Economic and Social Considerations for the Future of Nuclear Energy in Society

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Milestone 5: Survey on stakeholder engagement and transdisciplinary collaborations in nuclear decision-making

Work Package 1

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Table of Contents

Executive summary

The milestone addressed by this document is an assessment of the actual uptake of recommendations on stakeholder engagement in energy governance and transdisciplinary collaborations, in the nuclear field. As part of ECOSENS subtask 1.3.2, an online survey with regulators, policy representatives, research institutions and other societal stakeholders in European countries was carried out. This document describes the methodology, results and findings of this online survey that explored several stakeholders opinions in seven different countries involved in the project.

The survey gathered 65 responses: 5 from Belgium, 10 from Slovenia, 26 from Spain, 4 from France, 3 from the UK, 7 from the Czech Republic and 5 from Romania. Two people from Finland, one from the Netherlands, one from Italy and one from the United States also took part, but were not included in the quantitative analysis due to insufficient sample size per country. Thus, the final valid sample for quantitative analyses was 60. As this is a study with very specific stakeholders, rather a qualitative and exploratory study, in which not all stakeholder categories were represented in all countries, the results cannot be interpreted as representative, reflecting only the perceptions of the respondents.

While there are important differences in the profile of respondents from the countries analysed, the representativeness is higher for Spain and Slovenia.

In general, respondents from all countries assess the actual level of participatory governance on nuclear issues as unsatisfactory, particularly on the phase out of nuclear power plants and the decommissioning of nuclear reactors. There seem to be more opportunities for participation in radioactive waste management. The participation of diverse civil society stakeholders in sustainability assessments of nuclear energy or broader energy systems is reported to be generally low in the different countries studied, except for the Czech Republic, where respondents deemed it to attain a moderate level. The involvement of social science and humanities experts in sustainability assessment is also low in most countries, but seen as moderate in Belgium and the Czech Republic.

All country respondents give high importance to all recommendations for improving participatory governance derived from international guidelines in ECOSENS Task 1.3, with “transparency about objectives, decisions taken and expected results” being the most highly valued. The implementation of these recommendations is seen as moderate to low in the different countries, with the provision of the appropriate means to support participation, and the establishment of the legislative and administrative framework being the least implemented.

There is also a general concern about the lack of reliable information, highlighting the need for actions to ensure that citizens have access to accurate and reliable information. Finally, there is consensus that it is essential to improve transparency in decision-making, both at government level and in the nuclear sector, in order to build public confidence.

Separate analysis and conclusions per country are provided.

1 Introduction

The European ECOSENS project (2022-2025) aims to create a space for dialogue and collaboration where researchers in social sciences and humanities, in nuclear energy research and policy, as well as representatives of civil society and other relevant stakeholders, can meet and exchange views on the development and use of existing and new nuclear technologies.

In the context of major societal challenges, such as the climate crisis, the call for sustainable development and the concerns regarding energy security, ECOSENS aims to open up the techno-scientific issues to the social, political, cultural and ethical context, in order to guide policies in the nuclear field. By "nuclear field" we refer in this document to the nuclear energy fuel cycle, from uranium mining to installation and operation of nuclear power plants (routine and accident conditions), up to radioactive waste management and decommissioning.

Within ECOSENS WP1 "A collaborative assessment of (imagined) energy worlds", a dedicated task aims at providing an *Analytic and critical review of stakeholder engagement in energy governance and inter-disciplinary collaborations* (Task 1.3). The task assesses the actual uptake, in the nuclear field, of recommendations on stakeholder engagement in energy governance and transdisciplinary collaborations in terms of justification, effectiveness and sustainability. This is expected to produce actionable insights for improved societal dialogue on energy governance and the inclusion of social considerations in technology and sustainability assessments of nuclear energy. The results of this analysis will also inform the development of recommendations for enhanced mechanisms of interaction between citizens, civil society, decision-makers and researchers.

As part of subtask 1.3.2, an online survey with regulators, policy representatives, research institutions and other societal stakeholders in several European countries was carried out, to analyse the uptake of recommendations on stakeholder engagement and transdisciplinary collaborations in energy governance. The survey investigates the actual impact of recommendations uptake, as seen by various stakeholders; how forms of public dialogue vary across social conditions; and how to avoid or mitigate structural and cultural issues that hinder effective adoption.

Participatory decision-making is conceptualized as a pluralistic system of governance with high levels of information, accountability, and transparency. It seeks to "ensure that in the decision due account is taken of the outcome of the public participation" (as per e.g. the Aarhus Convention).

This document describes the methodology, results and findings of this online survey that was submitted to several stakeholders from different countries involved in this project.

2 Methodology

The aim of the survey was to assess the actual uptake of the recommendations on stakeholder engagement, how forms of public dialogue vary according to societal contexts, and the challenges and drivers for effective uptake of the recommendations. Data was collected from June 2024 to January 2025.

Tool: Data was collected through an online survey organised in the countries participating in the project. The items included in the survey looked for insights into the following research questions:

- How participatory is (nuclear) energy governance today, as seen by different stakeholders?
- How has participation taken place in the context of sustainability assessments related to nuclear energy matters?
- What experiences do stakeholders have related to engagement in nuclear energy policy, in relation to the key elements relating to the cross-cutting principles and gaps identified through the analysis of recommendations;
- What challenges do stakeholders face in relation to engagement in nuclear energy governance with aforementioned elements?
- What suggestions can be made in view of improving these elements relating to stakeholder engagement?

The steps involved in setting up the survey were as follows:

1) Stakeholder mapping in countries participating in the task, covering the Quintuple Helix Model[1] for both the nuclear and the relevant energy-related stakeholders (each project partner);

2) Drafting list of questions (CIEMAT), reviewed and modified by partners;

3) Pilot testing of the survey (CIEMAT). The questionnaire was sent to three Spanish stakeholders and improved based on the input they provided;

4) Programming the final list of questions in an online survey, using Lime Survey platform;

4) Translating the questionnaire to language relevant for the studied countries (only for Spain and France) by CIEMAT and SYMLOG;

5) Sending invitation letters to participate in the survey (by CIEMAT, EIMV and RATEN) (Annex 1) using Snowball sampling;

6) Launching the questionnaire (Annex 2). Data collection was from June 2024 to January 2025;

6) Quantitative and qualitative (thematic) analysis of responses.

Target group: stakeholders covering the quintuple helix for both nuclear and relevant energy-related stakeholders, as mapped by case study participants:

[1] Carayannis, E. G., Barth, T. D., & Campbell, D. F. (2012). The Quintuple Helix innovation model: Global warming as a challenge and driver for innovation. *Journal of Innovation and Entrepreneurship*, *1*(1), 2. https://doi.org/10.1186/2192-5372-1-2

1. Political stakeholders dealing with nuclear energy or energy in general, e.g. government officials (local, regional, national, European), political action groups;
2. Nuclear industry stakeholders and other related business groups, e.g. nuclear energy producers, nuclear energy suppliers, nuclear energy industry associations;
3. Academic stakeholders working in nuclear issues, e.g. research centres, and universities;
4. Civil society stakeholders, e.g. community groups, NPP local residents, civil society organisations, NGOs;
5. Stakeholders representing the environment, e.g. environmental NGOs.
6. Media representatives (journalists specialized in energy issues and communication agencies)

Recruitment: Relevant stakeholders were identified from multiple sources to maximize the relevance and heterogeneity of the sample. The online questionnaire was sent via email with a letter of invitation. After some weeks, a reminder was sent to maximize the response rate. The snowballing technique was used to identify new stakeholders. Despite repeated efforts to recruit respondents, in most countries the number of respondents was very limited and did not cover all stakeholder categories.

The informed consent form (Annex 3) was embedded in the online form, providing information regarding the objectives of the survey, confidentiality in handling the information, and enabling participants to consent or not to take the survey.

3 Participants' description

This section presents the description of the participants who took part in the survey in terms of demographic characteristics (gender, age and education level), as well as other relevant information. Specifically, years in the energy/nuclear sector, stakeholder type adapted from the Quintuple Helix model of innovation, and level of influence and interest in planning and decision-making related to nuclear energy policy were assessed.

The survey was distributed to different stakeholders from different countries, resulting in 65 responses in total. 60 of them came as follows: 5 from Belgium, 10 from Slovenia, 26 from Spain, 4 from France, 3 from the UK, 7 from the Czech Republic and 5 from Romania. The other 5 came from Finland – 2 responses, Netherland, Italy and United States – one response each. Their contributions have been included only from a qualitative point of view, in order to draw conclusions that are significant for the study. Thus, the final valid sample for the quantitative analyses was 60. As this is a study with very specific stakeholders and is rather qualitative and exploratory, the samples obtained are considered sufficient for cross-country analysis and comparison. The number of participants in the countries analysed varies significantly, with Spain and Slovenia having the largest sample sizes.

Of the whole sample, 63.3% were men, 33.3% were women and 3.3% preferred not to disclose their gender. The age group with the highest number of participants was 41 to 60 years old with an average age of 56.38 and a standard deviation of 11.03. The majority of participants has a Master's or PhD degree, with an average career of 25 years in the sector. The specific socio-demographic description of participants for each country can be found in Table 1.

Table 1. Socio-demographic description of the participants of each country

		Belgium (N=5)		Slovenia (N=10)		Spain (N=26)		France (N=4)		United Kingdom (N=3)		Czech Republic (N=7)		Romania (N=5)		Total
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	%
Gender	Male	4	80	8	80	15	58	3	75	2	67	5	71	1	20	63
	Female	0	0	2	20	11	42	1	25	0	0	2	29	4	80	33
	I prefer not to say	1	20	0	0	0	0	0	0	1	33	0	0	0	0	3
Age	20-40	1	20	1	10	1	4	1	25	1	33	1	14	0	0	10
	41-60	2	40	5	50	16	62	2	50	2	67	4	57	4	80	58
	61+	2	40	4	40	9	35	1	25	0	0	2	29	1	20	32
Years working in the sector	< 15 years	2	40	2	20	5	19	2	50	2	67	3	43	0	0	27
	16 - 30 years	2	40	5	50	10	39	1	25	0	0	2	29	3	60	23
	31 + years	1	20	3	30	11	42	1	25	1	33	2	29	2	40	21
Highest evel of education	Medium degree training cycle	1	20	0	0	0	0	0	0	0	0	1	14	0	0	2
	Bachelor's degree or equivalent	0	0	1	10	2	8	0	0	1	33	0	0	1	20	5
	Master's degree or equivalent	2	40	1	10	12	46	3	75	1	33	2	29	1	20	22
	PhD or equivalent	2	40	8	80	12	46	1	25	1	33	4	57	3	60	31

The majority of respondents were from the research and education system, with also a notable representation from public authorities. The economic system participated mainly in Spain, but not in the

other countries. For the media sector, there were only two representatives participating, both of them in Romania. Environmental NGOs that took part in the survey where from Slovenia (N=4) and the Czech Republic. Civil society organizations were mainly from Belgium, but also from France, the Czech Republic and Romania. In the Spa

nish case, two participants belong to other groups; these are "private renewable energy company" and "radioactive waste management representative". Figure 1 shows how the stakeholders are distributed across the different types of the Quintuple Helix model.

	Civil Society Organizations	Research and education	Economic system	Environmental NGOs	Public authorities	Media or social networks	Other
United Kingdom (N=3)	0	1	0	0	2	0	0
Spain (N=26)	0	8	11	0	5	0	2
Slovenia (N=10)	0	4	0	4	2	0	0
Romania (N=5)	1	1	0	0	1	2	0
Czech Republic (N=7)	1	2	1	1	2	0	0
France (N=4)	1	2	0	0	1	0	0
Belgium (N=5)	3	2	0	0	0	0	0
Total (N=60)	6	20	12	5	13	2	2

Figure 1. Stakeholders' profile in each country

In terms of influence and interest, respondents reported that their influence on decision-making on nuclear energy policies was relatively low, except for specific cases of public authorities and the economic sector, but still, for the most part, all respondents showed a high level of interest in this area. Belgium is an exception as the participants ranked their interest more than one point below the participants from the majority of other countries. Figure 2 shows the average level of interest and influence per country in nuclear policy planning and decision-making.

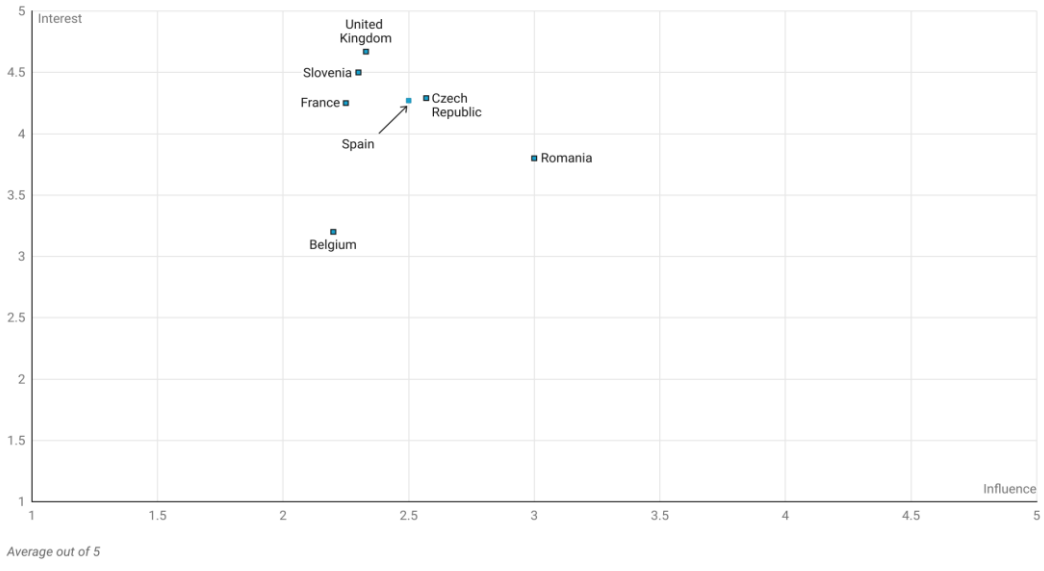

Figure 2. Participants' self-reported level of influence and interest (average per country) in decisions on nuclear energy policies

4 Results and findings

4.1 Participatory governance in nuclear issues

In order to assess respondents' views on the inclusiveness of decision-making in the nuclear sector, participants were asked to rate from 1 to 7 how participatory they consider governance to be in different areas or domains in their country. The areas included in the questionnaire were: decisions on the inclusion (or not) of nuclear energy in the national energy mix, decisions related to the development of new nuclear technologies, closure of nuclear power plants, extension of operational lifetime of nuclear power plants, decommissioning of nuclear reactors, preparedness for nuclear and radiological emergencies and post-accident recovery, and radioactive waste management.

Figure 3 shows the average score given the participants per country (scale from 1, not at all participatory, to 7, fully participatory). Respondents were also given the opportunity to add comments if they wished to clarify their assessment.

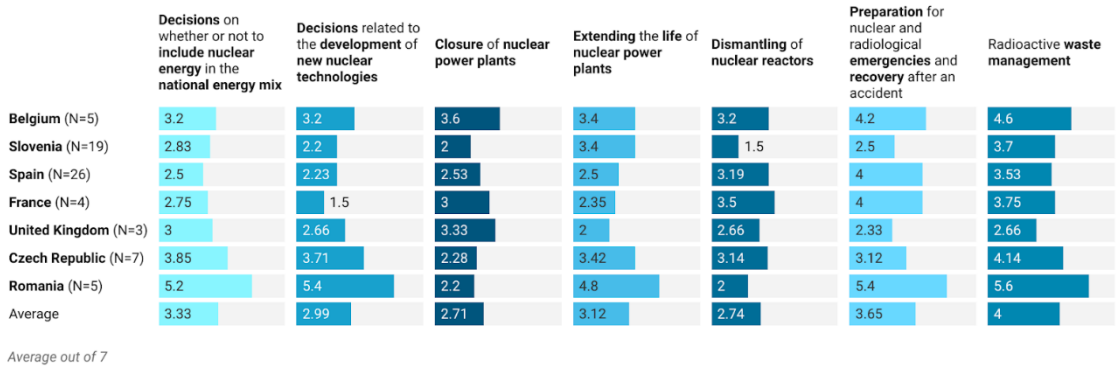

Figure 3. Views on participatory nuclear governance in each area per country

As can be seen from Figure 3, respondents view that participatory governance is in most cases unsatisfactory (i.e. obtains below the mid-point score of 4 in the scale 1 to 7), particularly concerning the involvement of stakeholders in decision-making on the role of nuclear power in the energy mix and on new technologies and in the development of new nuclear technologies. As an exception, participants from Romania assigned relatively highest scores for participatory governance in most domains. In countries such as Slovenia, Spain and the United Kingdom, few items exceed a score of three points. There is a widespread view that there is a need for deliberate participatory governance that considers all points of view.

Looking at the specific cases, we can see that participants from Belgium give radioactive waste management and emergency preparedness in particular higher average scores. However, these average scores, considered on a 7-point scale, are around the midpoint. On a positive note, one participant mentions some press coverage and an in-depth report on SMR technologies, which evaluates the available technologies. Although the report is considered valuable, it is not publicly available.In addition, local participation has been introduced for low-level waste management and is expected to be introduced for high-level waste, although no decision has yet been made.

One case cited as a success story is the disposal facility for low and intermediate-level waste. The positive aspects of this agreement are the initial involvement of society, the willingness to share technical information, the right of the community to vote and the ability of the community to influence not only the socio-economic aspects but also the technical aspects.

Slovenia is the country with the lowest score for participatory governance, scoring approximately in the middle of the scale only for radioactive waste management. A respondent explains that although the idea of including nuclear energy is widely accepted among stakeholders, some NGOs oppose the construction of a new nuclear power plant, and they are suppressed both politically and in the media. The same goes for nuclear experts, who want to express their opinions, but decisions are made by the government and opposition political parties.

Also noteworthy is the lack of monitoring and discussion in the field of nuclear emergencies. Respondents view that these remain in the background and are largely not implemented. Participants argue that there is a lack of preparation of the population for possible emergencies, there is not enough information and iodine tablets are not properly and widely distributed.

The respondents reflect that the processes in which they have been able to participate were the development of national strategies and the development of nuclear energy, as well as the development of the National Energy and Climate Plan. In other areas, such as individual licensing processes (for nuclear facilities), although the public and local communities have been able to comment and make recommendations at some points, the processes are generally open only to ministries and regulators. Despite this, some respondents claim that participation is non-existent and that existing online opportunities have no real impact.

A case where some stakeholders did have influence was in 2020 when the Environmental Agency of the Republic of Slovenia (ARSO) decided to extend the operating life of the Krško nuclear power plant from 40 to 60 years without Environmental Impact Assessment (EIA) and related public hearing process. The organisations Focus, PIC and Umanotera succeeded in challenging the environmental impact assessment before the extension was confirmed, and the extension went ahead with an environmental impact assessment.

In the past, there have been success stories in terms of participation in the country. This is the case of the establishment of the Nuclear Safety Council between 1987 and 1990, which is now defunct, with the participation of a wide range of actors from different sectors of society.

In **Spain**, the respondents emphasise that decisions on nuclear energy are taken by the government. There is a feeling that there has not been a robust debate in the country, but that ideological guidelines have been followed instead, without taking into account scientific and economic analysis. An example cited by respondents was the case of the failed centralised temporary storage facility for high-level radioactive waste, where the participatory process is seen as very good, but ultimately failed for political reasons.

The decision to close and dismantle nuclear power plants was taken by the government together with the electricity companies. They have had a decisive role in deciding how this process will be carried out, and they will also have a say in the decommissioning of the plants, as they are the ones financing the

Enresa (national radioactive waste company) fund. Since then, stakeholders have not been able to participate directly in decision-making; they have only been able to receive information..

Most of the respondents' comments are along the same lines: democracy is not sufficiently developed in the nuclear sector. Some of them state that they are not aware of any participatory process in which stakeholders have had a say. Some others point to activities that were good during the process, but that nothing was done with the results obtained and therefore had no impact. One example was the Nuclear Energy Dialogue Table in 2005, where different actors were able to exchange opinions and knowledge.

Nevertheless, there are successful cases of participation in the country. For example, the advisory committee of the CSN (Nuclear Safety Council) monitors its activities, increasing its transparency and opening the doors to the participation of different stakeholders. Similarly, the awareness-raising activities on nuclear installations, aimed at a mostly young public, and the SIPMA seminars (Seminario Internacional de Periodisme y Medio Ambiente) for journalists organised by Enresa, are well appreciated.

As can be seen from Figure 3, the emergency preparedness items are the most highly rated, especially in the nuclear towns, which have a close relationship with the CSN and are informed and listened to in their concerns, including through meetings and publications in the local press. Waste management is also seen in a better light, partly because there has been some public debate in the preparation of the General Radioactive Waste Plans, although there is still a lack of involvement and debate at the national level.

In **France**, they follow the same line, as participants do not evaluate decision-making very positively. A clear example is the recent decision to merge the research organisation IRSN (L'Institut de Radioprotection et de Sûreté Nucléaire) with the larger nuclear regulator ASN (Autorité de Sûreté Nucléaire), which was a political decision in which there was no public participation. On the other hand, waste management is one of the most highly rated areas of participation, for projects such as CIGEO, which intends to build a geological repository for radioactive waste.

We can see that preparedness for a nuclear emergency is the highest-rated item in France. This may be due to associations such as ANCCLI (l'Association Nationale des Comités et Commissions Locales d'Information), which is fully committed to the development of post-accident plans. The key points are the increased competence and autonomy of civil society and the availability of the regulator and public expert to take full advantage.

Early participation in decisions such as the life extension of the 900 and 1300 MWe reactors, where seminars and public meetings are held to educate and inform the population about the safety conditions of the life extension of these reactors, is also positively assessed. Nevertheless, some opinions reflect the lack of representativeness of civil society groups, many of which could be opposed to this.

In the **UK**, participants argue that nuclear power is driven by commercial motives in consultation with government and regulatory oversight, with organisations such as the Nuclear Industry Association influencing its inclusion in the energy mix. Stakeholders are deemed to have little influence on decision making, except for local stakeholders who are the main stakeholders and potentially affected. Concerning waste management, this is carried out by the industry, except for some cases such as the Geological Disposal Facility (GDF), which focuses on community involvement.

In the **Czech Republic**, participatory governance is rated relatively positively by the respondents compared to the other countries. However, decisions regarding the closure and decommissioning of nuclear power plants are exceptions, as scores in these areas fall by more than one point compared to the others. The issue of safety and waste management does not seem to be at the centre of discussion and there is no perceived need to pursue it, except among the professional public and the affected localities.

In terms of positive practices that have been implemented in the country, respondents identified several strategies that are deemed to have worked. Firstly, a civil safety commission in the vicinity of nuclear power plants and, in addition, the efforts to foster the existence of local working groups at the regional and municipal levels for the siting of the deep geological repository. Local authorities in potential siting areas have also been involved in the discussions. Finally, some participants mention the Energetic Trebic Region Association, which aims to promote nuclear energy in the Trebic region, primarily by developing projects, including the building of new reactors, at the Dukovany nuclear power plant. This organisation is dedicated to spreading information about nuclear energy, efficient energy use and reducing the region's energy dependency. It consists of schools, elected representatives at the community level, and members of the government and other officials are regularly invited to their seminars and events. One of the main points they advocate is public education and participation in decision-making processes to promote nuclear energy as a way of improving the quality of life of the region's inhabitants.

In **Romania**, participants express a vision that stakeholder participation is taking place in all areas of decision-making. This includes a strategic environmental assessment process and decisions on new nuclear technologies carried out by national, local and cross-border authorities. As we can see in the Figure 3, all of Romania's scores are very high compared to the other countries, except for closure and decommissioning, which is because most respondents chose 'don't know' as this is not an issue that is currently being addressed. These high scores are due to the amount of public information and debate that takes place, the exemplary operation of nuclear reactors and the active presence of the CNCAN, the regulatory body. The same high level of participation in nuclear decisions was also reflected in the possibility of joining the European ALFRED project, where the discussion involved various ministries, R&D organisations, relevant NGOs in the field, representatives of the Parliament, universities and Romanian academia, and local host community.

The **Netherlands** stresses the idea that some processes have been carried out with some public participation, but in none of them have stakeholders had a sufficiently noticeable influence. In addition, decisions made in this area without public participation are mentioned. For example, the decision to close the Borssele plant, taken by Parliament and subsequently cancelled by the Cabinet, the deferred decommissioning of the Dodewaard nuclear plant scheduled for 2045, and the 10-year decommissioning/post-decommissioning periods are also mentioned. Still, it is mentioned that, following the intervention of the Aarhus Compliance Committee, preparations are being made for public participation for the next 60 years.

One of the respondents from **Finland** mentions two successful experiences in the country. One is the Environmental Impact Assessment Act, which was an instrument to ensure that all interested parties participate in the planning and part of the decision-making on the disposal of spent nuclear waste in 2000. The second one is the Nuclear Energy Act which also requires some degree of public participation, although it is up to the main stakeholders to decide how to comply with the requirements of the law.

From **Italy**, it is mentioned that in terms of public participation in nuclear energy decision-making, no significant examples of citizen involvement can be recalled beyond the 1987 referendum[2]. This referendum represented the only "participatory" way in which society could directly influence the country's energy policy.

The respondent from the **United States** did not respond to this section.

4.2 Participatory governance in sustainability assessment

Respondents were also asked about their views on stakeholder involvement in sustainability assessments of nuclear energy or broader energy systems. To this end, they were asked whether sustainability assessments had been carried out in relation to nuclear energy or broader energy systems, with the possibility of answering yes/no/don't know. Those who responded affirmatively, were then asked to rate, on a scale of 1 (not at all) to 7 (to a full extent), whether different civil society stakeholders, including wider publics, had been involved in these assessments and their translation to policies, their perception on the involvement of social science and humanities experts in these assessments. There was a separate section for qualitative explanation for each of these two questions.

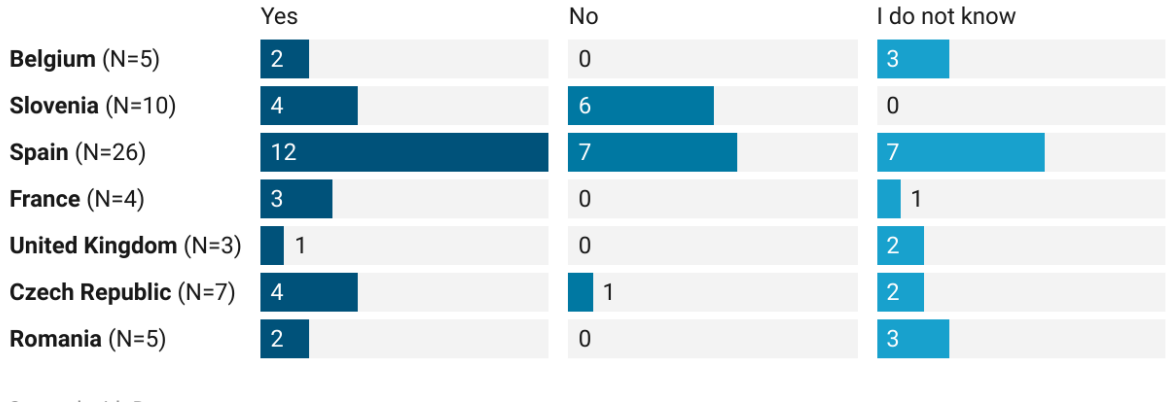

Figure 4. Have sustainability assessments of nuclear energy or broader energy systems have been conducted in your country?

In Figure 4, we can see difference between the different countries. Most of the votes are split between 'yes' and 'don't know', except in those countries with a higher participation of respondents (Spain and Slovenia). In the other countries, Belgium, France, the United Kingdom, the Czech Republic and Romania, affirmative and hesitant answers predominate.

[2] 2011 referendum was not mentioned by the participant

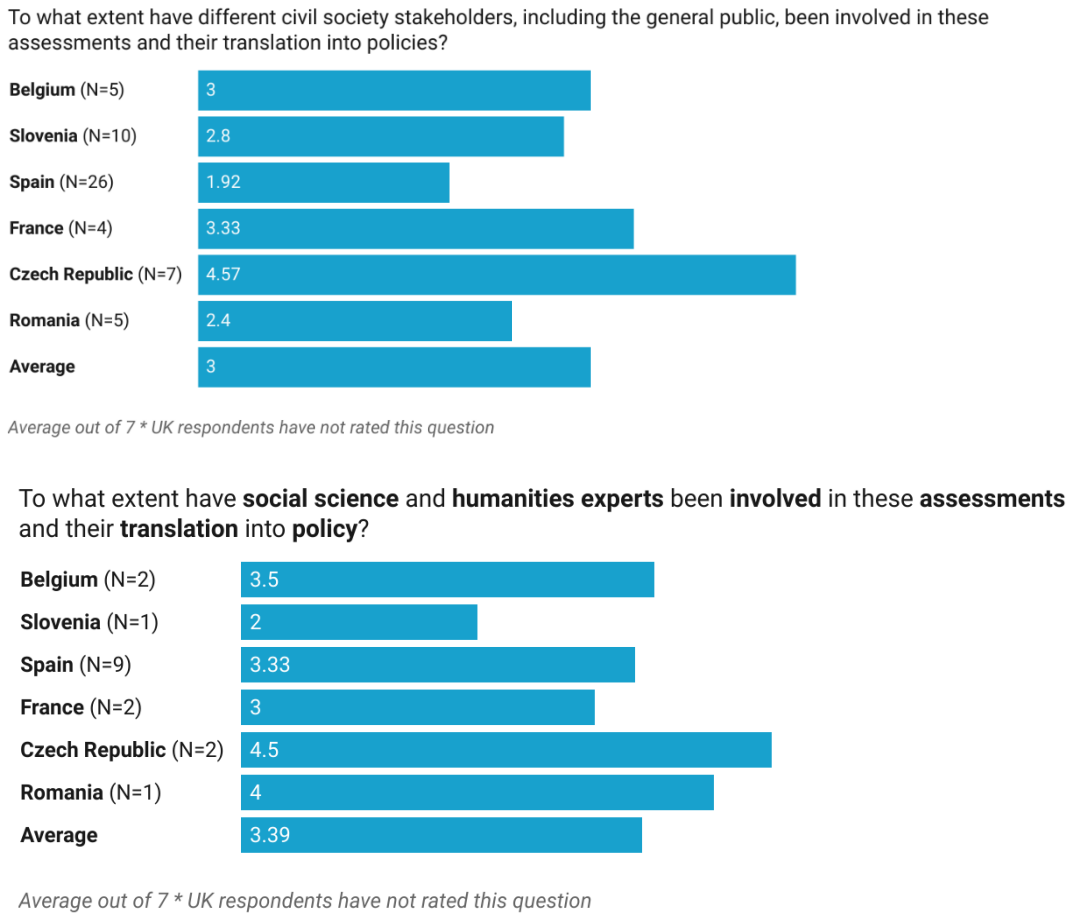

Figure 5. The extent to which different civil society stakeholders have been involved in sustainability assessments and their translation to policies

According to Figure 5, the **Czech Republic** is the country reporting the highest level of stakeholder involvement in sustainability assessment, even though the average score is only just above the midpoint. On the contrary, Spain is the country reporting the lowest average score. For the second question, regarding the involvement of social science experts in sustainability assessment, Slovenia is the country where participants assign the lowest score while Czech Republic reports again the highest score. Much remains to be done to improve these processes, according to the responses of all countries.

In Belgium it seems that some debate exists in the public sphere, although in many cases it lacks detail and nuance. For the involvement of social experts there is some disparity of opinions between the participants: due to one vote being placed at 1 on the scale and another being placed at 6 (M=3.5).

Slovenia has one of the lowest scores in this section. We find the same complaint from Slovenian stakeholders: they participate in assessments, but their opinions are rarely translated into actual policy. In the case of the National Energy and Climate Plan, for example, the public was able to participate and the drafts were published, but no major comments were taken into account. It is also hoped that a national

referendum will be called so that the public can have its say on the new nuclear power plant project[3] and show whether nuclear energy really has public acceptance.

The participation of social science experts is a point where many discrepancies are found. Half of the respondents do not answer or mark the option "I don't know", the other half have different opinions, one of them affirming that they very much agree with the affirmation that the social science experts are involved in this area, in contrast to the other one who strongly disagrees with it. One of them notes that the Ministry (not cited which one but probably referring to the Ministry of Environment, Climate and Energy) received more than 400 comments from 22 stakeholders in a public consultation on National Energy and Climate Plan, but that the social sciences and humanities disciplines did not participate.

In **Spain** comments are similar to previous sections: the government carries out consultations, but claims are not heard and decisions are taken unilaterally. According to the respondents, participation in this area is mostly limited to public consultation processes. Regarding the involvement of social science experts, it is mentioned that in the communities with nuclear installations what they say is followed with great interest, but that this is not the case at the national level, where again decisions are made on the basis of ideology. One respondent mentioned the participation of sociologists at the dialogue table in 2005. This dialogue table held in 2005 in Spain was an effort by the government of José Luis Rodríguez Zapatero to encourage debate and the participation of various sectors in decision-making on the country's energy policy. However, the impact and direct results of this dialogue table on Spanish energy policy were limited, in the sense that it did not lead to concrete measures regarding the future of the existing nuclear plants in Spain, it was rather a process of reflection.

France's average scores on these two questions are rather low. It is worth mentioning that one respondent considers that stakeholders should not necessarily be involved, viewing that “governance” is meant to be implemented by politicians. Regarding the involvement of social scientists, the IRSN is mentioned in light of the work they are doing on how to calculate the costs of nuclear accidents and include civil society in research projects from the outset. However, despite these efforts, one respondent believes the IRSN will disappear.

In the case of the **United Kingdom**, all respondents ticked the 'don't know' option and left no comment.

In the Czech **Republic**, the rating comes from civil society organisations, which have been involved in many political and professional discussions in this area, in some cases even blocking the selection of sites for radioactive waste repositories. On the other hand, the participation of social experts is assessed as moderate, stressing that it is important to involve them in the considerations for the installation of new nuclear power plant units around Třebíč.

Romania, in contrast to the previous section, has a rather low score. Nevertheless, some successful practices are mentioned. There was a sustainability assessment of the nuclear energy initiated by the Nuclear Agency, a government agency responsible for the development and promotion of nuclear energy, which gathered the opinions of R&D&I organisations, universities, regulators and some

[3] The referendum was cancelled based on decision of Slovenian Parliament in October 2024 as the NPP 2 was already decided to be included as part of Resolution on peaceful use of nuclear energy (in May 2024). According to legal support of Parliament the same issue cannot be voted.

ministries. However, during its preparation there were no major elements involving social science experts, as the main line of assessment was technical, which we see reflected in the scores, and at the time of the survey it had not yet been released for public debate.

Another example of good practice is that of the public body responsible for the safe management of radioactive waste and spent fuel, which over the years has organised public meetings with local authorities, NGOs and citizens in the area where a repository for low and intermediate level waste is to be built.

In the **Netherlands**, public participation in the National Energy Strategy regarding nuclear energy has been limited. The option of non-nuclear development and the associated sustainability issues were not considered. Furthermore, national climate advisory bodies have indicated that nuclear energy is not a logical option, but their input has not influenced policy decisions. While there is participation in the debate on radioactive waste, it does not feed into a broader discussion on nuclear energy. Regarding its expansion (life extension and new plants), the social sciences play a secondary and largely invisible role in the public sphere.

Finland, Italy, and the United States did not respond qualitatively to this section.

4.3 Recommendations about participatory governance

This section reports on the importance given by stakeholders themselves to international recommendations made for their participation in decision-making and their involvement in governance. The questions were designed to assess the eight recommendations synthesized in the work previously conducted in subtask 1.3.1.

The procedure was the same as in the previous sections: first, they rated the importance they give to this in different situations on a scale from 1 (not important at all) to 7 (extremely important), and then they rated the actual implementation on a scale with the same values. In the case of a positive assessment of implementation, respondents were asked to describe the experience in detail.

Figure 6 and Figure 7 show that the importance given by stakeholders to the different recommendations is high in all the studied countries. Participants from Belgium and France giving higher scores in comparison to those from the other countries in many of the recommendations. Somewhat lower ratings were given by participants from Romania, the Czech Republic and the UK. Although in general all elements score highly in terms of the importance stakeholders attach to their participation in nuclear energy policy, transparency of objectives, decisions and expected results is considered, overall, as the most important.

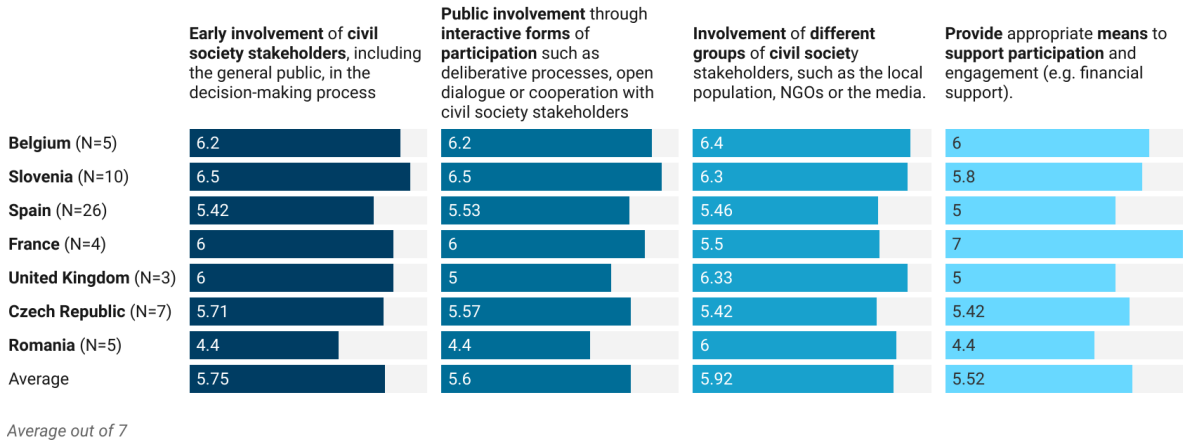

Figure 6. Stakeholders' views on the importance of the different elements related to stakeholder engagement in nuclear energy policy (I)

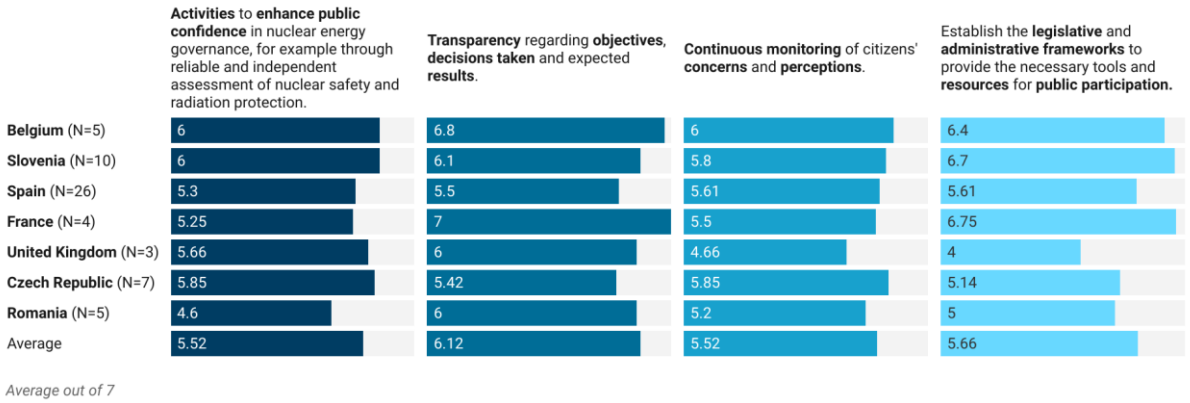

Figure 7. Stakeholders' views on the importance of the different recommendations related to stakeholder engagement in nuclear energy policy (II)

In Figure 8 and Figure 9, we can see that in all countries the extent to which the recommendations have been implemented in practice is far below their importance. Activities to improve public confidence in the management of nuclear energy are considered the best implemented, while the establishment of a legislative and administrative framework to provide the necessary tools and resources for public participation is considered the least implemented.

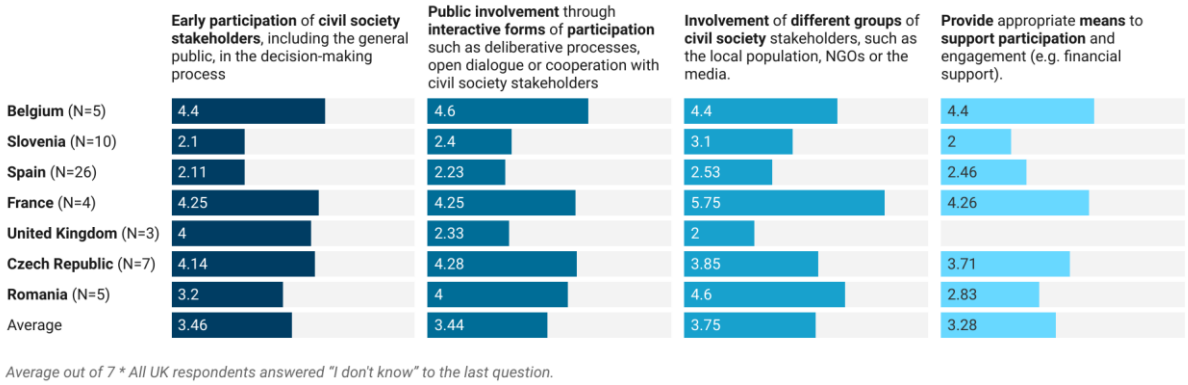

Figure 8. The extent to which the recommendations have been implemented in practice in each country, in the context of nuclear energy policies (I)

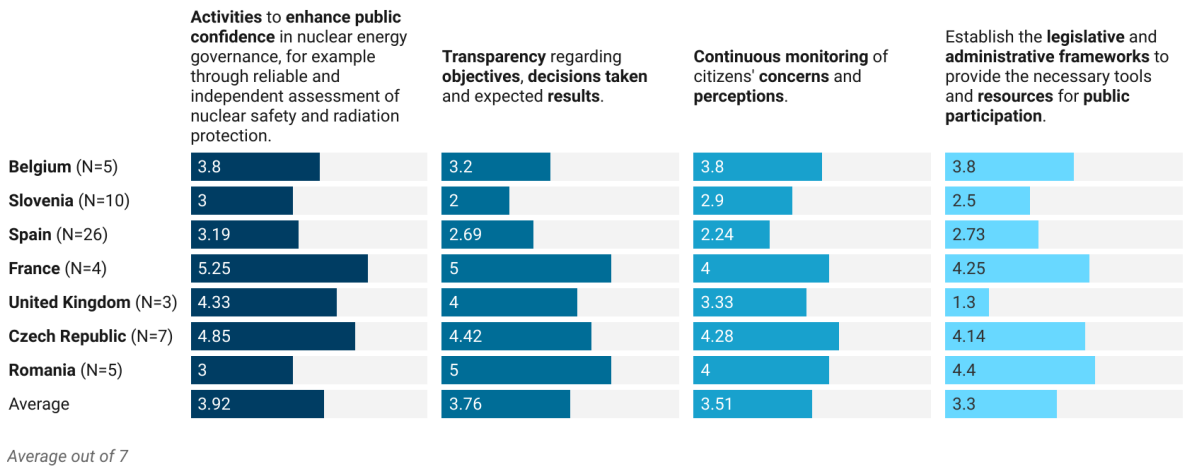

Figure 9. The extent to which the recommendations have been implemented in practice in each country, in the context of nuclear energy policies (II)

Belgium is one of the countries where participants place the greatest importance on the recommendations, especially for transparency, the existence of legislative and administrative frameworks for participation, and involvement of different actor groups. Regarding the uptake, early involvement, interactive forms of participation, involvement of different actors and funding are deemed to be better implemented than other recommendations, such as transparency.

Participants highlight some positive experiences. A notable example is the low level active waste management project in the municipality of Dessel, where the local community was involved in decision-making from the outset. In 1999, a partnership was formed between the population and the waste management organisation to answer two questions: is a repository in Dessel technically feasible, and is it acceptable to the community? The answer, published in a report in 2004, was yes, but not unconditionally, which led the local community council to conditionally accept the hosting of a surface repository. Since then, the partnership has used this platform to make monitor and engage in the development and decision-making of this repository. In relation to the creation of a legal framework to meet the socio-economic demands of the local community, a law was passed in 2010 to create a special fund to finance the socio-economic aspects of the project.

In terms of actions that can be taken to improve public confidence, participants mention the government agency (nuclear regulator) responsible for safety inspections and, if necessary, for shutting down reactors. Its main objective is not to build confidence, but to be an independent guardian of nuclear safety, which indirectly builds public confidence.

Slovenia is the country that scores the lowest in the implementation of participatory governance practices in the field of nuclear energy, despite the importance attached to these processes, as we can see in the graphs. They attach great importance to the establishment of legislative and administrative frameworks for public participation and to the early and interactive involvement of stakeholders. It is precisely the early involvement of societal stakeholders, together with transparency, that respondents rate the lowest. On the other hand, the involvement of different civil society stakeholders is viewed more positively, followed closely by activities to improve public confidence in the governance of nuclear energy.

In the comments, Slovenian respondents give a positive assessment of the implementation of some of these processes and give some examples. These include the national referendum on the new nuclear power plant project, which was held before the site selection process (see footnote 2), and the debates that took place in various platforms, events and media as part of the preparatory process. The public and NGOs were also able to express their opinions during the preparation of the National Energy and Climate Plan. On the other hand, the investors of the country's new nuclear power plant, as well as other organisations such as the Chamber of Commerce and Industry, are organising open information meetings throughout the country, in addition to opening a public information office about the new plant in the local community.

Regarding activities to improve public confidence, the past experience of safe and reliable operation is mentioned as a basis for public confidence. However, it is also noted that some activities to promote nuclear energy in schools and the media were not based on a reliable and independent assessment of nuclear and radiological safety, which may have had an impact on public perception. New investors are constantly monitoring public opinion; however, the results of surveys are not public. An NGO called the Nuclear Society Association (association of nuclear professionals working in the nuclear field) also carries out public acceptance assessments (but not on representative sample). As for the existing legislation, it was extended after the Fukushima accident and has been amended so that new construction could take place.

Spanish respondents see the uptake of recommendations to be the most unsatisfactory, failing to reach even 3 points in any of the activities to improve participatory governance, with transparency being the category with the lowest score.

Participants highlight the recurring perception that decisions in the nuclear field are often based on ideological considerations. A clear example, cited by one respondent, is the consultation process on the construction of a centralised temporary storage facility for high-level radioactive waste. Although an open and transparent participatory process was used to solicit candidates, the final decision was ultimately driven by political criteria. In such cases, social consensus is highly valued as a means of ensuring transparency and providing the public with adequate information to build confidence in the technology.

The efforts of CSN (Nuclear Safety Council) and Enresa (national radioactive waste company) to involve nuclear communities in the decision-making process are appreciated, but it is emphasised that they have little interaction with the rest of society. Similarly, the initiatives and experiences carried out within the European framework are positively received, as they have successfully brought together different stakeholders to share perspectives, address concerns and improve cooperation.

In terms of stakeholder engagement, the industry's reputation for secrecy makes communication efforts difficult. Nevertheless, respondents agree on the importance of informing the public about nuclear activities and ensuring that the press provides accurate, high quality information. On the other hand, it is felt that without financial support it is not possible to have a real debate, as this requires a place to meet, information activities or trips to learn about other contexts.

Public confidence is a key objective for the sector, which is why independent safety audits are carried out, employees are trained to ensure their commitment, and an independent body - the CSN - oversees operations, nuclear safety and radiation protection. In general, the transparency of the sector is considered to be remarkable, especially with regard to operational experience and safety.

Finally, with regard to the legal and administrative framework, the existence of public participation mechanisms is appreciated. For example, information committees in the municipalities around nuclear power plants, and the CSN Advisory Committee. There is also progress in areas such as environmental impact assessments and the inclusion of public participation in the general plan for radioactive waste management or the updating of regulatory standards. However, there are still areas where the public is calling for further legislation, such as the creation of a law on the site selection procedure for an Interim Storage Facility.

France is the country where participants rated the implementation of the different elements the highest, reflecting the importance attached to them. Respondents unanimously agree that the most important aspect is providing adequate means to support participation and engagement, as well as transparency. In terms of implementation, the highest rated item is the involvement of different civil stakeholders. Respondents particularly emphasised the importance of stakeholder involvement and the need to carefully consider who is and who is not included in the process, stressing that civil society is not monolithic but a collection of diverse groups, each of which requires a tailored approach to dialogue. It is also seen as crucial to broaden the dialogue beyond local stakeholders to include external experts with relevant insights and interests.

An annual budget is allocated to local information committees, which are legally associated with each risk-related entity. In terms of transparency, there are bodies such as the Nuclear Safety and Radiation Protection Authority (IRSN) or the National Association of Local Information Committees and Commissions (ANCCLI), which play a key role in building public confidence in these projects, using tools such as the Risk and Safety Perception Barometer and conducting international missions to verify the safety of operating facilities.

In the **UK**, participants put a greater emphasis on early stakeholder engagement, as well as on inclusiveness and transparency. On the other hand, ongoing monitoring of concerns and a legal framework for engagement are rated less highly. In fact, this last aspect, the establishment of a legal framework, is the item with the lowest score in terms of implementation. In contrast, the implementation of activities to strengthen public trust is the highest rated item. Respondents report that lack of

information is one of the main obstacles to effective participation. Meetings are held behind closed doors, minutes or agendas are not published and the public has no opportunity to ask questions. Similarly, the disinformation that reaches the public weakens the process and increases fear. To address these issues, it is suggested that more emphasis be placed on science, technology, engineering and mathematics (STEM) education in schools and that funding be made available to enable stakeholders to participate in debates.

In the **Czech Republic**, there is a notable gap of about one point between the importance given to the recommendations by stakeholders and the actual level of implementation. In terms of both importance and implementation, all items receive similar scores. However, with a difference of only a few tenths of a percentage point, respondents feel that there is more room for improvement in implementation in terms of involving different civil society groups and providing adequate means to support participation and engagement. With regard to the latter, respondents point to a lack of sufficient institutional support. On the other hand, respondents of the survey claimed that measures have been taken to encourage participation. For example, public debates are organised in which interested members of society can learn new information, and there is close cooperation between state administrative bodies and legislators. Some respondents mentioned as an important example the cooperation with the Czech Radioactive Waste Repository Authority (SÚRAO), which, however, is disputable, as there is a long-lasting sharp conflict between SÚRAO and locations preselected for siting the deep geological repository. Some respondents also valued activities to improve confidence in nuclear governance. One respondent confirms that there is a general acceptance of a high level of trust in the regulator and the operator, as well as transparency in the information they publish. Public support for nuclear energy is also described as high.

In **Romania** the evaluation of the implementation shows some variation in scores between the different categories, with higher scores in areas related to transparency, but rather low scores in relation to direct participation processes. For example, in the area of early stakeholder involvement, respondents note that the appropriate level of involvement is not always achieved, as it depends heavily on the openness and availability of stakeholders. In the same vein, one of the respondents working in the media and communication sector believes that dialogues should be more open and that there should be more direct cooperation between the state and the public, including shared responsibility for decisions. Despite these challenges, public communication, such as the nuclear emergency simulation at the Cernavodă Nuclear Power Plant to evaluate and improve national and international nuclear emergency response plans, and the involvement of the press in some of these discussions were seen as positive steps.

One of the most criticised points in Romania is the lack of financial support for participation. Respondents described this as almost non-existent, stating that it is very difficult to participate if there are no resources and that planning activities becomes unfeasible as costs and funding mechanisms are not adequately considered.

Activities to improve confidence in nuclear governance are also viewed critically. However, some efforts were recognised as successful, including public communication through brochures and the simulation of a serious accident at the Cernavoda nuclear power plant. Suggested ways to increase transparency include independent evaluation, ongoing activities and the use of the media and a specialised press to publish information.

As mentioned above, transparency is highly valued by the respondents and it is emphasised that this is important in order not to jeopardise the level of acceptance.

In the **Netherlands**, citizens' concerns and perceptions are tracked through public surveys to gain insight into public support and opposition to nuclear power.

Regarding legislative and administrative frameworks to provide resources for public participation, the respondent mentions that measures are being taken to bring legislation into full compliance with the Aarhus Convention after the Netherlands was found to be in breach of the decision on the life extension of the Borssele nuclear power plant after 40 years. Furthermore, it is added that "these measures are very slow, and logical intermediate measures based on existing legislation, such as public participation in the decennial Periodic Safety Review (PSR), are not taken". Finally, it is mentioned that, at present, there are no resources for public participation and that the public has to bear the costs of participating in meetings, conducting counter-investigations, taking legal action....

In **Finland**, the Finnish Radiation and Nuclear Safety Authority (STUK) is highly valued in nuclear safety and radiation protection issues. However, it organizes almost no public participation activities, despite the importance of strengthening citizen confidence in nuclear governance.

Transparency in objectives, decisions and results is a general policy in Finland, although there are exceptions where authorities or companies do not follow these principles. Even so, both companies and their stakeholder organizations continuously monitor citizen concerns and perceptions through annual public opinion surveys, which allows them to anticipate and manage potential controversies.

Unlike in Sweden, in Finland the authorities do not usually allocate resources to civil society actors, as nuclear legislation does not require it. However, there are requirements for authorities to organize public participation activities, which underlines the need for legislative frameworks that guarantee access to resources for citizen participation.

Finally, transparency about the actors involved in nuclear projects is valued as essential. It is important to clearly disclose, for example, if any foreign investors, such as Russia, are involved in an initiative. This reinforces public confidence and credibility in nuclear energy decision-making in the country.

The United States and Italy have not responded to this section.

4.4 Challenges and drivers to adopt recommendations

Respondents were asked to indicate challenges or barriers they think their country is facing in relation to stakeholder engagement in nuclear energy governance. We also asked them to justify why they think these challenges were important. Then participants were asked to provide some suggestions or actions in view of overcoming these challenges/barriers in their country.

Figure 10. Word cloud of the main perceived barriers

The barriers most frequently mentioned by respondents (Figure 10) were those related to the lack of trust and communication, with a total of 22 times, referring to problems such as the general lack of public trust, the lack of opportunities for participation, the omission of public opinion or poor communication on the part of the authorities. Another major barrier is poor accessibility and lack of transparency in terms of the information the public receives. Poor regulation and institutional capacity, together with misinformation and stigmatization of the nuclear sector are indicated as a problem. Respondents refer to the fear of risk which is deemed to be caused by misinformation and poor regulatory and institutional capacity. Finally, partisan interests, issues related to resources and funding, engagement and accountability, and biases in decision making are also identified as barriers, although not as decisively.

In **Belgium**, the most frequently cited barrier was the lack of a long-term policy vision. In the nuclear sector, a policy of abrupt change is seen as dangerous and unethical. Respondents also pointed to the lack of an Energy ministry responsible for the nuclear sector and a group of independent scientific advisors. According to the respondents, this is due to a partisan government and its lack of independent knowledge.

To address these challenges, they suggest increasing support in two key areas: first, facilitating discussions on possible nuclear scenarios and calling for referendums to involve the public in decision-making. Second, to invest in radio ecological research to study environmental issues, conduct impact assessments and fully evaluate all possible scenarios and consequences.

In **Slovenia**, the lack of information, participation and transparency is often mentioned, and it is said that participation is just a box-ticking exercise, that important political decisions are made in advance, and that the sources of information are neither credible nor well-informed. For example, two months before the national referendum (finally cancelled, see footnote 2) on new nuclear power, critical information had not been published, such as the title of the referendum question, the cost of building JEK2, the power capacity of JEK, the technical deficiencies, the environmental impact or the price of the technology.

Respondents point to Slovenia being a small country where there is a shortage of qualified personnel, most preferring to work in the private sector for higher salaries. In addition, the country's nuclear

facilities date back to the 1960s (research reactor TRIGA) and 1980s (NPP Krško – NEK), and the investment in research and international projects is seen as minimal. Corruption is deemed a problem in the country, including the influence of financial contributions to media and political parties that support the construction of JEK 2 (except one political party in parliament Levica).

Several measures are proposed to address these challenges. These include implementing treaties and documents adopted at the national and international level, such as the Aarhus Convention, the precautionary principle, and UN and EU declarations and conventions. Establishing an open dialogue with the public is seen as essential, along with efforts to improve transparency through new communication methods and strengthening approaches that prioritise interdisciplinarity and inclusiveness. A national programme is also recommended to address the need for qualified personnel, improve expertise in new technologies and secure funding for new nuclear projects.

In **Spain**, the main obstacle is seen to be the political bias and party politics, and the politicisation of the debate, which is deemed to influence the population into opposing nuclear energy. Respondents also point to lack of information, public interest and meaningful stakeholder participation in decision-making processes, including the absence of referendums on nuclear policy. Public debates on the broader energy model are seen as essential. It is important to encourage public debates on the preferred energy model, according to respondents. One respondent argues that this is because nuclear energy is a technology that requires a high degree of technical complexity and significant long-term investment, making it difficult to manage through the deliberative mechanisms of liberal democracies, which by their nature allow limited citizen participation.

There is no agreement on governance responsibilities. The nuclear sector believes that governance is a matter for the Nuclear Safety Council (CSN), and the CSN believes that it is merely a regulator, with no role to interact with society. Some respondents identify the nuclear sector itself as an obstacle, citing examples where the sector perceives society as an adversary or where there is a lack of democratic commitment among its actors.

Several proposals were put forward to overcome these limitations. These include the creation of a specific body to manage social participation so that the merits of each nuclear project and the distribution of costs and benefits (economic, social, etc.) in the short and long term can be assessed. Another recommendation is to improve the technological education and training of the population, especially in schools and among communicators. Finally, political forces must be forced to reach agreements on these issues, as they require a medium- and long-term strategic vision and cannot be confined to the scope of a single legislative period.

In **France**, insufficient attention to public participation is identified as a significant barrier. Respondents emphasise that society has its own concerns and priorities that need to be considered by institutional actors in order to create meaningful opportunities for dialogue. This lack of participation not only limits the transparency of activities, but also reinforces the dominant position of experts, side-lining the wider public. In addition, the lack of support and understanding from the state is identified as a challenge, as decisions are sometimes taken without considering the interests and concerns of society.

To address these issues, it is proposed to build on the example of organisations such as the Nuclear Safety Authority (ASN) and the Institute for Radiological Protection and Nuclear Safety (IRSN), which have developed ways of increasing transparency and public involvement.

The **UK** participants claim that the public is afraid of nuclear energy and this slows down participation. In particular, the public that does not have a background in STEM issues makes it difficult to participate and understand the dialogue. On the other hand, the lack of information and the publication of misinformation is also mentioned as a reason for weakening the process. Finally, barriers such as the lack of opportunities for the public to ask questions and participate in a dialogue, and the lack of funding for the different stakeholders are also mentioned.

In the **Czech Republic**, the role of the European Union and how it subsidises competing technologies, making nuclear energy more expensive, is repeatedly mentioned. Participants refer to the issue of deep geological repository, particularly the populism surrounding it and the difficulty of reaching agreement between the many communities with different interests and representatives. Other issues mentioned are the lack of public justification for the need for nuclear energy, the negative image of this energy source and the limited space for dissent in the traditional media. These issues are deemed relevant because the public often lacks information from sources outside the pro-nuclear sector. Disinformation tactics are also used, contributing to the spread of inaccurate ideas in public perception.

Suggestions for overcoming these barriers include the view that society is over-regulated and that decision-making is increasingly dominated by feelings and individualistic interests rather than being based on data. Participants also recommend being open to different sources of information, taking a critical view of the issue, finding different sources of information and not relying solely on local elected representatives. Finally, the possibility of televising more public debates is also mentioned.

In **Romania**, all respondents consider that the main barrier against an effective governance is a lack of real participation and reliable information. They stress that the future of nuclear projects will be determined by the level of public confidence in this technology, which will influence its acceptance or rejection. In the concrete case of Romania, respondents point to a lack of economic resources, particularly when it comes to travelling and participating in debates.

To overcome these barriers, they suggest that it is necessary to redefine what constitutes valuable participation, going beyond public hearings and debates, which often lack engagement. They also suggest implementing measures to improve the process of designing trustworthy information, diversifying communication methods, fostering cooperation with the public and improving public education on the issue.

The main barriers detected in the **Netherlands** have been the lack of accessible interpretation of the legislation, the defensive approach of the authorities, the lack of openness in participation and the scant consideration of citizen participation.

As ways to overcome this barrier, it is suggested to dedicate resources to public participation that allow the continuity of the work of civil society organizations and NGOs, and, in addition, the acceptance that the Aarhus Convention is a binding law and directly applicable in cases of doubt in the legal system.

In **Finland**, the insufficient legislation on public participation, the passive attitude of the authorities, the lack of budget for public participation, the deficiency in investigative journalism and the scarce opportunities for participation are highlighted as barriers.

To overcome these barriers, it is proposed to reform legislation to include greater citizen participation, to train and educate public officials and authorities thoroughly, and finally, it is also proposed to diversify the number of experts commenting on these news items, to hear new voices and points of view on the subject.

Two barriers are mentioned from **Italy**: the general lack of information and the excessively politicized debate. The combination of these two barriers leads to a lack of open debate. To put an end to this problem, it is proposed to change the educational system, to adapt media communication and to ban speculation and false news about nuclear energy.

The **US** respondent did not provide any examples in this section.

5 Conclusions

This report assesses the results of an online questionnaire answered by 60 stakeholders from seven different European countries which contribute to ECOSENS WP1. The questionnaire was designed based on the results of Task 1.3.1 "Recommendations from document review".

The survey aimed at exploring the actual uptake of recommendations from the perspective of different stakeholders, how forms of public dialogue vary according to social conditions, and how structural and cultural issues that prevent effective uptake can be circumvented or mitigated. A comparative analysis between countries to examine how forms of social participation in nuclear energy issues vary according to social conditions has not been possible, as the differences in the samples from each country render such comparisons unreliable. The heterogeneity in sample sizes undermines the validity of cross-country comparisons. As a result, any attempt to generalize findings or draw meaningful contrasts would risk oversimplifying complex, context-dependent dynamics of public engagement in nuclear energy debates. Thus, the seven countries were analysed separately and only some general conclusions can be drawn.

Respondents from all countries assessed the actual level of participatory governance on nuclear issues as unsatisfactory, particularly on the closure of nuclear power plants and the decommissioning of nuclear reactors. A notable exception was the field of radioactive waste management which, according to the respondents, presented more participation opportunities. The participation of civil society stakeholders in sustainability assessments of nuclear energy was generally low in the different countries studied, except for the Czech Republic, where this was assessed as moderate. The involvement of social science and humanities experts in sustainability assessment was perceived also low in most countries, but assessed as moderate by respondents from Belgium and the Czech Republic.

In all countries, respondents gave high importance to all recommendations for improving participatory governance, with transparency about objectives, decisions taken, and expected results being the most highly valued. However, implementing these recommendations was deemed to be moderate to low in the different countries, with the provision of the appropriate needs to support participation and the establishment of the legislative and administrative framework being the least implemented.

Respondents expressed a general concern about the lack of reliable information, highlighting the need for action to ensure that citizens have access to accurate and reliable information. Likewise, there was a consensus that it is essential to improve transparency in decision-making, both at government level and in the nuclear sector, in order to build public confidence.

In **Belgium**, participatory governance in the nuclear sector was reported to be relatively low. However, positive experiences were mentioned, such as the case of the low-level waste management project in the municipality of Dessel, where the local community was involved in decision-making from the beginning. In order to strengthen participatory governance, it was recommended that more emphasis should be placed on building citizens' trust and that actions should be taken in this direction. Respondents also referred to the role of the nuclear regulator, as a safety inspection authority in creating credibility and transparency.

With regard to participatory governance in sustainability assessments of (nuclear) energy policies, the rating given by Belgian stakeholders was medium-low, higher than in Spain or Romania, but lower than in the Czech Republic or France. However, alongside the Czech Republic, Belgium was the country in

which social science and humanities experts were most involved, although this was still far from full participation.

The main challenges to the adoption of the recommendations on stakeholder engagement included the lack of a long-term policy vision and the absence of an independent scientific perspective. To overcome these limitations, it was proposed to facilitate discussions on possible future energy scenarios, and to organise referendums to involve citizens in decision-making.

In **Slovenia**, participatory governance in the nuclear sector received the lowest score compared to other countries; respondents referred to a lack of public participation in decision-making and repression of opponents of nuclear energy. Shortcomings in emergency preparedness were also noted. The rating for participatory governance in sustainability assessment was also low. Although some public participation is reported, respondents argued that citizens' opinions are not reflected in the final decisions, leading to mistrust in the process. Despite these difficulties, there have been positive experiences in the past, such as the national referendum on the new nuclear power plant project, which was held before the site selection process, and which was preceded by debates in various platforms, events and media, before being cancelled. The public and NGOs were also able to express their opinions during the preparation of the National Energy and Climate Plan.

While all recommendations for participatory governance are considered very important, their implementation was still seen as poor, being among the worst of the countries surveyed. The main obstacles identified by the Slovenian participants to the implementation of these recommendations were the lack of information, transparency and participation, as well as the lack of qualified staff, and corruption. To address these problems, participants suggested developing a legal basis to regulate the process, establishing a more open dialogue with society, and creating a national programme for the training of specialised work staff for nuclear power. It was also recommended to strengthen education and information dissemination in schools and the media, ensuring the use of reliable sources.

In **Spain**, nuclear decision-making was reported to be strongly influenced by the political ideology of the government, which was seen to limit openness and public debate in the sector. Although the Nuclear Safety Council (CSN) and Enresa have tried to involve nearby communities in some decisions, it was noted that a greater number of key stakeholders would need to be involved to achieve broader and more effective participation. In addition, the poor reputation of nuclear energy hindered communication and the establishment of a constructive dialogue with society.

The nuclear areas where greater participation was possible were nuclear and radiological emergency preparedness and radioactive waste management. In terms of participatory governance in sustainability assessment, participants' ratings were the lowest of the surveyed countries. This mostly reflected the perception of unilateral decision-making than created mistrust and a lack of legitimacy in the decision-making processed, as public opinion is not reflected in the final decisions.

The uptake of recommendations in Spain was seen as rather low, except in the case of activities to improve public trust in nuclear energy governance. The main challenges to improving participatory governance were therefore the politicisation of the debate, lack of information and public disinterest. To overcome these obstacles, several measures were proposed, such as the creation of a specific body in charge of managing social participation, the improvement of technological education in society, and the

development of a medium- and long-term nuclear energy policy vision that allows for more informed, inclusive and transparent decision-making.

In **France**, governance in the nuclear sector was not considered to be fully participatory. Nevertheless, participants noted that the country is one of the most active in promoting citizen participation in the sector. Emergency preparedness and radioactive waste management were recognised as the most participatory domains. Early participation in decisions such as the life extension of the 900 and 1300 MWe reactors (where seminars and public meetings were held to inform the population about the safety conditions of the life extension of these reactors and to receive feedback) was mentioned as a positive experience. In terms of participatory governance in the sustainability assessment, respondents from France and the Czech Republic had the most positive assessment. However, in the case of France, the responses indicated that there is room for improvement in this area, given that the level of participation was described as below moderate.

France was the country where respondents attached the greatest importance to most of the recommendations on stakeholder involvement; respondents also had the most positive views regarding implementation of most practices facilitating involvement. One of the main challenges identified was the lack of responsiveness to public concerns by the government, which leads to mistrust in the system.

To address this, it was suggested that organisations be set up to improve transparency and strengthen relations with society to ensure that its concerns are taken into account in decision-making. It was also recommended that all relevant stakeholders be involved in the decision-making process, and that the specific budget earmarked for the creation of information committees associated with any risky installation by law be continued.

In the **UK**, participatory governance in the nuclear sector had significant shortcomings, as most stakeholders were poorly involved in the process, except for local communities, which were the main stakeholders affected by decisions in this sector. The decommissioning of nuclear power plants was considered the most participatory area in the UK, in contrast to most of the other countries surveyed.

No specific sustainability assessments of nuclear energy or broader energy were reported by stakeholders in this country. However, positive experiences of assessing nuclear projects that have succeeded in involving local stakeholders were mentioned, as well as new initiatives that have shown a commitment to transparency. One of the main obstacles to effective participation was the lack of involvement of all relevant stakeholders. To address this, it was recommended to strengthen science, technology, engineering and mathematics (STEM) education in schools and to encourage the active participation of stakeholders in discussions on nuclear energy.

In the **Czech Republic**, a medium to low level of participatory governance was identified in different areas. As for the radioactive waste management, the situation is better regarding low- and intermediate-level waste and more difficult regarding the disposal of spent nuclear fuel and high-level waste. Successful practices of governance transparency were also identified, such as the creation of a Civil Safety Commission (at the Dukovany nuclear power plant in 1996) and the organisation of discussions to convey information about nuclear projects. While some respondents claimed that civil society organisations have been actively involved in political and technical debates on the nuclear sector, the sample was too small to generalize these observations. The lack of institutional support remained a major obstacle.

The main challenges to participatory governance in the nuclear sector included competition from subsidised technologies, which make nuclear energy more expensive, as well as its poor reputation and the presence of misinformation and misleading content in the public debate. These factors were seen to hamper the social acceptance and development of the sector, reinforcing the need for more effective strategies to improve communication and confidence in this energy source.

In **Romania**, participatory governance in the nuclear sector received a good overall rating, with the exception of the closure and decommissioning of nuclear power plants, which are not issues currently being addressed by the nuclear programme, These high scores could be explained by the amount of public information and debate that is taking place. The need to strengthen cooperation between government and citizens to ensure more effective participation in decision-making was noted. In terms of participation in sustainability assessments, the score was particularly low compared to other countries such as the Czech Republic, although some positive practices were recognised that can serve as a reference for future improvements. Some recommendations were better implemented in Romania, such as transparency, while others were clearly insufficient, such as adequate funding and resources or activities to improve public trust.

To improve the process, it was proposed to redefine what is considered valuable participation and to establish mechanisms to combat misinformation, ensuring that public debate is based on accurate and verifiable data.

In the **Netherlands**, some forms of participation are mentioned, but they are not significant enough to affirm that stakeholders have influenced decision making. Likewise, the few resources available for public participation are criticized, which ends up being an expense for those actors who decide to take part. Finally, the barriers mentioned were the lack of accessible interpretation of the legislation, the defensive approach of the authorities, the lack of openness in participation and the scant consideration of citizen participation.

In the case of **Finland**, there were some measures that seek public participation, such as the Environmental Impact Assessment Act and the Nuclear Energy Act. Annual public surveys were conducted to monitor public opinion on nuclear energy. Different barriers were identified: insufficient legislation on public participation, the passive attitude of the authorities, the lack of budget for public participation, the deficiency in investigative journalism, and the scarce opportunities for participation. Even so, although no major public participation activities were carried out, STUK (the Radiation and Nuclear Safety Authority of Finland) was highly valued and considered a body that increases confidence in nuclear governance.

Finally, no public participation activity has been recognised in **Italy** since 1987, when a referendum was held. Conversely, a lack of open debate in the country was noted, stemming from a general lack of information and overly politicised discussions.

A key limitation of the present analysis must be acknowledged. Despite efforts to recruit participants representing all sectors of the quintuple helix, in most countries the respondents come from only two or three sectors. As a result, there are notable differences in respondent profiles across the countries studied. While the sample size is relatively large in Spain, it is considerably smaller in other countries,

particularly the United Kingdom, as well as France, Belgium, and Romania. It is therefore important to recognise that the findings presented in this report are based on limited and unevenly distributed data. No definitive conclusions can be drawn, and the results should not be considered representative of broader trends or generalisable to a wider population. Rather, the findings reflect the individual perspectives of the respondents and should be understood as offering a partial and exploratory view of the situation. This limitation is highlighted in the interest of transparency and to preserve the integrity of the research. Accordingly, any interpretation of the data should be made with caution, and broad generalisations should be avoided.

Future studies involving larger and more balanced samples in each country—ensuring representation from all stakeholder categories—would enhance the potential for generalisation and allow for more robust comparisons both across stakeholder groups and between countries.

6 Annexes

Annex 1. Invitation email to participate to the online survey

Subject: Invitation to participate to an online survey in the framework of the European project ECOSENS

Dear Mr./Ms./Dr.

On behalf of the ECOSENS consortium, I would like to ask you to share with us your valuable experience and knowledge on the stakeholders' involvement in nuclear energy governance in your country by answering a short online survey.

ECOSENS (2022-2025) is a European project which stands for "Economic and Societal Considerations for the Future of Nuclear Energy in Society" and brings together specialists of social research and of nuclear energy research and policy to exchange views and collaborate with civil society and other relevant stakeholders with the aims of:

- Providing a societal perspective on the development and use of existing and new nuclear technologies, in the context of major societal challenges: climate crisis, sustainable development and energy security.
- Providing an assessment of nuclear energy sustainability considering the entire life cycle of the current nuclear technologies, possible evolutions of the energy markets and nuclear technologies in the transition toward climate neutrality, and the societal perspective in order to reveal and evaluate the possible roles of nuclear power within the European energy mix viewed at 2030, 2050 and beyond.
- Provide a new economic model, based on the System of Provision, for the assessment of nuclear energy, providing a suite of indicators relevant not just for the investors (e.g. equity holders) but for a broad variety of stakeholders (e.g. consumers, governments, suppliers).

Given your expertise and experience, you were identified as a potential contributor to our endeavour to identify the status at European level of:

- How participatory is (nuclear) energy governance today,
- Experiences related to stakeholder engagement in nuclear energy policy,
- Challenges for stakeholder engagement in nuclear energy policy/governance,
- Impact of stakeholder engagement in (nuclear) energy governance,
- Ways to improve stakeholder engagement in nuclear energy governance.

The link to the online questionnaire, open until October 31, is
https://encuestas.ciemat.es/index.php/352973?lang=en

The duration of the survey is approximately 15 minutes. At the outset of the survey, your consent will be requested, with assurance of anonymity. Your responses will be analysed together will all other responses of stakeholders from various European countries (Spain, Belgium, France, UK, Slovenia, Slovakia, Romania, Czech Republic) to extract commonalities and divergences in experiences and views on stakeholder engagement.

A report of the results of the research will be sent to you if you wish.

In order to get a clear picture of the state of play on this issue in each of the countries analysed, I strongly encourage you to respond.

In case you have any additional questions please contact me (as Task leader) or Daniela (project coordinator).

I thank you in advance.

Best wishes,

Roser Sala
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Annex 2. Questionnaire

ECOSENS project. Stakeholders Survey

Thank you for participating in this survey on **stakeholders' engagement in nuclear energy decision-making**. The objective is to assess, in different European countries, the actual uptake of the recommendations on stakeholder engagement in nuclear energy governance.

Your responses will be kept strictly anonymous. Only aggregated data will be reported. Please, try to answer all questions, even though we do not expect you to have in depth knowledge of all of the items addressed.

The questionnaire takes around 15 minutes to be answered, plus a few more minutes if you wish optionally to share more information.

Participant profile

Q0. Please, specify your main profile according to the following stakeholder categories:	1. Research and education system, e.g. universities, higher education systems, research centres and schools 2. Economic system, e.g. nuclear industry, other relevant industry (e.g. energy distribution), firms, services and banks 3. Environmental NGO 4. Civil Society Organisations, Local Information Committees, citizens' associations 5. Public authorities: national, regional or local governments, regulators or other governmental agencies, politicians 6. Media or social networks 7. Other. Please, specify: _____

Please select…

Q1. How do you perceive your **level of influence** in the planning and decision-making related to nuclear energy policies?	1 Very low	2 Low	3 Medium	4 High	5 Very high
	□	□	□	□	□
Q2. What is your **level of interest** in the planning and decision-making related to nuclear energy policies?	1 Very low	2 Low	3 Medium	4 High	5 Very high
	□	□	□	□	□

Participatory governance (*)

Q3. In your view, and for each of the following domains, how participatory is nuclear energy governance today in your country?

Participatory decision-making relies on a plural system of governance with high levels of information, accountability, and transparency. It seeks to "ensure that in the decision due account is taken of the outcome of the public participation" (as per e.g. the Aarhus Convention).

	1= Not at all participatory	2	3	4	5	6	7= Fully participatory	9= I don't know	Q3b. If you wish, please, comment on your response for each of the domains:
Q3_1. Decisions on the inclusion (or not) of nuclear energy in the national energy mix	□	□	□	□	□	□	□	□	
Q3_2. Decisions related to the development of new nuclear technologies	□	□	□	□	□	□	□	□	
Q3_3. Closure of nuclear power plants	□	□	□	□	□	□	□	□	
Q3_4. Extension of operational lifetime of nuclear power plants	□	□	□	□	□	□	□	□	
Q3_5. Decommissioning of nuclear reactors	□	□	□	□	□	□	□	□	
Q3_6. Preparedness for nuclear and radiological emergencies and post-accident recovery	□	□	□	□	□	□	□	□	
Q3_7. Radioactive waste management	□	□	□	□	□	□	□	□	

Q4. Could you please share any examples of successful experiences involving stakeholder participation in nuclear energy governance in your country? What key elements do you believe contributed to the success of such initiatives?

Q5. Have **sustainability assessments** of nuclear energy or broader energy systems have been conducted in your country?

1= Yes

2= No

9= I don't know

Only if Q5=Yes

Q5a1. To what extent have different civil society stakeholders, including wider publics, been involved in sustainability assessments and their translation to policies? (*)

1=Not at all	2	3	4= To a moderate extent	5	6	7= To a full extent	9 = I don't know
□	□	□	□	□	□	□	□

Only if Q5=Yes

Q5a2. Please provide a short explanation for your response:

Only if Q5=Yes

Q5b1. To what extent have social sciences and humanities disciplines been involved in sustainability assessments and their translation to policies? (*)

1=Not at all	2	3	4= To a moderate extent	5	6	7= To a full extent	9 = I don't know
☐	☐	☐	☐	☐	☐	☐	☐

Only if Q5=Yes

Q5b2. Please provide a short explanation for your response:

Q6. Please, indicate your view on the importance of the following elements related to stakeholder engagement in nuclear energy policy:

	1=Not important at all	2	3	4= Moderately important	5	6	7= Extremely important	9= I don't know
Q6_1. Early involvement of civil society stakeholders, including wider publics, in the decision-making process								
Q6_2. Public engagement through interactive forms of participation such as deliberative processes, open dialogue, or cooperation with civil society stakeholders								
Q6_3. Engagement with different groups of civil society stakeholders such as local population, NGOs or media								
Q6_4. Provision of appropriate means to support participation and engagement, e.g. financial support								
Q6_5. Activities to enhance public trust in nuclear energy governance, for instance through reliable and independent assessment of nuclear safety and radiation protection								
Q6_6. Transparency about the objectives, decisions taken and expected outcomes.								
Q6_7. Continuously monitoring of public concerns and perceptions.								

Q6_8. Establishing the legislative and administrative frameworks to provide the instruments and resources needed for public participation								

Q7. In your view, to what extent have the following recommendations been implemented in practice in your country, in the context of nuclear energy policies? (*)

	1=Not at all	2	3	4= To a moderate extent	5	6	7= To a full extent	9= I don't know	**Only if Q7=4, 5,6 or 7** Q7b. Please, provide some detail of these experiences
Q7_1. Early involvement of civil society stakeholders, including wider publics, in the decision-making process									
Q7_2. Public engagement through interactive forms of participation such as deliberative processes, open dialogue, or cooperation with civil society stakeholders									
Q7_3. Engagement with different groups of civil society stakeholders such as local population, NGOs or media									
Q7_4. Provision of appropriate means to support participation and engagement, e.g. financial support									
Q7_5. Activities to enhance public trust in nuclear energy governance, for instance through reliable and independent assessment of nuclear safety and radiation protection									
Q7_6. Transparency about the objectives, decisions taken and expected outcomes									
Q7_7. Continuously monitoring of public concerns and perceptions.									
Q7_8. Establishing the legislative and administrative frameworks to provide the instruments and resources needed for public participation									

Challenges and drivers for the uptake of recommendations

Q8. Please, indicate some **challenges or barriers** you think your country is facing in relation to stakeholder engagement in nuclear energy governance (e.g. lack of information, lack of participation opportunities, comments and proposals not addressed…):

Challenge or barrier	Why is this important? Please justify:
Q8_1: _____	
Q8_2: _____	
Q8_3: _____	

Q9. What **suggestions or actions** could you provide in view of overcoming these challenges/barriers in your country?

Participant information

Q10. Gender	1. Male 2. Female 3. Other 4. Prefer not to say
Q11. Age	[open]
Q12. Highest education level	1. Primary education or lower 2. Lower secondary education 3. Upper secondary education 4. Post-secondary non-tertiary education 5. Short-cycle tertiary education 6. Bachelor's or equivalent 7. Master's or equivalent 8. Doctorate or equivalent
Q13. Country	1. Spain 2. Belgium 3. UK

	4. Slovenia 5. Slovakia 6. Romania 7. Czech Republic 8. France 9. Other. Please, specify:
Q14. For how many years have you been working or been involved in the field of nuclear or energy in general?	[open]

Q15. Would you like to receive a summary of then results from this survey? If so, please, indicate your email address: _____

Annex 3. Informed consent to participate in an online survey

Please, read the below statements and indicate your consent to participate in this study:

- I understand what the study is about and what the results will be used for.
- I know that my participation is voluntary and that I can withdraw from the survey at any stage without giving any reason.
- I am aware that my information and answers will be anonymized and any personal information will be kept confidential.
- I am aware that the anonymized data collected through this survey may be reused at a later time for research purposes.

☐ I have read all statements and consent to participate in this study