9.22E-03	
	8,204	9.12E-03	
	5,723	3.03E-03	
	8,162	4.44E-03	
Route 3	5,620	2.86E-03	7,981,422,149
	6,982	3.12E-03	
	15,809	8.75E-03	
	9,070	3.02E-02	
	2,070	3.36E-02	
	2,929	2.13E-03	
	1,966	1.03E-04	

5.4 Total cost estimation

As mentioned before, the total cost originated from transporting SNF consists of the radiological health cost, transportation cost, and the socioeconomic cost. We estimated total cost for three routes from Kori to Wolsung. Since the total cost for Route 1 is 7,520,166,464 [won], Route 2 is 48,696,713,788 [won], and Route 3 is 7,984,972,437 [won], we can expect that Route 1 is the optimal route for transporting SNF from Kori to Wolsung.

Table 7 Total cost estimation for each route

Route	Total cost (won)
Route 1	**7,520,166,464**
Route 2	48,696,713,788
Route 3	7,984,972,437

6 Conclusion

A transportation of SNF may cause an additional radiological exposure to environment and human beings. Radiological risk is a primary concern for people who live near or travel on SNF shipments route. Therefore, the radiological risk induced by SNF transports must be estimated and managed quantitatively for human health. Generally, the route selection for SNF transportation is based on the collective dose risk calculated using RADTRAN code in current method. If a route gives minimum collective dose risk into a region near the shipments route among the several alternatives, the route is the optimal path for that transportation. However, since there are some other effects causing the public near the shipments route, it should be considered for the transportation of SNF. A cost analysis is one of the methods to decide whether a project or an action is proper or not in the economics so that cost estimation can be applied to the decision-making regarding route selection of the SNF transportation. A total cost from transporting SNF consists of radiological health cost, transportation cost, and socioeconomic cost.

In this study, a new method considering the total cost is proposed for route selection of SNF transportation. It is based on the cost estimation on several effects caused from transporting SNF. First, the radiological health cost is estimated multiplying a collective dose risk by the monetary conversion factor. Here, it includes any risky factor to compensate for radiological exposure due to accident during transportation. Second, the transportation cost is composed of link cost and node cost. Each cost is defined newly considering the characteristics on transporting SNF. Third, the socioeconomic cost from transporting SNF is obtained with the contingent valuation method. To obtain the socioeconomic cost in a region, WTP must be estimated with questionnaire. In order to apply the proposed method to estimate total cost for route selection, we considered three routes of transporting SNF from Kori to Wolsung. As a result, total cost for each route was assessed and we can expect the optimal route. The socioeconomic cost estimated by CVM was very dominant compared to radiological health cost and transportation cost. It is because that the socioeconomic cost is caused by unwanted facilities or actions which can lead the loss of property, the anxiety and associated illness, and the reduced economic activities within a region and people seem to want much compensation for these possible losses. As a result of questionnaire, the public might want to be provided with proper compensation (11,615,000 [won/person-rem/household]) and this is much higher than radiological health cost and transportation cost. Accordingly, socioeconomic cost estimation is required when SNF transportation is performed.

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Appendix – Questionnaires for estimating socioeconomic cost from transporting SNF

Let us assume that spent nuclear fuel (SNF) will be transported through your residential area. The risk of transporting SNF will be increased as the transportation is more frequent. The transport company claims that the risk of transporting SNF is dramatically decreased since the company has introduced new and effective safety equipment and better policies. However, there have been a lot of conflicts between the company and resident. What would you think if the SNF is transported to the destination via your residential area? Please fill out the questionnaires.

Question 1) If SNF is transported through your residential area, what would be your biggest concern?

① Economic loss due to the reduction of house and land value
② Damage from the weakened economic activities
③ Restrictions of a local community's economic activities
④ Physical and mental illnesses caused by psychological anxiety

Question 2) After much deliberation amongst subject matter experts, the transport company decides that SNF will indeed be transported through your residential area. SNF transportation is going to be performed. How will you cope with this situation?

① I will organize the committee to strongly insist on decision nullification.
② I will stand against the decision by scrutinizing the absurdities of unfair competition and safety test.
③ I will find a way to interrupt SNF transportation plan even if I use my own money.
④ I will accept SNF transportation, but sufficient compensation and support should be guaranteed.
⑤ I will follow the decision without any doubt.
⑥ The others

Question 3) What would you think if the transport company claims that the SNF being transported through your residential region and it will not do any harm to the environment because it is equipped with the most up-to-date safety mechanisms and accident-proof systems?

① Strongly agree
② Agree
③ Neither
④ Disagree
⑤ Strongly disagree

Question 4) If SNF transportation will be implemented in spite of residents' opposition, what is the proper compensation for the damaged region, including your residential district?

① Cash reward for damage
② Support for regional economic revival
③ Enhancement of the regional convenient facilities
④ Job creation and preference support
⑤ Tax reduction
⑥ The others

Question 5-1) Let us assume that transportation company is planning to introduce a new and effective radiation protection equipment and better operating policies to reduce, by half, risks associated with transporting SNF. However, it will be much costly to introduce a new piece of equipment. Government is planning to collect money from you. How much are you going to pay for new equipment and better operating policies?

① 1,000~4,900 Won
② 5,000~9,900 Won
③ 10,000~19,900 Won

④ 20,000 ~29,900 Won
⑤ 30,000~39,900 Won
⑥ 40,000~49,900 Won
⑦ The others

Question 5-2) Please write down specific price.

Question 6-1) Let us assume that transportation company will make compensation for a loss. How much are you going to accept for compensation from the transport company when the risk of transporting SNF doubles?

① 1,000~4,900 Won
② 5,000~9,900 Won
③ 10,000~19,900 Won
④ 20,000 ~29,900 Won
⑤ 30,000~39,900 Won
⑥ 40,000~49,900 Won
⑦ The others

Question 6-2) Please write down specific price.

Question 7-1) Let us assume that the route for transporting SNF will be changed since your residential neighborhood strongly refuses to the transportation. How much are you going to pay for the new passing area of transporting SNF? Please keep in mind the new passing area will be farther from your residential area with more payments.

① 1,000~4,900 Won
② 5,000~9,900 Won
③ 10,000~19,900 Won
④ 20,000 ~29,900 Won
⑤ 30,000~39,900 Won
⑥ 40,000~49,900 Won
⑦ The others

Question 7-2) Please write down specific price.

Question 8-1) Let us assume you will be moving in the passing area of transporting SNF involuntarily. However, it is almost impossible to change the route selected for transporting SNF unless you reward with your money. How much are you going to pay for changing the route of transporting SNF? Please keep in mind the new passing area will be farther from your residential area and the risk of transporting SNF will be decreased with more payments.

① 1,000~4,900 Won
② 5,000~9,900 Won
③ 10,000~19,900 Won
④ 20,000 ~29,900 Won
⑤ 30,000~39,900 Won
⑥ 40,000~49,900 Won
⑦ The others

Question 8-2) Please write down specific price.