Incorporating Value Discussions into High Level Radioactive Waste Disposal Policy: Results of Developing Fieldwork

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Abstract The disposal of high level radioactive waste has fared no better in Japan since its legislation in 2000 than in most countries grappling with the same problem. This research aims to contribute to realizing some form of disposal in Japan, by suggesting ideas for an improved institutional scheme of policy making. This scheme concerns value judgments in decisions of technology use. Historically, implementing agencies have allowed limited debate on issues of value. What would develop if values previously neglected were given a chance to become a technical option of their own for the disposal of high level radioactive waste? This question has been taken out to the field, in the form of group interviews of young citizens. Here, the details and preliminary discussion of the fieldwork are described, as a temporary result of this study. A final section is dedicated to discuss the possible contributions of this study to the consideration of engineering resilience.

Keywords High level radioactive waste disposal • Policy making • Value discussions • Citizen interviews

1 Introduction

1.1 High Level Radioactive Waste Disposal in Japan

The disposal of high level radioactive waste has fared no better in Japan than in most countries grappling with the same problem. Since 2002, two years after legislation announced that Japan's waste would be vitrified, stored for 30–50 years, then disposed in a geologic repository within its territory, Japan has embarked on a process of 'local solicitation', asking municipalities to apply appropriate sites for further investigation. Compensatory money and services sparked near calls for application nationwide, but nothing has been officially registered.

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Moves to fix problems within the set framework, such as finding visual means of explaining the official position, and elaborating on the compensatory measures, have been studied and adopted in abundance. There have also been moves to shift—less from the localities, more to the national government—the political weight of applying to the siting process. All have ended to no avail as of today.

Meanwhile, opposition against the present method of disposal of high level radioactive waste (and of its by-production) has been repeatedly put forth by the concerned public in the form of public comments on policy drafts and opinions gathered at public hearings. These opinions have been presented both prior to [1] and after [2] legislation, but close inspection reveals that it is hard to say they have been given a substantial response [3]. Much of the official publications and discussion events have dismissed other methods of disposal on grounds of their political and technical challenges to realization, arguing instead on the safety of geologic disposal, or what can be done for localities accepting site exploration.

This apparent evasion of debate occurs not necessarily because geologic disposal cannot withstand counterarguments, but rather, because the choice of geologic disposal relied heavily on politically top-level selection based on prior international debate and engineering perceptions. This means that, in the Japanese context, it is difficult to give a logical explanation why the choice of disposal method was made; what criteria were considered, whether the choice of criteria or their relative significance were democratically or scientifically warranted. Albeit mention in the present policy of securing a margin for the ‘future generations’ to reform the present policy, doubts arise whether anyone can recognize a “betterment” coming along when there has been no attempt to substantiate what “better” actually means.

Such a history suggests, both in practicality and in democratic theory, that more radical reconsideration of policies is due.

1.2 Overarching Aims

This research aims to contribute to realizing some form of disposal in Japan, by suggesting an improved institutional scheme for radical (re)consideration of high level radioactive waste disposal policies. The improvisation will center on problems of how decision making agendas have been limited/assigned to certain actors over time. This direction will lead further to questions such as, “How should the public participate?” or “What is the role of certain specialists in policy making?” which are both questions echoed from related studies [4, 5].

To reconsider institutional schemes in this view, the history of decision making on high level radioactive waste disposal will be reviewed with a mind to discern what agendas have been heretofore assigned to which actors, while consciously inquiring how agendas and actors could or should be defined. These queries are of importance, since determining ways in which agendas/actors could be categorized, and being able to position existing issues within the spectrum of these categories (e.g. from the technically general to the specific, from national to local, etc.) is

fundamental to understanding what agendas have been “mis-assigned” in past policies; what has been assigned perhaps against a more desirable order of agendas/actors at some point in time.

1.3 Research in Development: Incorporating Values into Decisions of Technology Use

This study is in process (most of the understanding arrived at this point has been formed as the author’s graduate thesis [3], and is expressed in the first sub-section of the introduction), and a working hypothesis has been derived: One problem of prior institutional schemes is that citizens have been deprived of debate concerning overall value judgments of technology use (upstream engagement), and instead have been expected to participate in judging technical, specific issues (downstream issues). Since it can be assumed that the characteristic of citizen actors lies in their citizenship and not their engineering expertise (or the lack of it), it follows that devising a means to ask citizens to discuss values concerning such issues would be a better combination of agendas/actors. This is a point shared with researchers working for the Science Council of Japan’s on issues of high level radioactive waste disposal policy [6].

It is worthy of noting here that the categories of actors employed here does not split society into engineers and citizens, but rather assumes an abstract notion of citizens being those thinking as a politically independent member of society (including vocational engineers, researchers etc.), with the other end of the scale being so-called specialists, engineers, or non-“value-thinkers”; those who have the know-how of solutions to predefined problems based on their expertise. It is not necessarily that “the non-engineers’ view was not considered” but rather that “those of the public who spoke as citizens were dismissed” or “agendas which concerned value judgments were put aside” in the debate concerning high level radioactive waste disposal policy of Japan.

This working hypothesis has been put to test. Using chances granted by funds from Tokai village, a municipality with a long relationship with the nuclear industry, a method for consulting people in matters of value regarding disposal related technology has been devised and conducted. The details are introduced in the subsequent sections.

2 Methods of Incorporating Values into Discussion of Technology Use

2.1 Objectives and Methods

The objective of the fieldwork at Tokai village is to attempt to consult people on issues of values which influence decisions on technology use (as concerns this

presentation). To have achieved this, the value-laden issue needs to be defined, then the context of the technological problem conveyed, then the problem consulted. The results of the consultation can then be analyzed by the researchers and translated back into its implications for discussions of technology use. This process needs to sufficiently convey the context of the discussion, and be appropriately defined (if the issue is too abstract in terms of value, for example if people were asked to discuss political values each endorses, this would likely not work any better than asking them to talk about the appropriate thickness of waste containers).

The method of consultation devised here takes the form of a group interview. During August 2014 to February 2015, 18 people were interviewed in various groups, each session lasting around 90 min. Participants were asked to relax and to discuss freely “what you think is a desirable means of ‘disposal’ of high level radioactive waste” without worrying about present technical limitations. A less than 5 min explanation of what high level radioactive waste is, what it looks like, how much radioactivity it holds and how long that lasts, how much of it Japan has, and its present designation was given at certain timings using the figures shown (Fig. 1).

One important characteristic of these interviews was that the targeted age group of the participants was limited to “young” people, set as being between 16 (a high school freshman) to 34–35. This target was meant as a current attempt of listening to the “future generation”.

Fig. 1 The 4 slides handed to participants during the group interviews

2.2 Results and Discussion

Some of the frequently observed opinions obtained through the group interviews are listed above (Table 1). Many of the participants from varying groups raised questions about reducing and re-using the waste, and some mentioned that such efforts to fundamentally ameliorate the situation should be continued after the waste has been stored in a repository. There were mixed feelings about putting hopes in future technology development, but not many were in favor of giving it up altogether. Questions about what sort of place would seem fit for the storage of waste drew answers that places isolated from the human environment and places which humans have little relation to even into the future were considered better, revealing that the general idea of a geologic repository (for storage/final disposal) may not be far off. The seabed and outer space, though controversial within the groups, was also raised as a possibility. Many of the participants viewed the unfairness of siting a repository as a problem, and suggested that the sites be dispersed into <10 sites, or 47 sites—one for each prefecture. It would follow that the idea of dispersed repositories should be given a (perhaps qualitative) technical evaluation. When asked what sort of message might be left to future generations, many of the participants said a warning would be necessary, of the fact that high level radioactive waste is present, and of its storage place. Some offered to say that an apology to the

Table 1 Primary results of the group interviews

Opinions ^a	General implication
“It is better for the waste to be re-used”	Means to minimize the fundamental problems should be reconsidered
“It is better for the production of waste be reduced”	
“Can’t the radiation be reduced?”	
“Can’t the radioactivity to be shortened?”	
“Somewhere isolated from the human environment would be better for a repository”	The general idea of a geologic repository may not be far off, but other possibilities should also be evaluated in these terms
“Somewhere that has little to do with humans for years to come”	
“The waste should be stored so that the unfairness of siting is minimized”	Means to minimize “unfairness” should be reconsidered
“Monitoring of the waste should be continued for as long as possible”	Even for a repository with passive safety designs, maintaining active safety measures should be considered
“Effort should be made to be able to do something if anything happens”	
“Effort to pass on messages of the presence of the waste and of apology should be taken”	Means to pass on warnings and apologies should be reconsidered

^aRevised and translated

future generations was due, yet others openly stated that they thought this unnecessary.

Overall, it can be said that once people started thinking about the high level radioactive waste, most did not opt for trying to have as little to do with it as possible, instead coming up with ideas about how the problematic could be reduced, what the generation could actually do in face of the waste.

At least 10 of the arguments held implications to the present policy in that they raised questions which had not been adequately investigated in Japan's context. These initiatives can be directly translated into 'homework' for the experts, or discussed further with citizens by giving more information about the general concerns for the ideas that the experts hold. For example, informing citizens about the technical difficulties of separating radioisotopes, or the technology level of transmutation may yield different feelings for the idea of decreasing radioactivity, or call for extra conditions on the desirability of waste re-use.

From the results of the interview, it can be said that a general background understanding of high level radioactive waste seemed to have been conveyed to most of the participants, although a more detailed explanation of the nature of radiation may have been necessary. There may also be room for improvement in the explanations to some of the technical questions raised during the interview, which could have affected the range of ideas the participant could voice, however, this point requires more trials to confirm. The setting of the issue itself can also be considered appropriate (neither too technical, nor too abstract) if we note that a certain number of opinions concerning values were obtained through this interview.

3 Citizen Input When Engineering Resilience

3.1 *Defining "Resilience" in Relation with Engineering and "Values"*

It seems important to clarify: What does it mean to "engineer resilience"? As described above, this study is based on the belief that engineering is the act of realizing values in society by integrating fields of expertise, including social, political or economic know-how. Where does resilience fit in this picture? Is it another tool, or is it a value? Is it something whose usefulness engineers can master and take for granted, or is it something which can only arrive into the engineering realm from outside? Yet another way of asking this question: Is resilience something which realizes (for example) "health", or is it something which competes with, requires a striking of balance with "health"?

As the last interrogative suggests, resilience is neither a societal value nor entirely a tool. Rather, it can be considered as an "added value" to the engineered societal value in question. If we tentatively phrase the definition of resilience as the (hopefully long-term and society-wide) *enduring effectiveness of an engineering act*

during and after adverse events (keeping in mind common denominators offered in prior conceptualizations [7]), we could say, for example, that a health-resilient solution is likely better than a solution just meant to realize health. So health is the value which is being engineered, and “health-resilience” (the enduring conservation of health even during and after adverse events) is the “added value”. In other words, an engineer who tries to achieve a healthy solution does not guarantee that the state of achieved health will be a long-term one for society at large, during and after disasters.

It is also noteworthy that aiming for “resilient” solutions instead of just healthy ones or uncostly ones is something which makes engineering more valuable, and is something which the engineering community should aspire for itself. Here, lessons learnt from the past century urge the engineers to recall that, the societal value of a technology (whether resilient or not) should be decided by its citizens. Resilience will not be required for a societally unrequired branch of expertise (no matter how those experts may believe that the technology will be more valuable once performing resiliently). Care is also required in conceiving of “resilient communities”. The notion—just like any other non-resilient paradigm for modern societies—sees communities in light of engineering interests. These are interests which tend to repel exceptions or transitions of lifestyle, and retain control over society.

3.2 How This Research Approach Can Contribute to Engineering Resilience

As aforementioned, resilience can be considered as an “added value” to a solution realizing a societal value. Care is needed not to assume the value in question actually is valued, just because the solution is resilient. This means that significance remains in the attempt of this research to “discussing values” and clarify “what matters and why” for citizens upon deciding societal solutions. There may also be the need to give special attention to social values in disaster situations, since priorities may change. There may be multiple lifesaving triages, perhaps with heavier priorities on younger generations or the socially vulnerable. While it is unrealistic to attempt a thorough discussion of values during crises, it is possible to go over past cases and obtain citizen input into reconsideration of measures taken during emergencies. This is likely a key research agenda for Fukushima studies, and is necessary to investigate engineering challenges for “resilient communities”, yet efforts heretofore seem fragmented and insufficient.

Another point to make is that introducing “resilience” into solutions (healthy solutions -> health-resilient solutions) requires more collaboration between “experts” and “non-experts” upon considering how they may be engineered. This is because more input of those who use the system (the majority of who are “non-experts”) becomes more important when considering engineering in abnormal situations. For instance, looking for components in the techno-social system which

may be susceptible to changes in working conditions is something which requires wisdom of “living in” the system as well as “planning and controlling it from outside”. This feature of “lay people” being the “users” and “day-to-day supervisors” of the systems experts devise, is what makes their input more valuable upon considering what is too costly to plan at the normal engineering scale of time and probability. The method suggested in this study may contribute to such efforts in its approach to clarify what input we are asking from whom.

This is not to say that conventional expertise is neutralized. Resilience is essentially about the efficiency of the system, so we are acting as those “planning and controlling the system from outside” when we feel the need for resilience. When considering how to formulate resilient solutions, we need to integrate expertise, and consider in systems and balances. Here, the importance of a deep understanding of how much we know/don’t know should not be diminished.

4 Conclusions

High level radioactive waste disposal policy has not worked out in Japan as it has been designed, and a study of the criticism it has received shows that those responsible for maintaining its policy have not been able to respond to such debate due to its lack of consideration about the value judgments incorporated in issues of technology use. This understanding of the problem has been applied to fieldwork in Tokai village, where group interviews were conducted with the cooperation of young citizens, to ask for ideas on “What would be a desirable means of ‘disposal’ of high level radioactive waste”. The results centered on ideas to tackle the “fundamental” problems of the waste, such as its presence, amount, radiotoxicity and “uselessness” or “unwanted-ness”, rather than just cope with the safety risks the waste imposes. There were also opinions on what sort of environment would be best for storing the waste, which shared points in common with the present policy but also added that the “unfairness” of concentrated siting should be reconsidered. Other opinions opted for persisting in R&D and maintenance, for reducing or reusing the waste, hauling it to outer space, etc. These opinions on the desirable means of dealing with the waste hold respective implications for those with the know-how to consider how they may be realized, or to evaluate their technical feasibilities into the future so that they can be reconsidered as alternative options.

A consideration of what it means to “engineer resilience” led to the idea that resilience can be considered as the “added value” of enduring efficiency during crises, added to the societal value realized in an engineered solution. The approach in this study of asking citizens for input on discussions of value also applies to “resilient” solutions, perhaps in the same way. One marked research agenda would be to obtain input of “what matters and why” in reconsideration of how societies have addressed passed disaster situations, especially to grasp what has developed in Fukushima. Another point made was that obtaining input from “non-experts” as the

“users” and “day-to-day supervisors” of the systems experts devise, may be valuable upon considering resilient solutions.

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