

Public participation in decision-making on nuclear research installations

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Abstract

The aim of this paper was to determine predictors for the intended level of involvement in decision making concerning new installations for nuclear research. The research is based on empirical data from a large-scale public opinion survey in Belgium. Results show that attitudes towards participation and moral norms are the strongest predictors for the intention to take part in public involvement activities, other influential predictors being subjective norms, descriptive norms and time constraints. At the same time, the analysis reveals that financial benefits from participation do not seem to influence people's intention to participate in decision processes related to new nuclear installations.

Keywords: participation, nuclear research, predictors

1. Introduction

Public participation is nowadays an imperative for the formulation and implementation of good policies in the environmental and health domains. It has also become a key determinant in decision making processes related to the development of science and technology in general, in the framework of "responsible research and innovation" (Sutcliffe 2011, pp.9; European Commission 2011, pp.31).

Higher forms of public and/or stakeholder involvement are more and more called for in the framework of participatory risk governance related to nuclear technologies, not only because they contribute to democratizations of decisions, but also because they increase the overall efficiency of the process and result in more sustainable decisions (Rick Jones 2008; OECD 2006 pp.9).

However, motivating stakeholders remains a challenge and previous studies show that, when offered the opportunity to participate, the public frequently refrains from active participation (Dijkstra *et al* 2010).

Results from past public opinion surveys in Belgium (Perko *et al* 2010; Van Aeken *et al* 2006) highlighted a decrease in people's willingness to invest time in getting informed about installations with risks (in general) or participating in related decision-making processes. The percentage of people in Belgium who would not spend any time in getting informed about such installations increased from 25% in 2002 to 34% in 2009. With regards to participating in decision-making processes, 40% said that they had no time at all for such activities in 2002, with a slight increase to 44% in 2009. These studies showed that (self-assessed) cautious people, younger respondents, those who read scientific magazines regularly or have interest in science and technology, as well as those with lower confidence in authorities (for the actions they take to protect against chemical/nuclear accidents and environmental pollution) are more willing to spend some time in getting informed or participating in decision-making processes concerning industrial installations with risks.

The goal of this study was to determine predictors for the intention to participate in decision making processes related to new nuclear research installations. The predictors studied were derived from the social psychology theory of planned behaviour (Ajzen, 1991) and related literature.

Although extensively used in health studies, only few applications of the theory of planned behaviour can be found in the literature that deal with science related issues (or new technologies). Some examples shall be mentioned here. Poliakoff and Webb (2007) have looked into scientists' participation in public engagement activities. Their study highlighted four important predictors: past behaviour, attitude, perceived behavioural control and descriptive norms. Dijkstra *et al* (2010) found that the strongest predictors for the level of public engagement were the self-reported knowledge about

genomics research, the information-seeking behaviour and the level of education. Other, weaker predictors, contributing to a lesser extent to their model were the interest in genomics issues, age, gender, social involvement and trust-confidence. Miller *et al* (2007) investigated socio-demographic predictors for public engagement in the assessment of carbon dioxide capture and storage (CCS) technology. They found small effect sizes showing that men were more prepared to take part in public discussions; at the same time, women were more likely to believe in the importance of public consultation by the government. This study also revealed that a higher education was a significant contributor to the willingness to participate in public discussions on CCS.

In the next section, we detail on the theoretical background underlying this study. In section 3 we elaborate on the methodology used and in section 4 we present and briefly discuss the results. A more detailed analysis will be reported elsewhere. In section 5 we take a closer look at the actor organising the involvement process and its influence on people's willingness to get involved. In the final section we summarise the conclusions of this study.

2. Theoretical background

2.1 The theory of planned behaviour

One of the leading theories used for the prediction of human behaviour is the so-called "theory of planned behaviour" (Ajzen, 1991). This theory argues that actual behaviour is determined by the person's behavioural intention, which is, in turn, influenced by three independent predictors: specific attitudes towards the behaviour in question, the person's subjective norms and the perceived behavioural control.

An attitude is understood in this context as a "*disposition to respond with some degree of favorableness or unfavorableness*" (Ajzen and Gilbert Cote 2008) to the behaviour in focus, in our case participation. Subjective norms refer to beliefs about whether a "*specific referent group* [for instance relatives or friends] *would approve or disapprove of one engaging in the focal behaviour*" (Poliakoff and Webb 2007). Perceived behavioural control refers to one's perception about whether she/he has the resources, abilities and other prerequisites required to perform the behaviour successfully, for instance the ability to participate in public engagement. A high level of perceived control "*should strengthen a person's intention to perform the behavior, and increase effort and perseverance*" (Ajzen 2002b).

2.2 Extensions of the theory of planned behaviour

Several studies in the literature have suggested adding to the predictors derived from the theory of planned behaviour the following: descriptive norms, i.e. what others actually do in a similar situation (Chassin *et al* 1984); moral norms, i.e. the individual's perception of the moral correctness or incorrectness of performing a behaviour (Beck and Ajzen 1991); past behaviour (Ajzen 2002a); and environmental constraints (e.g. financial or time-related, see Poliakoff and Webb 2007). The latter are considered in some other studies as part of the perceived behavioural control, since they are resources or obstacles that are perceived as impeding or facilitating the behaviour (Ajzen 2002b).

In some cases, moral norms were shown to be strongest predictors of intention and behaviour than the three factors suggested by the theory of planned behaviour (Beck and Ajzen 1991).

In the study reported here we applied the extended theory of planned behaviour in order to determine predictors for the intended level of involvement in decision making concerning new installations for nuclear research. For this purpose we analysed the following potential predictors: socio-demographic variables (age and gender), specific attitudes, subjective norms, descriptive norms, moral norms, past participation behaviour, environmental constraints. In order to tackle the specifics of the nuclear domain we added to these the attitude towards nuclear, the risk perception of an accident in a nuclear installation and the confidence in authorities for the actions undertaken to protect the population against risks from nuclear installations. The study

is based on empirical data from a large scale opinion survey in Belgium (Turcanu *et al* 2011).3. Methodology

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3.1 Data collection and sample

The survey data were collected using CAPI ("Computer Assisted Personal Interviews"). The population sample consisted of 1020 respondents and is representative for Belgium adult population (18+) with respect to sex, age, region, province, habitat and social class.

Most questions in the survey were formulated as statements, to which the respondent could answer using a five point Likert-scale (e.g. <strong disagreement, disagreement, undecided, agreement, strong agreement>), plus a sixth category (<no answer/don't know>). The latter answering option was allowed, but not encouraged. To avoid question-order effects, randomization or rotation was applied whenever deemed appropriate.

For the in-depth analysis of the relation between the dependent and the independent variables, multiple item constructs were used whenever possible, in order to increase the reliability of the measurement and to enhance the measurement scale. The formal test for the reliability of the scales constructed with multiple items was the calculation of Cronbach's alpha. When this coefficient exceeds 0.70, it indicates a reliable scale. Factor analysis was employed to improve the measurement of a latent variable and to determine the extent to which the various items are components of a one-dimensional construct.

3.2 The level of involvement

The dependent variable investigated was peoples' intention to take part in public involvement activities *regarding new installations for nuclear research*" (see figure 1). The answering scale was derived from the theory of stakeholder participation (Health Canada 2000), and ranged from no involvement at all to active partnership in decision making process.

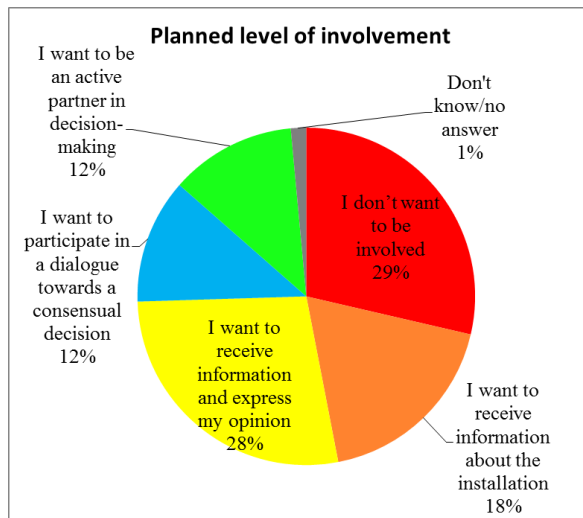


Fig. 1 Intended level of involvement regarding new installations for nuclear research

Results show that almost one third of the respondents does not wish to be involved in any way. Among the people who would like to be involved most of them prefer to receive the information and express their opinion (28%). From the 1020 respondents interviewed, 24% would like to be involved

to a larger extent, either as an active partner in decision-making or as a participant in a dialogue towards a consensual decision.

3.3 Potential predictors

3.3.1 Attitude towards participation

We measured both specific attitudes related to the studied behaviour, as well as general attitudes, namely the attitude towards nuclear energy.

The attitude towards participation in public involvement activities concerning new nuclear installations in their municipality was measured by three questions with a common root assessing whether participation was regarded as a positive behaviour. The participants were asked to give their opinion about participation in such a process using the scales: pointless - worthwhile, useless - useful and disappointing - rewarding, using a score from one to seven (see figure 2).

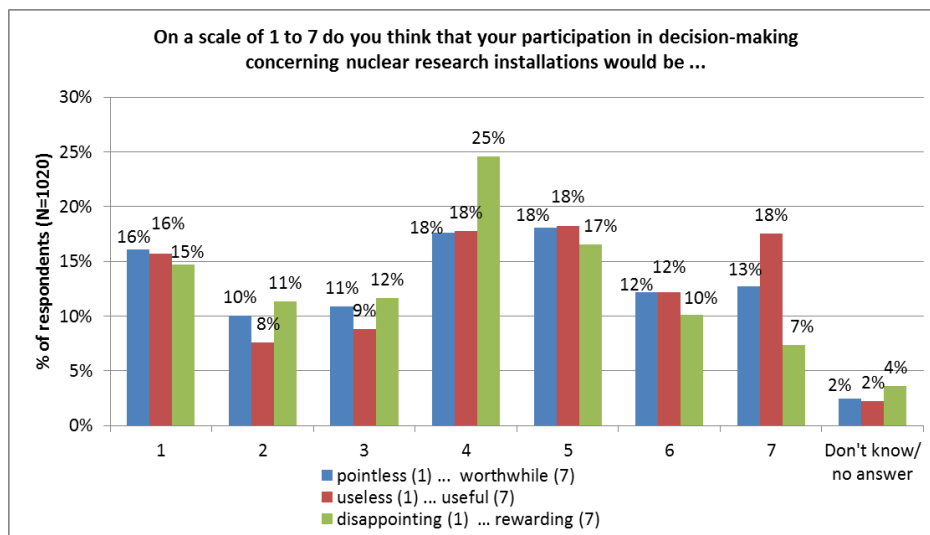


Fig. 2 Three dimensions of the attitude towards participation (N=1020)

The results show that the attitude towards participation is somewhat sceptical, with average scores near to the middle point of the scale for all three dimensions investigated. Most people take a neutral, a neutral-positive or an extreme negative stand. The usefulness of participation seems to be somewhat more appreciated than the other two dimensions which are more related to the expected outcome.

A factor analysis performed on these three items revealed one factor accounting for 73% of the variance in the data, a higher value on this scale implying a more positive attitude towards participation. The reliability of the scale constructed with these three items is $\alpha=0.82$.

3.3.2 Descriptive, subjective and moral norms, environmental constraints

Subjective norms were measured with the statement: "Most people who are important to me (family, friends) would support my participation". Almost half of the respondents felt that their close environment would support such activities: 44% agreed vs. 32% disagreed.

The item referring to moral norms was expressed as "I have a duty as a citizen to participate in such activities". More than 40% of the respondents agreed or strongly agreed that participating in public involvement activities is a citizen's duty, while a similar percentage (36%) disagreed or strongly disagreed.

Descriptive norms captured the (lack of) social pressure of performing the behaviour: "*Of the people I know, nobody would participate in such activities.*" Almost half of the respondents disagreed or strongly disagreed with this statement, while 25% agreed or strongly agreed.

We also measured the influence of time and financial constraints, respectively, by the following items: i) "*I do not have enough spare time to participate in such activities*" and ii) "*I would participate only if this activity would be remunerated*".

About 30% of the respondents stated that they do not have enough spare time for public involvement activities regarding new nuclear research installations, compared to 47% who think time constraints are not an issue.

Expected financial benefits did not seem important to the respondents: almost 70% of the respondents disagreed that remuneration is a necessary condition for participation.

3.3.3 Past involvement

Past involvement was assessed in a general context, with no reference to the nuclear domain. The respondents were asked if they participated in the past in a public involvement activity concerning decisions about their environment: "*Citizens can become involved – participate- to decisions concerning their environment in various ways, for instance a citizens panel, a meeting in the town hall, an internet forum. Have you participated in the past in any public involvement activity?*" The possible answers to this question were "yes" / "no".

Almost one out of ten respondents (9%) said that they have participated in the past in some form of public involvement activity related to their environment.

3.3.4 Attitude towards nuclear energy

The attitude towards nuclear energy was assessed through three general statements. These enquired whether the respondent believed that "*the benefits/ advantages of nuclear energy outweigh the disadvantages*", whether "*the reduction of the number of nuclear power plants in Europe is a good cause*" and, respectively, if they thought that "*nuclear power plants endanger the future of our children*". The respondents had to state their degree of agreement or disagreement with these statements on a 5-point Likert scale ranging from "*strongly disagree*" to "*strongly agree*".

A factor analysis performed on the three items (with first item inverted) resulted in one factor with eigenvalue larger than 1, which accounts for 64% of the variance in the data. The reliability of the scale is $\alpha=0.72$. A higher value on this scale represents a more negative attitude towards nuclear energy.

3.3.4 Risk perception and confidence in authorities

Risk perception of an accident in a nuclear installation was measured with the following question: "*How do you evaluate the risks from an accident in a nuclear installation for an ordinary citizen of Belgium*". Confidence in authorities was measured with respect to the actions undertaken to protect the population against nuclear accidents: "*How much confidence do you have in the authorities for the actions they undertake to protect the population against risks from an accident in a nuclear installation?*" For both items, a 5-point Likert answering scale was used ranging from "very low" to "very high".

About 34% of the respondents evaluated an accident in a nuclear installation as a high or very high risk, while 39% expressed a low or very low risk perception. When it comes to confidence in authorities for the actions undertaken to protect the population, 42% of the respondents expressed high or very high confidence, while 28% expressed a low or very low confidence.

4. What influences peoples' intended level of involvement?

4.1. No involvement vs. some degree of involvement

We first tested a model in which the dependent variable was recoded as a binary variable, with "0" coding the case when the respondent is not willing to be involved at all, and "1" meaning that the respondent is willing to be involved to a certain degree.

Binary logistic regression was performed to study the influence of the potential predictors discussed above (see Table 1, second and third columns). Results show that the attitude towards participation and the moral norms are the strongest predictors for the intention to take part in public involvement activities. For instance, the more one believes that participation is a citizen's duty the more likely he/she is to be taking part in public involvement activities. Only two other predictors came out as statistically significant in the model: subjective norms and time constraints. The more support one feels from its close environment, the more likely he/she is to be involved. While time constraints play an important role, it is interesting to notice that financial benefits from participation do not seem to influence people's intention to participate in decision processes related to new nuclear installations. Neither do risk perception of an accident in a nuclear installation, or the confidence in authorities as regards the actions undertaken to protect the population against such risks, play any role.

The age (year of birth) and the descriptive norms were just below the 95% confidence level ($p=0.08$ and $p=0.07$, respectively). Younger respondents could be slightly more inclined towards getting involved in decision-making processes concerning new nuclear research installations. The involvement of the people one knows could also increase the respondent's level of involvement.

Table 1 Summary of results from explanatory models

Dependent variable Predictor	Participation (binary: yes/no)		Level of involvement (4 levels: receive inform., receive inform.and give opinion, participate in dialog towards consensus, active partnership)	
	B	Sig.	Stand. Beta	Sig.
Constant	-22.595	.074		.216
Gender of the respondent (male)	.063	.760	-.071	.032
Year of birth	.011	.081	-.011	.747
Subjective norms	.342	<.001	.083	.031
Moral norms	.717	<.001	.168	<.001
Descriptive norms	-.170	.072	-.140	<.001
Time constraints	-.239	.004	-.148	<.001
Financial constrains	-.071	.451	.042	.229
Attitude towards participation	.989	<.001	.249	<.001
Attitude towards nuclear energy	.137	.320	.154	<.001
Past behaviour (yes)	-.322	.431	-.079	.022
Risk perception of a nuclear accident	-.010	.907	.004	.910
Confidence in authorities	.046	.627	-.066	.061
	Logistic regression. Nagelkerke's $R^2 = 0.51$. N=841 (out of N=1020)		Linear regression. Adj. $R^2 = 0.33$ N = 624 (out of N=713)	

4.2. Predictors for the degree of involvement

Next we looked at which variables can act as predictors for the level of involvement. We retained from the total population (N = 1020) only the people who would like to be involved to a certain extent (N = 713). A second regression model was thus constructed (Table 1, last two columns). The most influential predictors were again the attitude towards participation, moral norms and time constraints, and, differently from the previous model, descriptive norms and the general attitude towards nuclear

energy. A more positive attitude towards nuclear energy leads to less (intended) involvement. At the same time, the higher the belief that most people (known to the respondent) would participate in decision-making processes, the more likely it is that one intends to commit to a higher level of involvement.

Time constraints come out again as influential, whereas financial constraints are inconsequential. Opposite to the study of (Poliakoff and Webb, 2007), in which both constraints of time and money did not predict scientists' intentions to participate in public engagement activities, time limitations seem to play an important role in our study with regards to the intention of citizens to participate in public involvement activities.

Past participation and gender have but a weak influence: men are likely to be more involved than women in decision-making processes related to new nuclear research installations (which confirms e.g. Perko *et al* 2010 and Dijkstra *et al* 2010); and those who have participated in the past are more likely to have a higher involvement. Confidence in authorities for the actions undertaken to protect the people against accidents from nuclear installations is just below the 95% confidence level, but it looks like people who are have higher confidence will be less involved than people with low confidence, which confirms the past results mentioned in section 1.

5. Who organises the process: does it matter?

Finally, we investigated the willingness to participate depending on the actor organising the process: the controlling authority, the company managing the project, a non-governmental organisation, an independent institution (e.g. a university) or a local action group. The scale used was from 1="not at all", to 7="very much".

In general, for those who would not like to be involved at all in decision-making processes concerning new nuclear research installations, the organiser of the process did have a significant influence on their planned behaviour.

Among the respondents who would like to get involved to a certain extent in decision-making processes (N=713), the preferred organising actors an independent institution (mean = 5, std.dev=1.8) followed by local action groups (mean=4.75, std.dev=1.8), as illustrated in figure 3.

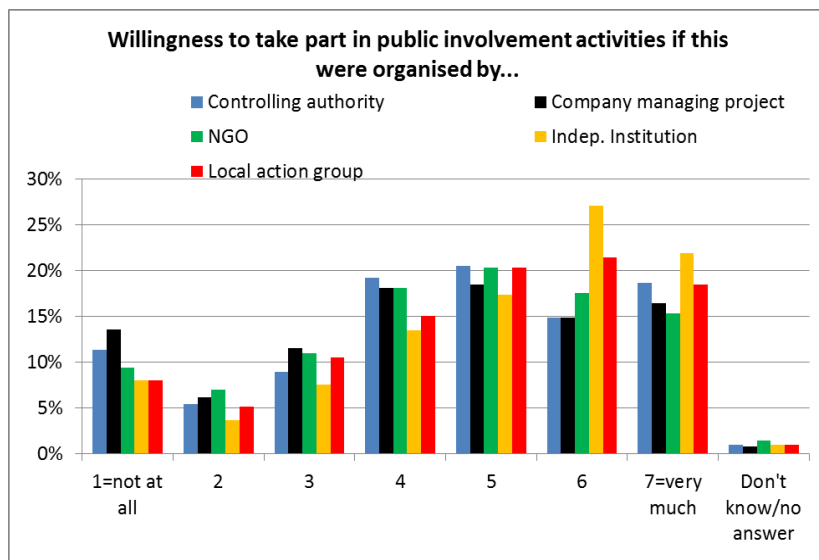


Fig. 3 Involvement depending on the actor organising the process (N=713)

The least preferred is the company managing the project (mean=4.3, std.dev=1.9). The controlling authority (mean=4.5, std.dev=1.9) and an NGO (mean=4.5, std.dev=1.8) score in between the previously mentioned actors.

6. Conclusions

Results clearly show that most people (70%) would like to get involved in decision-processes related to new nuclear installations and to be able to at least express their opinion (52%). For higher degrees of involvement however, people have to be convinced that their participation is worthwhile and brings benefits to the decision-making process. It is also worth noting that while time constraints are recognized as a challenge, financial benefits are inconsequential as regards the planned degree of involvement.

Citizen's culture associated to participation, as well as the support of the close environment, plays an important role. Long term programmes of stakeholder involvement, with early involvement at the outset of the process are therefore necessary. It is important to allow divergent views to be expressed from the very beginning and to create the premises for a constructive dialogue.

Finally, it also came out that the actor organising of the process bears some influence on people's willingness to be involved, independent institutions (e.g. a university) being the preferred actors.

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