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# SURVEY ON SWEDISH CITIZENS KNOWLEDGE ON NUCLEAR WASTE REPOSITORY

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**ABSTRACT**

The Swedish Nuclear Fuel and Waste Management Company (SKB) applied in 2011 for a permit to construct a disposal facility in the municipality of Östhammar. Given this is still an ongoing permit process the aim with this study is to investigate how informed the Swedish citizens are in these issues.

Telephone interviews were conducted in December 2018 to January 2019. A majority of the citizens, 55%, are aware of the plans of a nuclear waste repository. Most don't know where the repository is planned to be located, but surprisingly many knows that copper canisters are suggested to be used. This together with a cluster analysis is presented and discussed in the paper.

**Keywords:** nuclear waste, repository, Sweden, citizens

**NONMENCLATURE**

| Abbreviations | |
|---|---|
| SKB | Swedish Nuclear and Waste Management company |
| SSM | The Swedish Radiation Safety Authority |

## 1. INTRODUCTION

In Sweden, the high-level waste is at the moment stored in an intermediate storage of spent nuclear fuel at Simpevarp in Oskarshamn municipality (CLAB) in anticipation of a final repository. It is the nuclear industry that is responsible for finding a place and a method that entails a safe repository. To do this, the nuclear industry has formed the company Swedish Nuclear Fuel and Waste Management Company (SKB). In 2011, SKB applied for a permit under the Environmental Code and the Nuclear Activities Act to construct a disposal facility in Östhammar municipality. SKB has proposed a special method for final disposal of the spent nuclear fuel. It is called KBS-3 and is based on three protective barriers: copper canisters, bentonite clay and the bedrock. These plans are subject to approval by the Swedish Government.

The aim with this study is to investigate how informed the Swedish citizens are in these issues.

The citizens' view of the nuclear waste repository has been studied earlier. Over the years, both SKB and the Swedish Radiation Safety Authority (SSM) have made various studies of the public's knowledge of and attitudes to the nuclear waste. Sjöberg conducted a series of studies in 2001 - 2008. These were focused on risk perception, and e.g. to compare the perception of risk among young people and the elderly, as well as between residents of the Oskarshamn and Östhammar municipalities (that both have nuclear power plants) and other municipalities in the country. The results from those earlier studies show amongst others that men are more positive about a final repository than women, the elderly more than younger. When it comes to age, the younger respondents were not so interested in the issue [compare e.g. 1].

## 2. METHOD

The Swedish National Council for Nuclear Waste conducted a survey where we asked a statistical sample of the Swedish citizens about their knowledge on the ongoing process to decide on a final repository. AB Samhällsinformation was commissioned to conduct

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telephone interviews with a representative selection of 1,000 citizens between 18 and 75 years. For the survey a random selected sample was purchased from the company Bisnode AB. The response rate was 67 %, i.e. 670 citizens responded. The loss mainly consists of people not answering their phone. The significance level 95% has been used. The younger age group and women were more difficult to reach then the older and the men and we adjusted the data to reflect the strata in the population.

Refina Information AB was commissioned to do a cluster analysis of based on the results. The cluster analysis resulted in 3 clusters. The 3 clusters were very stable: The cluster analysis is briefly discussed in section 3.1.

## 3. RESULTS

Below we present the results from the survey.

The first question in the survey concerned if the respondent's knew that a final repository for nuclear waste was planned in Sweden. 55 % knew this and 45 % did not know about this. Significantly more men than women said they knew about this.

The final repository is planned to be located in Östhammar municipality. In Östhammar the nuclear plant Forsmark is also located. The second question concerned if the respondent knew in which municipality a repository was planned to be located. Some answered Forsmark, mixing the name of the municipality with the name of the nuclear plant, see figure 1.

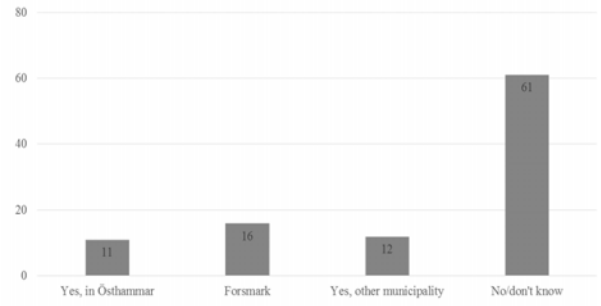
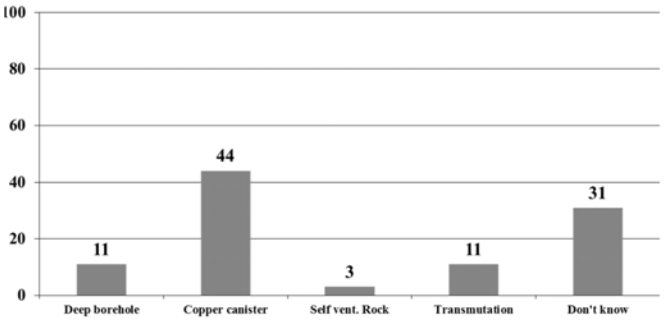



Fig 1 Do you know where the repository will be located?

More than 60% cannot answer where the final repository is planned. Of those that did know 27% answered that the repository is planned to Forsmark or Östhammar. Significantly more men responded Forsmark (29%) compared to women (9%).

One question concerned the familiarity of which method SKB suggested in their application, see figure 2.

Fig 2 which solution for final repository does SKB suggest in its application concerning spent nuclear fuel?




Copper canister received the most answers both from men and women, but significantly more men responded so (56 percent compared to 32 percent for women). Persons aged 66-75 responded this to a significantly higher rate than other age groups (58 percent).

The next question concerned if the respondents felt they had enough knowledge about the final disposal of spent nuclear fuel, see figure 3.

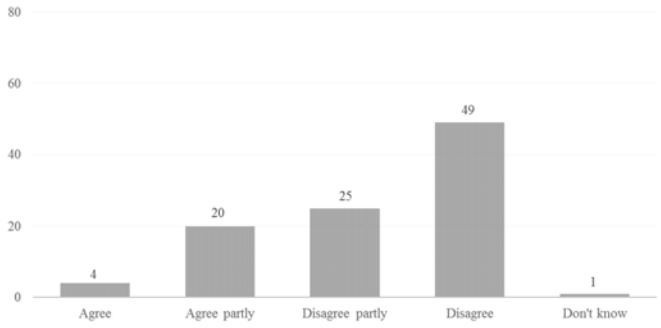



Fig 3 I think I have enough knowledge about the final disposal of spent nuclear fuel

If we calculate an average value with respect to the score given in figure 3, we get a total value of 1.8, which indicate a relatively poor knowledge about final disposal of nuclear waste. More men than women indicated that they have enough knowledge and this is also valid for the oldest age group.

Next question concerned if the respondent wanted to have more information about final disposal of spent nuclear fuel. 47% said Yes and 53 % No. The age group 56-65 years desires more information as well as people with higher education and those living in metropolitan areas.

This question was followed by the question: Regardless of how familiar you are with the issue of the management of spent nuclear fuel, do you think that we

in Sweden can handle and dispose the waste safely or not? The responses were more or less identical between the two surveys. 58% responded Yes, 18% No and 25% were unsure. The women were more negative (21% responded No), while 14% of the men said No. But also among the women more than half responded Yes.

The respondents were asked how important they thought the nuclear waste issue was using a scale ranging from 1 to 5, where 1 meant "not at all important" and 5 meant "very important". Most responded meant that this is an important issue, the average was 4.4 on the total level. We detected no significant deviations with respect to gender.

In figure 4 we show the results from three questions concerning the trust the respondents had to politicians, authorities and researchers/experts.

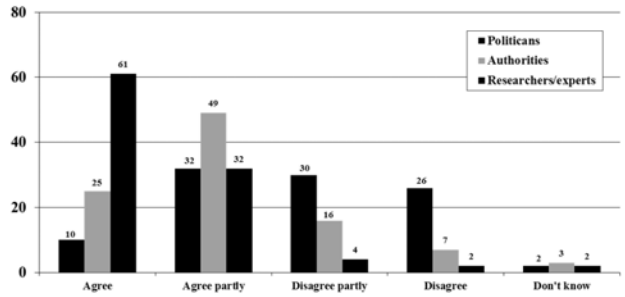



Fig 4 I trust the politicians' decisions/investigations by the authorities/researchers and experts on where and how to build a final repository

In figure 4 it is shown that the trust in politicians were low. No significant differences among groups can be detected. The respondents had more trust in authorities. Respondents with higher education trusted authorities more than those with lower education. Most trust did the respondents have to researchers/experts.

In one question the interviewer read some different threats and the respondents were asked to answer on a 10-degree scale how concerned they were for the issue. 10 meant that they felt very strong concern and 1 meant no worry at all. The mean value is shown in table 1.

| | |
|---|---|
| Climate change due to overuse of the Earth's resources. | 7,7 |
| War and conflicts around the world | 6,8 |
| Violence and gang-related shootings both in Sweden and in our surroundings | 6,7 |
| Uneven distribution of the Earth's resources leading to poverty and starvation. | 7,4 |
| Overuse of antibiotics leading to the establishment of resistant bacteria. | 7,5 |
| Air pollution due to coal burning and emissions from industries and aviation. | 6,8 |
| Radioactive spent nuclear fuel from nuclear power plants. | 5,7 |

Table 1. The concern the respondent felt for different threats

Concern for radioactive spent nuclear fuel comes as the last alternative. Throughout, more women than men expressed concern about the various alternatives above. Climate change worried more people in metropolitan areas compared to those living in sparsely populated areas.

### *3.1 The cluster analysis*

The cluster analysis resulted in three clear clusters. Cluster 1 is the biggest cluster and here 46% of the respondents are found. This cluster were concerned about everything, but they worried more about climate change, air pollution, unequal distribution of soil resources and overuse of antibiotics than about nuclear waste. The nuclear waste issue was perceived as important, but at the same time there was a high level of confidence in society's handling of the nuclear waste issues. Confidence was especially high in relation to authorities and researchers/experts, but even to politicians.

Clusters 2 represent 28% of the respondents. This cluster was not particularly worried, and certainly not about the handling of nuclear waste issues. This group wanted to invest heavier in nuclear power. Confidence in society's ability to manage nuclear waste issues was quite high, however, not as high as in cluster 1. The nuclear waste issue was also perceived as somewhat less important compared to the other clusters. Cluster 2 consist of a high proportion men (66%) and a slightly higher proportion of people aged 18-35 years.

Cluster 3 represent 26% of the respondents. This cluster was the most worried one and they worried also about (the important) nuclear waste issue and nuclear power in general. In addition, they mean they lack knowledge in the issue and their confidence in the society's ability to handle nuclear waste issues were very low. This cluster had just trust in researchers/experts.

Cluster 3 has a high proportion women (62%) and a slightly higher proportion of people aged 56-75 years.

The clusters can be interpreted as a measurement of our basic attitudes, i.e. relatively stable moods which can stay with us for a long time and give a certain emotional color to the rest of our experiences, knowledge and values. Basic attitudes are sometimes determined by knowledge and values, but they can also be determined by other psychological and genetic factors [8] [9].

## 4. CONCLUSIONS

Final repository of spent nuclear fuel is a technical system that needs expert knowledge [5]. A technocratic norm characterizes the nuclear waste issue, where there is a tendency to believe that the problem is best solved through enough expertise and detailed knowledge in a matter [5]. In such a discourse, the discussion is characterized by "apolitical problem solving" and moral arguments are perceived as opinions and not useful information [6]. Part of the technocratic norm is that the public's knowledge is regarded as deficient and that citizens are involved in order for them to better understand a question and to accept scientific knowledge [7]. However, this view has become increasingly criticized in favor of an emphasis on involving the public in the process, as these can contribute substantially to the process. Citizens' dialogues on issues related to science and technology are an important part of the solution to a complex problem, such as the nuclear waste issue.

It is therefore important to increase knowledge about what information the citizens have and how they perceive the nuclear waste issue, which this survey study has contributed to. We saw that almost half of the respondents did not know that a final repository was planned in Sweden and over 70 % did not know which the suggested location was. Surprisingly many, 44 %, knew however that copper canister was suggested to be used by SKB. This suggests that technological issues have had a lot of focus in the public debate. These technical aspects are probably hard for a general public to have an opinion on and it seems more appropriate to discuss issues as location and risk perceptions in the public.

In general the trust in politicians' decisions on where and how to build a final repository were low and more trust was put into researchers and experts. This can also be a reflection of a technological focus in the debate.

In the cluster analysis half of the respondents belonged to cluster 1. This cluster had some concern about nuclear waste, but at the same time had a great confidence in that the issue will be solved. Cluster 2 consisted of almost one third of the respondents and this cluster was not worried at all and they were confident in that society would solve how to safely dispose spent nuclear fuel. Cluster 3 consisted of a fourth of the respondents and these were very worried, did not have any trust in that politicians or authorities would be able to solve the issue and thought that the issue will not be solved.

In the future planning process it is important not only to involve the citizens, but also to approach them with relevant issues. Different clusters needs to be approached differently, reflecting their knowledge in the issue and acknowledge their worries. This requires different information strategies for the different clusters. How to develop such strategies is a matter for future research.

**ACKNOWLEDGEMENT**

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