Trust, Risk Perception, and Policy-making in Drinking Water Problems

Seungkwon You
(Assistant Professor, University of Missouri-Columbia)
Jiho Jang
(Assistant Professor Public Administration, HanKuk University of Foreign Studies)

Abstract: The purpose of this study is to investigate how environmental risks associated with water problems are identified and assessed among Korean elites and general population. By doing so, this study is expected to introduce how the Koreans focus on different dimensions of the risks in Korea. Although Korea has improved its quality of life significantly as the country has developed, people do not trust the quality of tap water that they drink everyday. Despite efforts made by the government, the public hasn't shown any confidence in water quality, due to a series of environmental accidents in the 1990s that included carcinogen detection in tap water and phenol flows into Nak-Tong river in South Kyong-Sang Province. Using Q method, this study finds different environmental risk perceptions among elites and citizens and provides rich exploratory information about existing values in tap water problems, which will be significant information to policy makers. The study finds three different types among Korean elites and citizens. First group is Anti-Capitalist, Techno-Skepticist, Critical Environmentalists. Second group is pro-technology, Optimistic Modernists, and finally, Political ecologists and Distrustful Modernists are the last group.

Key words: environmental risks, water problem, q-method, risk-perception

Korean Social Science Journal, XXXIII No. 2(2006): 33-65.

Ⅰ. Introduction

The issue of environmental risk extends far beyond direct health effects. Conflicts and differences are always revealed among policy stakeholders, regulators, scientists, environmental activists, business groups, and the public in perceiving environmental contaminations and hazards. Scientists perceive environmental hazards based on scientific evidence and then calculate risks, but the interpretation of findings is often contested and debated. On the other hand, public and environmental activists recognize risks from socio-cultural viewpoints, which often cannot be grounded on scientific facts and evidence. Activists rather have lost faith in the ability of science, technology, industry, and government to manage the environmental risks. This loss of trust in institutions and contestatory social group mobilization in representing their interests has very significant political and policy implications.

Risk assessment and risk management, despite the extensive adoption of scientific evaluation, involves contentious and politicized conflicts among issue stakeholders. These environmental controversies actually bring about a scenario wherein no one really knows what the real problems and risks are. The uncertainty of these environmental risks makes it more complex and difficult for policy-makers to solve or prevent problems. As a consequence, perception and values of environmental risks of various groups of experts and citizens becomes a key element in formulating environmental risk decision-making. These different perceptions of environmental risks among issue stakeholders drive political issues and choices, because they affect policy-makers and regulators' definition of environmental problems and policies.

While previous researches in environmental policy are predominantly focused on problem identification and policy re-

sponses, they have not answered one of the most important questions in policy implementation: What makes environmental policies socially and politically acceptable? Without modeling the individual attitudes or values about environmental problems, socially and politically acceptable policy cannot be produced.

Successful environmental policy formation and implementation depends on understanding and ironing out differences in perceptions and values among environmental actors. Without general acceptance among issue stakeholders, policy adoption or implementation fails. In other words, environmental risk perception is a imperative starting point in effective environmental risk management.

Thus, this paper is concerned with ascertaining different environmental risk perceptions among the general public, and policy makers, government officials, environmentalists, and scientists. Further, this study will explore the political and policy implication of these environmental risk perceptions. By discovering the contours of environmental risks perception, I hope to provide a clue to what environmental policy is socially and politically acceptable and feasible.

Ⅱ. The Role of Values in Environmental Risk Assessment and Management

In order to reduce risks to health, safety, and environment, governments has extensively involved in risk regulation. This risk regulation has two components: risk assessment, an objective and quantitative approach to determining risk; and risk management, a subjective and political approach to developing regulatory controls.

"Risk Assessment" is defined as "the quantitative characterization of the potential adverse health effects of human exposure

to environmental hazards" (National Research Council 1983). This is based on "risk-cost-benefit analysis," which "incorporates notions of probability and uncertainty as a basis for estimating technology and environment-related risks and for determining their values as costs" (Shrader-Frechett 1985, 33). Risk assessment as science involves four officially designated stages: risk identification; dose-response assessment; exposure assessment; and risk characterization (Pollak 1996). Risk identification is the stage, which identifies adverse health effects such as cancer or leukemia. Dose-response assessment figures "the relationship between the amount, intensity, or duration of exposure and the risk of a particular outcome" (Pollak 1996). Exposure assessment measure the actual dose delivered to the public. Risk characterization is the conclusion stage that summarizes the impact of a substance on human health. Because of these scientific characteristics of risk assessment, it is often considered universal tool to resolve social conflicts surrounding environmental problems.

Although it seems that risk assessment enjoys scientific privilege, many critics have questioned the validity of risk assessment in resolving conflicts. First, although risk assessment can clarify some debatable issues by presenting the scientific evidence and data, it is often not enough to satisfy all the contending parties (Graham and Phomberg, 1996). Contention among the public, experts, and government officials continues because of conflicting interpretation of data resulting from dividing interests.

Second, predicting risk is much more difficult than indicated by risk assessment because, in reality, the relationship between a small dose of a substance and later cancer death is unclear. Difficulty in conducting longitudinal studies, such as exposure for twenty years or more, makes it difficult for risk analysts to obtain empirical feedback, and the mixing of probability and health hazards causes the confusion and controversy surrounding risk assessment (Breyer 1993; Andrews 1997).

Third, risk assessment cannot resolve social conflicts not because of confusion about science or uncertainty about risk but because of differing values among stakeholders. As Andrews indicates, in reality, risk assessment cannot escape from value judgments. First of all, the selection of substances for risk assessment needs judgments, which are based on not only on objective risks but also on "publicity, lawsuits, and other political pressures" (Andrews 1997). Another judgment concerns more serious effects of health hazards, such as cancer, rather than lesser health hazards or environmental destruction. Also, value judgment is critical when experts make assumptions or inferences whenever the objective facts are not available. In such cases, experts draw the conclusion from lab tests such as animal studies because they cannot experiment on humans. However, dose-response and exposure assessment contain potential inaccuracies by having different procedures and fragmentary data. In addition, experts make assumptions about "variability in natural dispersion patterns and population movements, about other sources of exposure, and about the susceptibility of those exposed" (Andrews, 1997, 213). Thus, the effects of drinking polluted tap water on adults and children might be different.

Thus, critics argue that scientific knowledge of risk assessment does not necessarily reach to truth or certainty because of involvement of values at every stage of risk assessment. However, others argue that risk assessment is pure scientific activity and issues of risk can be separated from the individual and social values that enter in risk management process. They also argue that quantification in risk assessment can reduce the discretion of bureaucrats and experts in risk decision-making. It seems that risk assessment is the best option to identify and assess risks. However, risk analysis itself would not resolve many environmental conflicts that would require careful assessment of other factors such as values, costs, and justice.

When policy makers get to the point of decision-making, other non-scientific elements such as statutory requirements, costs, public values, and politics are considered along with scientific conclusions (Andrews 1997, 210). This procedure of choosing and justifying regulatory decisions is called "risk management." The decision makers within risk management need to consider the legal status of risks, the balance between risks and costs, the availability of technology to reduce risks, and the economic viability of developing technology to reduce risks (Andrews 1997).

Risk management matters because the risks that government chooses to manage affect suffering from injury or disease. In this process of risk management, values are at the core of risk management whether they are these of the public, scientists, or government officials. Each party identifies objectives differently to specify their own explicit value. For example, one can measure the number of lives saved or the number of years of potential life saved. With the former case, the death of a 10-year-old and a 70-year-old are considered the same, as each is one death. With the latter case, the 10-year-old count seven times as much as the 70-year old if both are expected to live up to 80 years old.

Another example shows how values make risk management more difficult and complicated. Suppose the value of extending a life by one year is $50,000. If pollution programs reduced the loss of life for people who were typically 50 years old, each individual would save roughly 25 years of life. It may be worth $1.25 million to avoid the loss of one statistical life. But economists argue that it would not make sense to spend $ 50 million dollars to save a statistical life if that money would result in taking five statistical lives by making people jobless.

Because of these value differences, risk management decisions are complex considering all the different values of each interested party. But if risk managers clarify the different values, it becomes much easier to communicate and explain why one al-

ternative is chosen and others are not.

Public Perception, Participation and Trust

Within this context of environmental risk, there is a need to understand how actors such as citizens, environmental activists, scientists and policy-makers perceive environmental risks. Cooper (1996) insists that "perceptions become critical when we try to combine social values, land use, economic issues, property rights, expectations, and all the human values to determine trade-offs between ecological balance and social opportunity." Hence risk perception will be helpful in investigating, controlling and communicating risk information about environmental hazards (Starr, et al, 2000). "Environmental risk perception" is often used to refer to the subjective view of the public, outside of the spheres of regulatory and scientific research and risk assessment. However, all groups dealing with environmental risk will have their own perceptions of environmental risks, and many aspects of their experience and knowledge will affect these perceptions (Starr, et al, 2000).

Public perceptions of environmental risk often differ from those of the experts, which become the major factor for public opposition to noxious facilities. First, the public tends to focus on risk without taking into account any offsetting benefits (Hadden, 1991). Because a lack of direct access to risk science, the public tends to overestimate the risk, while the experts tend to underestimate risk, blaming public ignorance or irrationality, and arguing that policy decisions should be based purely on quantitative risk assessments (Zeckhauser and Viscusi, 1996; Freudenburg 1996).

However, the public has a complex and multidimensional view of risk, adding to the quantifiable dimensions of probability, as well as to more qualitative dimensions such as fairness, controllability, and comprehension. Thus, it is not true any more

that public perception of environmental risks is irrational, impartial, and unreasonable. Actually, the public has recently gained access to scientific information, which has enhanced its impartial ability to perform rational risk assessment. However, the problem is that public perception will not be changed by risk assessment provided by scientists, because the public does not usually trust government and experts.

On the other hand, for experts to trust a specific risk analysis, they need the models being used, the parameter estimates, appropriate sensitivity analyses, and replicable results (Fischhoff, 1996). This discrepancy in estimating risks puts the government in an important position to balance its risk regulation efforts and avoid irrational responses to risk. Wrong allocation of resources to reduce risks eventually increases risks by not spending on other important risks. According to Krimsky and Plough (1988), the determinants of public perceptions of risk include the nature of the risk itself, the circumstances under which the risk is identified and publicized, the place of the individual in his or her community, the value of the community at large, and many other factors. This public sensitivity to technological, social, and psychological qualities of hazards is not well accepted in technical risk assessments.

Second, there are inequity problems caused by the conflicts of interests of those who receive the benefits, and those who receive the burden and cost by simply living near the facility (Rennick and Greyell, 1990). This introduces a complicated process of risk location. Traditional argument of environmental justice movement is that hazardous facilities have been disproportionately located in poor communities, which indicates that government and industry use social factors such as income as important determinants in site selection (Field, Raiffa, and Susskind, 1996). In addition, Rennick and Greyell argue that this is related to developmental issues and often the benefits of development go to other

regions while the burden and costs remain in the region near the facility, which creates more serious public distrust on the institutions that claim that benefits and compensation are given.

Other factors, such as differential application of the law, make the public distrust institutions, especially in Korea. For example, there is no specific legal limit of dioxin enforced against industrial waste incinerator, while there is a legal limit of dioxin enforced against municipal solid waste incinerators in Korea. This inequity raises one of the serious concerns among the people near the facilities, and has become the major reason to oppose their construction. Despite these controversies, the government admits no legal action can be taken toward industrial waste incinerators, and the new law against industrial waste incinerators will be effective in the year 2003.

Third, scientific uncertainty over technological safety, and difficulty in calculating the impacts of environmental hazards on human health, make public perception of environmental hazards more pessimistic. This uncertainty often leads governments to adopt the precautionary principle, which suggests not undertaking any action if the action potentially has high risks despite the uncertain probabilities. In reality, technological failures have happened for the past 40 years, such as leaks of radioactive materials from nuclear reactors, which supports adopting the precautionary principle. However, experts argue that unless an action has certain harmful consequences, then it should be permitted.

Other risk scholars argue that scientific uncertainty is not only a matter of science, but is influenced by social construction (Jamison, 1996). Jamison argues that uncertainty can be minimized when we have full trust in the institution, person, or data set that is being tested. On the other hand, uncertainty is magnified if distrust among the involved parties is great.

Fourth, the public does not trust government and the experts, which increases the level of risk perception. The various

surveys show that the level of trust in the government has decreased over the years. This results from various cases wherein the government confirms the safety of facilities and water, but its claims turn out to be false. This technical failure of experts is called *recreancy* by Freudenburg (1996, 2001). He argues that trustworthiness and recreancy are closely related because recreancy explains public distrust more than other socioeconomic or ideological variables (Freudenburg, 1996). Breyer (1993) writes that "public perceptions, Congressional actions and reactions, and technical regulatory methods reinforce each other" and "tend to create vicious cycle, diminishing public trust in regulatory institutions and thereby inhibiting more rational regulation." Thus, government and industry have suffered far more than have most groups in society from the erosion of public confidence (Freudenburg, 1996).

Risk scholars argue that government should be "concerned not only with creating institutional arrangements but also creating mechanisms for providing concerned individuals with credible reassurance" (Pollak, 1996). Fischhoff (1996) suggests several conditions that risk managers provide in order to secure public trust, including both scientific and social preconditions. The government makes sure that the public understand the models being used, reviews the parameter estimates, requests appropriate sensitivity analyses, and double-checks results. The public is also encouraged to be familiar with analysts, be awarded for participation, be treated respectfully, and have access to influence on the regulatory process (Fishhoff, 1996).

Another reason for the disparity between scientists and the public is that there are differences within the scientific community. Several studies suggest that there are even different suggestions and interpretations among scientists regarding the same problem (Freudenburg, 1996). Breyer argues that "People cannot easily judge between experts when these experts disagree

each other. The public, since the mid-1960s, has shown increasing distrust of experts and the institutions, private, academic, or governmental that employ them." This increases confusion and distrust toward the experts and their scientific risk assessment.

Finally, public wants control over facilities located in their communities. The public has been isolated from risk decision-making process, and government generally has depended on scientists to help it make risk decisions. This lack of citizen participation in the decision-making process, including a lack of information provided to the public at the preliminary stage of planning environmental facilities, leads the public to distrust, perceive negatively, and oppose new waste facilities, although it might sometimes be necessary to build them. This influences reelection if risk decisions are not quite supported by public. Thus, government needs careful examination of public values and perception, which can be revealed by public participation and consent (Kunreuther and Slovic, 1996).

Although democratic practices such as citizen participation in decision-making have not been fully institutionalized, the level of public participation in risk decision-making has increased steadily. Demand for open and participatory processes in democracy has increased and becomes an important pressure on government. Citizens and civic groups oppose noxious waste facilities in their communities as well as nuclear sites. The increasing role of public in risk choices shows the great importance of perceptions, regardless of their orientation, because participation often results in opposing proposed activities. The pubic wants strict governmental control on hazardous waste sites, while experts believe that the government is spreading only medium to low risks to the public.

Public fears or public perceptions are "risk-related facts." The government should consider these facts in the formulation of government policies regulating risks. Otherwise, social conflicts surrounding environmental risks will continue and threaten the le-

gitimacy of the political system.

The Attitudinal Study and the Utility of Q-Methodology in Environmental Policy

To measure elite and public attitudes toward the environmental risks of water problems, Q-methodology was chosen because it is especially useful in the study of subjectivity, or a person's worldview on any matter of personal, social, and policy importance (McKeown and Thomas, 1988, p11; Brown, 1980, pp.5-6 Barry and Proops 2000a, pp20-21). A number of published Q-studies have investigated extensive areas of environmental studies such as policy analysis (Eeten, 2001; Dayton, 2001; Focht and Lawler, 2001, Barry and Proops, 2001a) public management (Steelman, 2001) environmental attitude (Peritore, 1999; Kim, 1991; Fairweather and Swaffield, 2001 Kalof, 2001). Q-methodology provides a firm and rigorous approach and foundation to environmental policy analysis in attitudinal work. Addams and Proops (2000b, 2) especially claim the value of Q method in its ability to identify how individuals view environmental problems which is vital issue but often gets relatively little treatment in the literature. Addams and Proops (2000b,.2) argue that socially acceptable environmental policy is only possible when we know how people view and understand about the environment. Unlike more popular survey studies which are not successful in explaining environmental concerns and attitudes because they are based on individual traits such as gender, age, income, and education (Jones & Dunlap, 1992), Q-methodology is more successful in finding patterns of values and views within and across individuals. Q-methodology concerns what views individuals have and share with others, while the survey method concentrates on why individuals have certain traits and attitudes (Barry and Proops 2000a, p.20). Q-Method allows the researcher to find a finite number of patternings of attitudes, which can then be fur-

ther interpreted and analyzed. Thus, it is suitable and practically advantageous to studying those social phenomena that contain a complex mixture of values, attitudes, and policy conflicts, such as environmental conflicts. The founder of Q-methodology, William Stephenson, defined Q-methodology as a group of techniques by which respondents define their attitudes by sorting self-referent statements (Stephenson 1953, pp.58-59). This ranking procedure, called the Q-sort, mirrors the particular views of the human being about the subject under study (Brown and Ungs, 1970, p.520).

Stephenson (1953, pp.58-59) claims that Q-methodology reveals clusters of opinion through the mathematical process of factor analysis. Each "factor" is a composite, a grouping of the same opinions on the issue. While the survey method has been a popular way to study public opinion, it has a critical weakness in its attempt to measure individuals' comprehensive view of individuals when respondents answer questions independently. It only shows the independent information of an individual's opinion toward a particular topic. However, Q-methodology produces human subject's comprehensive view because the subject ranks each item relatively (Brown and Ungs, 1970, p519). Thus, Q-methodology, unlike the public opinion survey, employs a small number of respondents and makes it possible to discover structure or factor in subjective opinions, so that they can be observed and studied. It is not designed to determine how many people of a particular type exist in the world at large (Brown, 1980, p192).

One of the key aims of Q-methodology is to identify a finite number of discourses. Q-methodology enables researchers to sample ideas from a large pool of propositions on very debatable subjects such as the environment by obtaining the key discourses or ordered patternings.

Ⅲ. Results

Introduction

The Q-factor analysis of 30 Korean elites and citizens distinguished three factors, which we interpret as discourses about water problems. We call the three extracted factors Critical Environmentalists, Optimistic Modernists, and Distrustful Modernists.

The factors are neither fully independent of each other, nor do they account for all of the observed variance in the Q-sorts of the 30 participants. These three factors explain 46.05 percent of the total variance in the Q-sorts, with type 1 accounting for 26.88 percent, type 2, 10.73 percent, and type3, 8.54 percent. The correlation matrix indicates the extent to which each factor member shows similar attitudes. In this study, the correlations between Factors 1 and 2 (r=.338), Factors 1 and 3 (r=.373), and Factors 2 and 3 (r=.167) all are quite low. The low correlations among the three factors mean that Korean elites and people in this study tend to show rather distinctive attitudes toward water problems in Korea. This illuminates the wide spectrum of Korean views on water pollution.

Table 1. Correlations between Factors

Water Problems			
	1	2	3
1	1.000	0.338	0.373
2	0.338	1.000	0.167
3	0.373	0.167	1.000

The participants' actual Q-sorts were reflected, to a greater or lesser degree, in the extracted factors. The correlations of each participant's Q-sorts to the extracted factors are shown in Table 5.2.

Table 2. Re-ordered Factor Matrix for Water problems

Variable ID <M(male)/F(female), U(urban)/R(rural), Age, C(citizen), E(environmentalists), P(politicians), S(scientists), G(government officials)>
Ex: MU40C (male, urban, 40 years old, citizen)

SEQ.	VARIABLE ID	1	2	3	COM.	PURE
			FACTOR 1			
1	26 MR40E	(.657)	-.087	-.004	.439	.983
2	14 MU54P	(.797)	.085	.127	.659	.965
3	28 MU32E	(.743)	.119	.147	.588	.939
4	7 FR51C	(-.558)	.011	-.154	.335	.929
5	30 FU42E	(.712)	.236	.018	.564	.901
6	2 FR26C	(.618)	-.020	.245	.442	.864
7	25 MU29E	(.808)	.307	.114	.759	.859
8	3 MR33C	(.523)	.047	.214	.321	.850
9	11 FU44P	(.527)	-.000	-.240	.336	.829
10	12 MU42P	(.725)	.357	.019	.654	.804
11	10 MU40S*	(.275)	.151	.061	.102	.739
12	13 FU53P	(.648)	.375	.311	.657	.639
13	20 MU36G	(.414)	.191	.285	.289	.593
14	27 MR28E**	(.610)	.274	(.442)	.642	.580
15	21 MU41G*	.390	.388	-.139	.322	.473
			FACTOR 2			
16	29 FR23C	.085	(.584)	.039	.350	.975
17	17 MU43S	.102	(.582)	-.061	.352	.960
18	18 MU43C	-.046	(.848)	.201	.762	.944
19	16 FU65P	-.041	(.636)	.154	.430	.941
20	19 MU42G	.040	(.844)	.260	.782	.912
21	22 MU34G	.295	(.545)	-.181	.417	.712
22	23 MU36C	.378	(.599)	-.063	.505	.709
23	1 MU33C*	-.082	-.379	.346	.270	.533
24	6 MR54C*	.067	.145	-.144	.046	.454

		FACTOR 3				
25	9 MU65C	.097	.000	(.640)	.419	.978
26	15 MU67P	.159	.027	(.727)	.555	.953
27	5 MU43S	.119	.068	(.539)	.309	.939
28	24 FU26C	-.018	.216	(.669)	.495	.905
29	4 MU30C	.310	-.003	(.605)	.462	.792
30	8 FU27C**	(.415)	-.174	(.614)	.580	.651

* person having nothing in common with any factors.
** person having something in common with more than one factor.

These are known as "factor loadings." Correlations above 0.4 are, for this number of participants, deemed to be statistically significant.[1] After the careful review of the reordered factor matrix, several key observations were made. First, four individuals (11, 15, 23, 24) load on none of the factors, and for them the extracted discourses clearly do not describe their world-views. These four people's views are "idiosyncratic," i.e., has almost nothing in common with the views represented by factors 1 to 3. Hence they were eliminated from the actual interpretation after reviewing a reordered factor matrix. They are, a scientist, a government official, and two citizens. Examining the factor loadings indicates that in this area, the participants fall into three groups. Second, 24 participants load on only one discourse (i.e. they do not load on two or more). As this is by far the majority, this suggests that the extracted discourses do well in representing the world-views for most members in the sample. Third, a couple of individuals (14, 30) are loaded on two factors. They are an environmentalist and a citizen. We can suggest some participants have complex world-views. The environmentalist and the citizen's view is

1. Most Q-studies have the range of significant correlation figure from 0.35 to 0.5. However, 0.4 is the commonly accepted number.

mixed, partly 1 and partly 3 although the environmentalist favors 1 and the citizen favors 3. Subject 4 interprets the work approximately the reverse (i.e., Subject 4 has tended to score −4 those statements that subjects 1 to 3 and 5 to 10 have scored +4, etc.) We see the number of participants significantly "loaded" on each factor, and see that Factor 1, has 14 participants loading, Factor 2 has 7 participants loading, Factor 3 has 7 participants loading.

Ⅳ. Demographics

Korean elites and the general public in this study range in age from 23 to 67, with a mean age of 40.73. Among the 30 Korean elites and members of the public, nine are women and 21 are men. There are six members of the National Assembly, four government officials, three scientists, five environmentalists, seven urban residents, and five rural residents. The members of the National Assembly, the government officials, and the scientists are all from urban areas. Environmentalists are mainly from urban areas. Urban residents are from either the cities of Seoul or Pyong-Taek. Rural residents are from the county of Chong-Won in Choong-Chong North Province. Government officials are from the Ministry of Industry and Resources, the Ministry of Environment, and from the Bureaus of Environment for local governments. The scientists are environmental and chemical engineers. Environmentalists are members of Green Korea United, Center for the Young Environmental Movement, The Korean Federation of Environmental Movements, and the Center for Saving An-Sung River.

Factor 1: Anti-Capitalist, Techno-Skepticist, Critical Environmentalists

The Q sort which corresponds to Factor A is shown in Table 3.

Table 3. Factor Array for Factor 1 (in Q Sort Frequency Distribution)

-4	-3	-2	-1	0	+1	+2	+3	+4
3	23	7	2	10	1	5	20	11
4	31	9	14	16	13	6	21	12
8	35	15	28	18	17	30	22	24
		27	32	19	25	36		
			33	26	29			
				34				

Anti-capitalist, techno-skepticist, Critical Environmentalists, with the largest number of loaded people (12 in all), can be thought of as a representative majority discourse. All five environmentalists belong to this group, which fits the description of typical environmentalists, who are very critical about government and industry's action on the environment. Interestingly, the majority of politicians (four) belong to this group. This indicates that even lawmakers can be very sensitive to water pollution problems. Lawmakers need to respond to the demands of constituents regarding the severity of water pollution that threatens the lives of common citizens. Interestingly, the majority of rural residents belong to this group, which indicates that rural residents are more sensitive to and concerned about water pollution. The rural residents can observe nearby river pollution and the deteriorating impact of nature, such as diseased fish.

Like other types, Critical Environmentalists admit that environmental policy decision making and planning should be based on science and technology rather than on politics and emotion. It is quite intriguing that Critical Environmentalists do not advocate making environmental policy without scientific data and evidence, because typically environmentalists have been criticized for being propagandistic and emotional in their claims.

However, Critical Environmentalists also point out that sci-

entific and technological development is not the solution for water pollution. Critical Environmentalists use science and technology to prove their arguments and to test others' claims. However, they do not necessarily think that economic, scientific and technological development resolves water pollution. They believe that human values are more important; i.e., an environmentally friendly and sound perspective is a prerequisite to solving water pollution, more than simple technological or economic development. Critical Environmentalists instead propose another alternative, a change of attitudes and values. For this group, environmental crime is not being effectively monitored, and it advocates higher tap water quality standards. Critical Environmentalists seriously question the government's water management skills and efforts to lower environmental crime, and believe that higher water quality standards are necessary. According to the survey for 151 environmental experts including researchers, environmentalists, and governmental officials, 88 percent of respondents believe that environmental conditions have either stagnated or deteriorated. Further, 68 percent of respondents are not satisfied with current the government's environmental policy implementation (Hankyore Daily News, Feb 22, 1999).

However, this group cautiously disagrees that certain illnesses result directly from unclean tap water. Although Critical Environmentalists are very sensitive to the effects of water pollution, they do not automatically relate illness and tap water.

Increasing the water supply does not solve water shortages, and this type criticizes excessive water consumption. Thus, Critical Environmentalists criticize not only government and industry but also the consuming behavior of the public. This is proven by survey, as about 20 percent of the metropolitan population believes that citizens are responsible for environmental pollution, while 37 percent of the population believes that industry and government are responsible for environmental pollution (KSDN

Environmental Focus, June. 3, 1998). Since excessive consuming behavior of a minor segment of the population was severely criticized by civic groups and the media, the critique of consumption behavior cannot be ignored.

Critical Environmentalists are willing to assume the additional economic burden for better environmental conditions, and lose economic benefits by following a stricter water pollution policy. Often times, the people in developing countries are hesitant to pay the personal costs of a better policy, although they prefer to see the improvement in their environment, because their priority is economic prosperity. However, the Critical Environmentalists are certainly willing to share the economic burden, which indicates their sincere willingness to pay the cost of the environmental protection. This is also proven by a survey in 2000, in which 89.9 percent of the population agreed that environmental protection should be taken into account before economic development (Kukmin ilbo, June 22, 2000). Critical Environmentalists insist that environmentally safe and clean drinking water is more important than economic prosperity. For instance, the survey shows that 90 percent want to live in a cleaner environment although there are some inconveniences. They acknowledge that there is a tradeoff between economic development and environmental protection. This attitude contradicts the ecological modernization model, which insists that harmony between environmental protection and economic development is possible and desirable. However, this attitude type would not believe this possible. Rather, Critical Environmentalists believe that economic development has to be sacrificed for a better environmental condition and safety. Their view is not only a quality of life concern, but also a safety and health issue, because polluted and hazardous water can be fatal.

Critical Environmentalists disagree that polluting industries can be excused for producing excessive pollution because of the

high expense of abatement facilities. They do not want to trade or negotiate clean water protection, although it was a common complaint by polluting industries that abatement facilities were too expensive to install in small enterprises.

However, they disagree that industrial expansion and land use should be discouraged to prevent further water pollution. They do not necessarily think that land use deteriorates water quality.

Critical Environmentalists disagree that environmental groups organize environmental campaigns to promote their own organizations. Surely, members of environmental organizations who belong to this type do not support this accusation. In addition, other Critical Environmentalists appraise the sincerity and purity of environmental movements by showing negative attitudes toward the statement.

Critical Environmentalists are very critical of both government environmental policy and public environmental behavior. They acknowledge the importance of scientific data and evidence to measure water quality. However, they disagree that economic and technological development will solve water pollution. Rather, they insist that human values are a more decisive factor in controlling water pollution and providing environmentally friendly policy.

By examining the agreement scores for each statement, I find that one statement sharply distinguishes factor 1 from the other two factors. I use the commonly cited criterion that the agreement scores for the other factors should differ from the score for Factor A by at least 3 units. I find that the distinguishing statement is:

8. Economic development will solve environmental pollution such as water pollution.

For Factor 1, this statement receives a score of −4 (i.e. disagreement), while for the other factors its score ranges from 0 to

+ 4. Thus, Critical Environmentalists do not believe that modernization and progress will cure water pollution, and suggest a new paradigm and change in policy and values in order to have ecological protection.

Factor 2: Pro-Technology, Optimistic Modernists

The Q-sort which corresponds to Factor 2 is shown in Table 4.

Table 4. Factor Array for Factor 2 (in Q-Sort Frequency Distribution)

-4	-3	-2	-1	0	+1	+2	+3	+4
1	2	5	26	8	7	17	10	3
4	16	6	27	9	20	18	13	11
15	23	33	28	24	21	19	14	12
		35	29	31	22	25		
			30	32	34			
				36				

Seven people out of thirty participants are categorized as Pro-Technology, Optimistic Modernists. They include two government officials, five citizens (2 rural, 3 urban), one lawmaker, and one scientist. They value the role of science and technology in environmental protection, and positively support and appreciate the government's water pollution policy.

Like Critical Environmentalists, Optimistic Modernists strongly believe that water pollution policy should be based on science rather than politics and emotions. However, unlike Critical Environmentalists, they optimistically believe that modern technology and scientific development can solve water pollution. The Optimistic Modernists' attitude toward science and technology is different from that of Critical Environmentalists, in that the Optimistic Modernists believe that science and technology are the solution for environmental pollution, while the Critical Environmen-

talists believe that scientific data and technology are necessary to accurately assess the state of the environ- ment.

Optimistic Modernists admit that water quality should be improved. In addition, they fear walking outside on a rainy day because of acid rain problems. Although they acknowledge that the Korean water quality and water pollution can be improved, Optimistic Modernists disagree that Korean water is generally undrinkable. They strongly reject the idea that the Korean people need to boil tap water because it has germs. They further disagree that water quality is not trustworthy because various bacteria and viruses have been found. Optimistic Modernists do not agree that water quality is bad due to inconsistent or bad management policy and planning. In the assessment of water quality in Korea, Optimistic Modernists believe that water quality is sufficiently high, including the quality of tap water.

Optimistic Modernists think that government performs reasonably well in water management policy. They disagree with the statement that local governments in Korea do not implement active water management policy in order to pursue regional economic development. Optimistic Modernists highly regard efforts of the local and national government in water management policy, which they believe to be successful.

However, they support industrial expansion and do not necessarily think that it would increase water pollution. Optimistic Modernists, like Critical Environmentalists, believe that industrial land use is necessary and needs to be continued sustainable manner.

Optimistic Modernists think that polluting industries should be blamed for not equipping polluting abatement facilities. Thus, Optimistic Modernists believe that environmental protection should apply to all actors, and that society needs to pay some environmental costs to have clean water. They disagree that they would follow the government's water pollution policy solely if it

would help regional economic development. Again, Optimistic Modernists do not relate economic benefits and environmental protection. This means that they support certain environmental policies, although they do not necessarily produce economic benefits.

Finally, although they acknowledge the water shortage in poor nations, they do not agree with the environmental injustice claim in Korea that people in the wealthy neighborhoods consume too much water. They do not believe that rich people consume water at the expense of poor people.

Optimistic Modernists show a positive attitude toward water quality, as well as toward government efforts in water management. They strongly favor scientific and technological methods to cure water pollution.

Four statements distinguish Factor 2 from the other two factors (again on the criterion that the agreement scores vary by at least 3). These statements are:

1. We need to boil tap water because it contains bacteria and viruses.
3. Modern science and technology will solve the problem of water pollution.
14. Ten years from now, poor nations will see serious water shortages.
16. Local governments in Korea are more concerned with regional development than water management.

Optimistic Modernists support water quality in Korea. In addition, they believe that modern science and technology will eventually become efficient tools for overcoming water pollution. They do not see any water shortages in poor nations, probably due to the development of technology. They also reject the accusation that local governments are more concerned with regional develop-

ment, which is the common criticism against local government.

Factor 3: Political Ecologists, Distrustful Modernists

The Q-sort which corresponds to Factor 3 is shown in Table 5.

Table 5. Factor Array for Factor 3 (in Q-Sort Frequency Distribution)

-4	-3	-2	-1	0	+1	+2	+3	+4
15	32	9	3	6	8	5	10	1
23	34	19	4	7	13	18	12	2
28	35	21	27	14	16	24	26	11
		30	31	17	20	29		
			36	22	33			
				25				

Four urban citizens, one politician, and one scientist represent Distrustful Modernists. They are all from urban areas, which might be a key factor in their distrust of and cynicism about water pollution policy and water quality. Distrustful Modernists express their extremely high distrust of any actors involved in water management, such as government and business. First, they show a high distrust of water quality; they believe that all tap water should be boiled. They also believe that the standard for tap water should be raised. Actually, more than 86 percent of the Korea population, according to a recent survey, would not drink water directly from the tap (KSDN Environmental Focus, June 3, 1998). They either buy drinking water or boil their tap water. Although government officials from water management departments insist on the safety of the water quality, the public simply does not believe them, because bacteria and viruses were found in the tap water during several tests over the past decade.

Just like the Critical Environmentalists and Optimistic Modernists, Distrustful Modernists support the scientific method

in water pollution policy over political and emotional styles of decision-making. Thus, the Korean people in general support a scientific means of assessing and solving water pollution. They disagree that water pollution policy should benefit regional economic development, although they oppose the discouragement of land use and industrial expansion.

This very contradictory result, however, shows an exact picture of the contradictory attitude of Korean people. As many surveys show, people in Korea acknowledge the severity of environmental degradation. Almost 97 percent of population believes that environmental pollution is a serious national problem, and 90 percent of the population prefers environmental protection over economic development. However, the actual environmental behavior of Korean people is quite different from what they espouse.

For example, the government recommends that fast food restaurants avoid single-use products. Seventy-eight percent of people think it is a good idea not to use single-use wrapping at fast food restaurants and 75 percent say that they are willing to buy food at those restaurants that do not use single-use products. However, those restaurants not using single-use products experienced a decline in sales by as much as 10 percent since they eliminated single-use wrappings (Daily Sports News, July 30, 2001). Also, 53.5 percent of environmental government officials say that local governments put more efforts into economic development than into environmental protection. Further, 55.4 percent of environmental government officials predict that mayoral candidates who are dedicated to economic development are more likely to win in local elections than the mayoral candidates who are dedicated to environmental protection (Hankyore Daily News, May 14, 1998). Another example is that some local governments and citizens are willing to host risky facilities such as waste incinerators and waste burial sites, even while some local citizens are protesting the decision (Kookmin Ilbo, June 28, 2001).[2] Some

local governments and people actively host these risky facilities, because there are enough economic benefits and incentives to offset the risk. This is a very important message, and helps to explain some of the contradictory statements made by these types.

Distrustful Modernists are suspicious of government expertise in handling water pollution. Business sectors are fundamentally disinterested in environmental protection, because their main interest is profit-making, regardless of environmental damage. This deep distrust of government and industry is plausible when we consider the several previously mentioned serious environmental accidents that were caused by a lack of governmental monitoring, and by industry's exploitative attitude, which eventually sacrifice nature and the environment for financial gains.

Like Optimistic Modernists, Distrustful Modernists disagree that rich people consume much more water per capita than poor people. Thus, the unequal distribution of natural resources or environmental injustice argument in Korea is not quite plausible to Distrustful Modernists. They also disagree that people do not follow the government's water-saving campaign because of economic burden. Despite high distrust of government, Distrustful Modernists have faith in people's efforts to solve water problems on their own.

Overall, Distrustful Modernists show high distrust of the government on water management and water quality issues.

---

2. Residents in Kangnam and Socho districts in the City of Seoul protested the decision of the city government to host acity cremation site in their districts. On the other hand, Young-Wol county plans to host waste disposal facilities, and a local village in the City of Chon-Ju successfully competed with other villages in the city to host a waste incinerator, because the city promised to provide 5 billion won to construct the road, sewer and refuse facilities. In the city of Ulsan, 12 villages applied to host cremation facilities. Recently, residents in Young-Kwang, Kang-Jin, Jin-Do, and Ko-Chang counties submitted applications to host nuclear facilities, because the government promised to provide 300 billion won.

However, they do not necessarily think that installation of purification facilities at school facilities resulted in the loss of trust in the government's water safety claims.

Ⅴ. Conclusion

This research found three different types of respondents to water problems, which include Critical Environmentalists, Optimistic Modernists, and Distrustful Modernists. Both Critical Environmentalists and Distrustful Modernists are critical about water quality, while Optimistic Modernists do not show any negative views on water quality. The difference between Critical Environmentalists and Distrustful Modernists is revealed in their attitude toward science and technology. While Distrustful Modernists strongly believe in the role of science and technology in resolving water pollution, Critical Environmentalists are more inclined to value the role of human value and attitude changes, which would boost the rate of change in environmental behavior.

On the other hand, Optimistic Modernists are quite satisfied with the current status of water quality and management and confident with human competence in resolving water problems.

Previous empirical studies reveal three major perspectives: Technocratic Supporters, Disaffected Opponent, and Pragmatic Guardians (Focht and Lawler, 2000).

For water problems, Optimistic Modernists are similar to Technocratic Supporters in many aspects, as they emphasize the positive role of technical and scientific development in resolving environmental problems. Critical Environmentalists also share the similar view of Disaffected Opponents by showing distrust in political institutions and low faith in technology. Distrustful Modernists are similar to Pragmatic Guardians in terms of their position in between the Critical Environmentalists and Optimistic Modernists. However, if looked at more closely, there are some

differences. Distrustful Modernists have shown strong distrust, while Pragmatic Guardians are only cautious and watchful, and hold their judgment until they witness a fair and justified decision-making process. On the other hand, Pragmatic Guardians place a limited value on technology, while Distrustful Modernists show a strong faith in the role of science and technology in resolving risks.

Understanding individual and group differences in environmental risk perception attitudes will facilitate the development of effective environmental risk management strategies. Effective policy measures often consider the beliefs and perceptions of target groups. Based on the findings of the different discourses in water and waste problems, there are several policy suggestions that could be implemented.

Regarding the water problem, the public distrust of water quality is greater than ever. Thus, although the government claims and shows its evidence that the tap water is safe to drink, the Korean people will not drink tap water. It is very necessary to build popular trust. In Korea, environmental groups have strong support from the public, and people actually accept information from environmental groups, which is often contradictory to what government claims. Environmental groups strongly advocate for restrictive government policies. Thus, government needs to listen to what the environmental groups suggest and try to adopt it. When Professor Kim from Seoul National University found bacteria in the tap water, and the environmental groups asked the Environmental Ministry to solve this problem, the Environmental Ministry insisted that the tap water was safe to drink. Thus, the people's distrust level was heightened. As the protests from the public and citizen groups increased, the Ministry later on decided to perform joint research on the quality of tap water. With this information, the government should accumulate trust from both environmental groups and the public by

showing that it is really working hard to provide a safe and secure water quality.

In addition, the government should plan and perform professional, systematic, and efficient water management. The public points out that water management by the government is hindered by a lack of professionalism and efficiency, which is the major cause of public distrust in the government's water management.

Reference

Andrews, R. N. L. (1997) "Risk-based Decision Making." *In Environ - mental Policy in the 1990s, edited by N. J. Vig and M. E. Kraft*. Washington D. C.: Congressional Quarterly Inc.

Barry, J. and J. Proops. (2000) Citizenship, Sustainability and Environmental Research. Cheltenham: Edward Elgar.

Barry, J. and J. Proops. (2001) "Seeking sustainability discourses with Q methodology." Ecological Economics, 28 (3): 337-45.

Breyer, S. (1993) *Breaking the vicious circle. Toward effective risk regulation*. Cambridge: Harvard University Press.

Brown, J. (1980) "Introduction: approaches, tools and methods." In Environmental Threats: Perception, Analysis and Management, edited by J. Brown. London: Belhaven Press.

Brown, S. R., and T. D. Ungs. (1970) "Representatives and the Study of Political Behavior: An Application of Technique to Reactions to the Kent State Incident." Social Science *Quarterly 51*: 514-526.

Cooper, William. (1996) "Values and Value Judgments in Ecological Health Assessments." In Handbook for environmental risks decision making: values, perceptions and ethics, edited by C. R. Cothern , Boca Raton, FL: Lewis Publishers.

Daily Sports News, July 30, 2001

Dayton, B. (2001) "*Policy Frames, Policy Making and the Global Climate Change Discourse." In Social Discourse and Environmental Policy, edited by H. Addams and J. Proops*. MA: Edward Elgar.

Eeten, M. V. (2001) "*Recasting Environmental Controversies: A Q Study of the Expansion of Amsterdam Airport." In Social Discourse and Environmental Policy, edited by H. Addams and J.* Proops. MA: Edward Elgar.

Fairweather, J. R. and S. R. Swaffield. (2001) "Q Method Using Photographs to Study Perceptions of the Environment in New Zealand" In Social Discourse and Environmental Policy, edited by H. Addams and J. Proops. MA: Edward Elgar.

Field P, Raiffa H, Susskind L. (1996) "Risk and Justice: Rethinking the Concept of Compensation" The Annals of the American Academy of Political and Social Science 545: 156-164.

Fischhoff, B. (1996) "Public Values in Risk Research." The Annals of the American Academy of Political and Social Science 545: 75-84.

Focht, W. and J. Lawler. (2001) "Using Q Methodology to Facilitate Policy Dialogue" In Social Discourse and Environmental Policy, edited by H. Addams and J. Proops. MA: Edward Elgar.

Freudenburg, W. R. (1996) "Strange Chemistry: Environmental Risk Conflicts in a World of Science, Values, and Blind Spots." In Handbook for environmental risk decision making: values, perceptions and ethics, edited by C. R. Cothern. Boca Raton: FL: Lewis Publishers.

Freudenburg, W. R. (2001) *Risk, responsibility, and recreancy. Research in Social Problems and Public Policy*. Amsterdam: An Imprint of Elsevier Science.

Graham, J. D and L. Rhomberg. (1996) "How Risks Are Identified and Assessed." The Annals of The American Academy of

Political and Social Science 545: 15-24.
Jamison, D. (1996) "*Scientific Uncertainty and the Political Process*." The Annals of the American Academy of Political and Social Science 545: 35-43.
Kalof, L. (2001) "*The Multi-layered Discourses of Animal Concern." In Social Discourse and Environmental Policy, edited by H. Addams and J.* Proops. MA: Edward Elgar.
Kim, Young-Khee. (1991) Mass media and the environmental social movements. *Ph.D. dissertation, University of Missouri*.
Kookmin Ilbo, June 22, 2000
Kookmin Ilbo, June 28, 2001
KSDN Environmental Focus, June 3, 1998
Krimsky, S., and A. Plough. (1988) Environmental Hazards: Communicating Risks as a Social Process Dover, MA: Auburn House.
Kunreuther, H & Slovic, P. (1996) "*Challenges in risk assessment and risk management*." The Annals of the American academy of political and social science, May, 545
McKeown, B. and D. Thomas. (1988) Q Methodology. Newbury Park, CA: Sage Publications.
National Research Council. (1983) Risk Assessment in the Federal Government: Managing the Process. Washington D.C.: National Academy Press, 18.
Peritore, P. N. (1999) *Third World Environmentalism*. Gainsville: University Press of Florida.
Pollak, R. A. (1996) "*Government Risk Regulation*."The Annals of the American Academy of Political and Social Science 545: 25-34.
P. Rennick and R. Greyell. (1990) "Opting for Cooperation," Waste Management 90: 307-314.
Shrader-Frechett, K. S. (1985) Science Policy, ethics, and economic methodology: Some problems of technology assessment and environmental-impact analysis. Boston, MA: D. Reidel.

Starr, G., Langley, A., and A. Taylor. (2000) *Environmental Health Risk Perception in Australia. Center for Population Studies in Epidemiology, South Australian Department of Human Services.*

Steelman, T. A. and L. A. Maguire. (1999) "Understanding participant perspectives: Q-methodology in national forest management." Journal of Policy Analysis and Management 18 (4): 361-88.

Stephenson, W. (1953) The Study of Behavior: Q-technique and its Methodology. Chicago. IL: University of Chicago Press.

Zechhauser, R., & Viscusi, K. W. (1996) *The Risk Management Dilemma. Annals of the American Academy of Political and Social Science, Special Issue.*