Practical recommendations for enhanced mechanisms of interaction between citizens, civil society, decision-makers, and researchers

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with input from nuclear energy stakeholders

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Summary

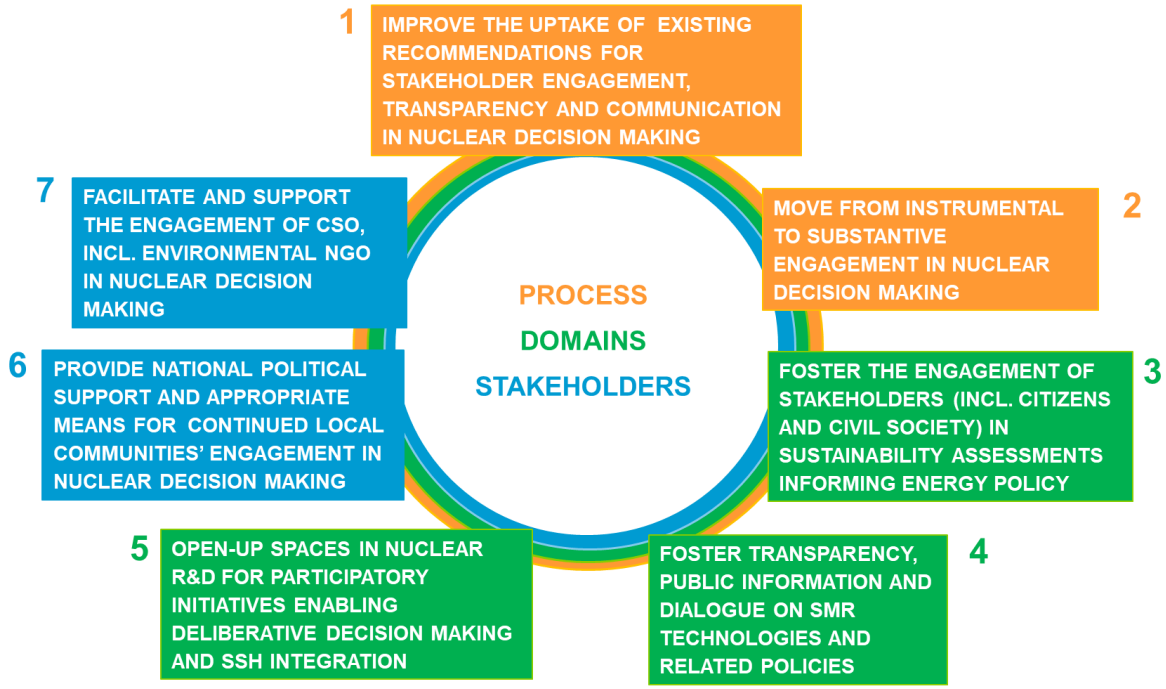
The European project ECOSENS ("Economic and Social Considerations for the Future of Nuclear Energy in Society") is a Coordination & Support Action that aimed at providing a societal perspective on the development and use of existing and new nuclear technologies, in the context of major societal challenges: climate crisis, sustainable development and energy security.

The project carried out actions towards creating an inclusive space for dialogue and collaboration where researchers in social and natural sciences fields meet, exchange views and collaborate with civil society and other relevant stakeholders, in order to open up techno-scientific issues to the social, political, cultural and ethical context, and to guide policies in the nuclear field. ECOSENS explored in particular the societal dimensions of nuclear energy within broader energy transitions, with stakeholder engagement in nuclear energy governance as one focus point.

A key outcome was to formulate recommendations for enhanced interaction between citizens, civil society, decision-makers, and researchers in nuclear decision making and energy policy. Based on findings from desk research, public opinion research (quantitative and qualitative), case studies on stakeholder engagement, interdisciplinary dialogues, international workshops and panels, ECOSENS has drafted a set of recommendations for improved stakeholder engagement in nuclear decision making and energy policy.

These are summarised below.

ECOSENS recommendations for improved stakeholder engagement in nuclear decision making and energy policy



Introduction

The *engagement* of citizens and *civil society stakeholders*[1] in nuclear decision making and wider energy policies is now recognised as a prerequisite for meeting climate goals and energy sustainability transitions. Participation is a legal right (protected, e.g. by the *Aarhus Convention* and the EU Environmental Impact Assessment Directive), ensuring legitimate, just and democratic decisions, and a key element of nuclear technology governance and societal transitions towards sustainability [2].

According to the Aarhus convention, participation of affected or interested parties is required not only for specific projects, but also for wider energy policies and strategies. The Espoo convention and the Environmental Impact Assessment Directive establish the duty to carry out an environmental impact assessment for certain activities (including those related to nuclear energy), with specific provisions for transboundary impacts. Public participation is recognised as a key component of these assessments. Under the EU's Environmental Impact Assessment (EIA) Directive (2011/92/EU as amended by 2014/52/EU), projects involving nuclear installations must, among other obligations, ensure effective public participation and access to justice in the assessment of their impact on the environment.

ECOSENS data and results

The European project ECOSENS ("Economic and Social Considerations for the Future of Nuclear Energy in Society") is a Coordination & Support Action that aimed at 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. Among others, it explored the societal dimensions of nuclear energy within broader energy transitions, with stakeholder engagement in nuclear energy governance as a focus point. An overarching aim was to formulate recommendations for improved stakeholder engagement. To this end, ECOSENS conducted:

- A review of existing guidelines and recommendations on stakeholder engagement in nuclear decision making (Zeleznik et al. (2024) as formulated by international organisations (e.g. IAEA or OECD-NEA) and prior European projects.
- A multi-method analysis (including surveys, interviews, panels and deliberative workshops) of stakeholder engagement in the governance of existing and emerging nuclear technologies, including Small Modular Nuclear Reactors (SMR), in various European Member States and the United Kingdom (Durdovic, et al., 2024, 2025; Zeleznik et al, 2025; Sala et al., 2025; Meskens et al., 2025).

The ECOSENS review of existing recommendations for stakeholder engagement in nuclear energy domains (e.g. new build, radioactive waste management, emergency preparedness, decommissioning) revealed some variations among domains. These regard, for instance, the *motivation* and *level of involvement* recommended for various stakeholder groups, notably broader publics. However, international organisations and European projects generally highlighted a consistent set of crosscutting needs for stakeholder engagement in the *governance* of nuclear technologies (synthesized in Figure 1). Several of these aspects reflect widely recognised *principles of good governance*.

The investigations conducted by ECOSENS further showed that actual practice continues to fall short of the ideas enshrined in legal frameworks, e.g. the Aarhus Convention (principles of public participation in nuclear decisions and energy policy advice), and in some national planning regulations (specific provisions to ensure *transparency* and *inclusion*). Compliance may often follow the letter of the law, but not necessarily the spirit of the law.

While the principles synthesised in Figure 1 are known and recognised, there is divergence in their interpretation and the manner and extent of their practical application. ECOSENS also found diverse understandings of what stakeholder *engagement* involves and why and when it should be enacted. The ECOSENS work also concluded that there has to be more attention to the evaluation of participatory processes, taking stock of existing guidelines[3].

This set of findings form the basis of the present ECOSENS recommendations (outlined in Figure 2).

[1] *Italics* indicate that the word or concept is defined or described in the Glossary at the end of this document.

[2] https://www.eea.europa.eu/publications/the-case-for-public-participation

[3] OECD (2021), Evaluation Guidelines for Representative Deliberative Processes, OECD Publishing, Paris, https://doi.org/10.1787/10ccbfcb-en.

Role of Social Sciences and Humanities (SSH)

Social sciences and humanities researchers and practitioners play a crucial role in enhancing stakeholder engagement as they can:

i) develop effective ways of conducting participatory work, researching and highlighting concrete theories, methods, skills and approaches that help design, structure and conduct engagement processes;

ii) evaluate stakeholder engagement processes and understand their occasional failure;

iii) actively support the engagement process itself by: a) conducting critical analysis of existing policy, b) collecting diverse types of data and using them as input for stakeholder engagement and deliberation, c) acting as facilitators, and d) providing structured feedback on the process and its outcomes.

Structure of the document

This document includes the foregoing Introduction describing ECOSENS findings on the need for, and added value of, stakeholder engagement as an integral part of nuclear decision making, as well as the current legal grounding.

Figure 1 synthesises Stakeholder Engagement Needs based on existing recommendations in the nuclear field. Figure 2 summarises the ECOSENS Recommendations in three categories: processes, domains, and stakeholders. These colourful stand-alone graphics can be used for group discussion. Table 1 highlights who should implement the recommendations.

The document then presents the recommendations one by one, with a description of context, a justification of why the recommendation is needed, how it can be implemented, and an indication of who should implement the recommendations. Icons highlight the stakeholders who will be particularly interested in each recommendation. Coloured boxes provide examples for inspiration, illustrating how recommendations have been implemented in selected contexts and demonstrating the do-ability of the recommendation.

Practical aspects related to the implementation of these recommendations, as discussed by an international panel at the final ECOSENS conference, are summarised in the subsequent section.

Recognising that understanding, experience or interpretation may diverge according to context, position or culture, terms such as "*stakeholder engagement*" or "*best practice*" are defined in a Glossary added as annex.

The first mention of such key terms is highlighted by *italics*.

A final annex describes the process for deriving the ECOSENS Recommendations.

Fig. 1 ECOSENS synthesis of stakeholder engagement needs based on recommendations of international organisations and projects in the nuclear field published up to 2024

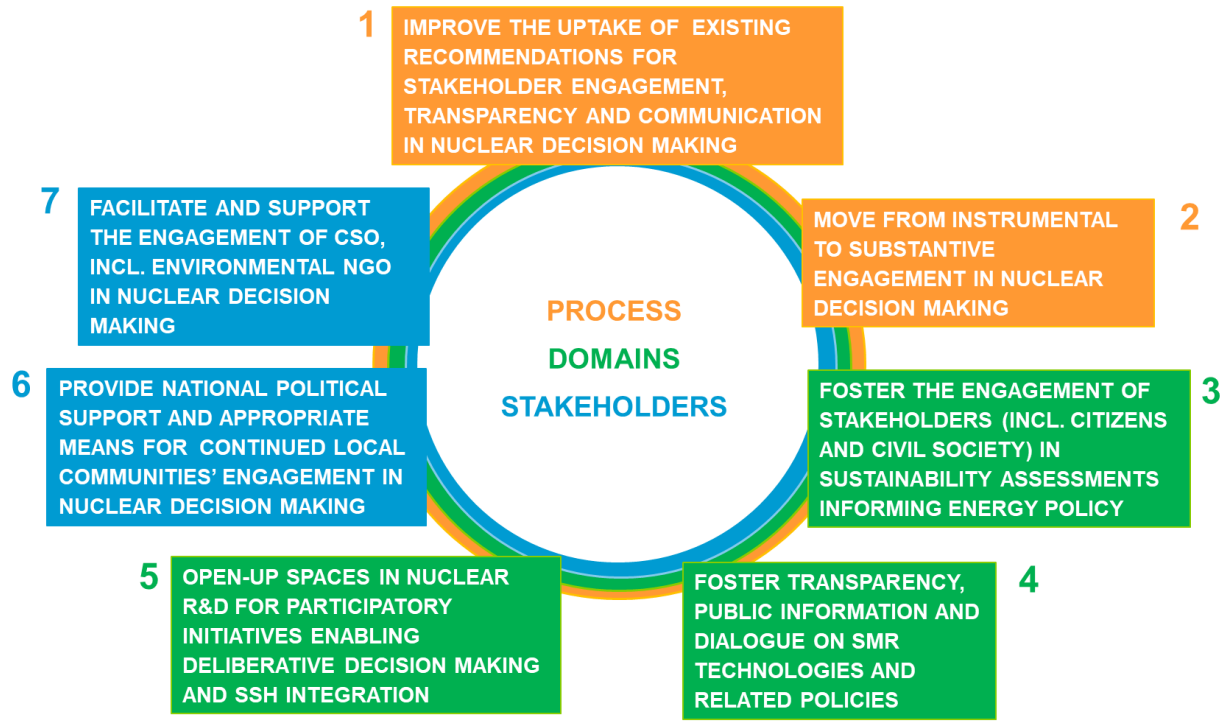


Fig. 2 ECOSENS recommendations for improved stakeholder engagement in nuclear decision making and energy policy

ECOSENS RECOMMENDATIONS

The seven ECOSENS recommendations for improved stakeholder engagement in nuclear decision making and energy policy are presented in the following.

Who are the recommendations for?

Recommendations concern the *types of stakeholders* covering the quintuple stakeholder helix[4] :

Political stakeholders, e.g.	National governments and prime ministerial offices, especially those coordinating long-term energy strategy and net-zero goals, Relevant ministries, Regional and local authorities, Regulatory bodies, Political decision makers, Intergovernmental organisations concerned with energy & climate policy, Science policymakers.
Economic stakeholders, e.g.	Nuclear industry, Actors involved in nuclear innovation.
Academic stakeholders, e.g.	Researchers from universities and research centres, Organisations working in nuclear innovation and R&D, Institutions conducting sustainability assessments and supportive research, Institutions deciding on R&D funding and trajectories.
Societal stakeholders, e.g.	Civil Society Organisations, Local communities.
Environment stakeholders, e.g.	Environmental NGOs

For each recommendation, the stakeholders with lead responsibility in implementing the recommendation are indicated.

[4] Carayannis, E. G. & Campbell, D.F.J. (2010). Triple Helix, Quadruple Helix and Quintuple Helix and How Do Knowledge, Innovation and the Environment Relate To Each Other? A Proposed Framework for a Trans-disciplinary Analysis of Sustainable Development and Social Ecology. Int. J.of Social Ecology and Sustainable Development 1 (1): 61–62.

1 IMPROVE THE UPTAKE OF EXISTING RECOMMENDATIONS FOR STAKEHOLDER ENGAGEMENT, TRANSPARENCY AND COMMUNICATION IN NUCLEAR DECISION MAKING

Many recommendations exist concerning effective, inclusive and fair stakeholder engagement, notably as a result of previous EU supported projects. However, nuclear decisions reveal a persistent gap between stated commitment to public and civil society engagement and practice.

There is little or no institutional space for public and civil society involvement. In some contexts, participation remains discretionary, not institutionalised, with limited scope for deliberation, inclusion of plural views and critical perspectives, and impact on actual decisions.

Public and expert input is frequently managed through tightly framed, technocratic processes that privilege industry and governmental narratives. There are still cases where local communities affected by nuclear developments have little leverage over final decisions, whether they refer to building new nuclear installations or closing down existing installations. Participation of critical stakeholders such as environmental NGOs, opponents, or independent experts is often hampered by legal constraints, restricted access to information, and/or lack of funding. Even nuclear regulators and waste agencies are sometimes sidelined in the formulation of key policies and treated more as passive implementers than active stakeholders.

This raises concerns about democratic deficit, legitimacy and the societal robustness of long-term nuclear policies. While positive examples of stakeholder engagement initiatives exist, there is insufficient application and little spillover of lessons learned in the past decades.

WHY?

- Current stakeholder engagement often lacks meaningful interaction and early involvement, potentially resulting in public distrust instead of informed decision making.
- Generating debate and exchange of ideas among different parties would increase awareness and understanding of the situation in the sector.
- Transparency deficits on the part of the governments and organisations with decision-making capacity, and poor communication, may lead to perceptions of secrecy and exclusion.
- Structural barriers (e.g. fragmented responsibilities, lack of resources, decision-making biases) undermine consistent implementation of best practices in stakeholder and public engagement.
- Lack of long-term participatory planning may lead to energy plans that are technologically ambitious but socially and economically fragile.
- Local consent mechanisms remain ambiguous. In some countries, the siting approach is nominally voluntary, but siting authorities or promoters consider this aspect to be optional, and /or means for communities to exercise their rights to withdraw are not available.
- Stakeholder engagement is often implemented after technocratic projects have failed, rather than seeking early and impactful participation throughout the decision process.
- The increasing politicisation of nuclear debates, limited transparency and impact of stakeholder input, and a prevailing top-down approach in energy governance can result in disengagement from participatory processes.

HOW?

Legal aspects

- Strengthen the legal and administrative frameworks to guarantee multi-annual financial and capacity building resources (particularly for NGOs, community watchdogs and local communities), as well as the rights and responsibilities for stakeholder engagement, ensuring that engagement is not optional, but embedded in nuclear governance.
- Assure compliance with legal requirements and strengthen the involvement of host municipalities in decision-making processes on timelines, host community agreements, and site monitoring,

including financial and technical support for local participation.

Institutional aspects

- Institutionalise early, continuous, and impactful public and stakeholder engagement across the entire nuclear fuel cycle, moving beyond consultation to dialogue and co-development of decisions.
- Enhance coordination and capacity-building within institutions to avoid fragmented responsibilities and ensure consistent engagement practices.
- Establish multi-stakeholder advisory bodies involving local communities, NGOs, independent experts and other stakeholders at every stage of project planning.
- Include in national energy frameworks timelines, budgets, and criteria for ongoing engagement, with regular audits and feedback loops.

Oversight

- Ensure oversight and evaluation of participatory processes, attending to i) design integrity, ensuring the process is perceived as fair and aligned with principles of good practice; ii) sound deliberation, ensuring conditions supporting meaningful, informed dialogue and decision making; iii) influence of recommendations and actions, demonstrated by clear evidence of impact on actual decisions; iv) impact, in terms of secondary and long-term effects on public learning, attitudes, and overall trust in the process.
- Establish an independent oversight body to monitor the quality of stakeholder inclusion in energy decisions and publish annual engagement audits. A European-level observatory could ensure cross-country learning and accountability.
- Ensure institutional responsiveness to public concerns, especially at the local level.
- Establish regional or national infrastructures (such as observatories) supporting stakeholder engagement in large nuclear projects, e.g. by tracking and monitoring public concerns.

Sustainability of stakeholder engagement

- Develop a long-term vision for stakeholder and public engagement integrated into national energy and climate strategies, beyond individual projects, with clearly defined methods and roles in shaping policy priorities and scenario evaluations.

Communication and transparency

- Ensure transparency by providing clear, timely, accessible, and balanced information on nuclear projects, and their objectives, processes, risks, and benefits before decisions are taken, requiring that all comments receive documented response.
- Make balanced framing mandatory in publicly funded outreach.
- Collaborate with existing organisations that promote transparency and public involvement.
- Being transparent about the objectives of a participatory initiative, and the impacts it generated (or not) are essential aspects to gain/retain trust, also towards future participatory initiatives.

Diversity and inclusion

- Broaden public and stakeholder inclusion by proactively involving civil society, NGOs, local communities, media, and critical voices, ensuring a plurality of perspectives.
- Strive for pluralistic, deliberative processes, ensuring equal opportunity and capacity to participate for all stakeholders.

- Introduce mechanisms for community veto or consent withdrawal in siting processes, e.g. for Geological Disposal Facilities (GDF).
- Recognize that power imbalances exist and actively map these. Among others, consider the various resources needed for participation (e.g. time, money) and clarify how these are distributed among different stakeholder groups. If a clear imbalance is identified, address this by redistributing some resources or organizing the initiative in such a manner that the imbalance gets levelled out.
- Recognise the value of various forms of expertise and knowledge.
- Recognise the value of co-research in identifying, jointly assessing, and reducing (where possible) uncertainties.
- Create a 'common language' in which actors move beyond their own pre-conceptions and categorisations.

Impact

- Create public forums or mechanisms through which citizens or NGOs or other stakeholders can influence the timeline, safety, or social implications of new nuclear projects or decommissioning.

Disseminate, adapt and improve good practice

- Learn from current good practices on structured participation formats (e.g. for radioactive waste disposal) that enable dialogue between institutions and local communities, promote community involvement and provide continuity. Such models could be adapted for nuclear new builds, SMR deployment, and decommissioning/ repurposing plans across all countries.
- Critically analyse and seek to continuously improve the current good practice, which is sometimes technically implemented, i.e in format not in spirit. Learn from real-life cases what worked and what didn't work properly.
- Develop social sciences and humanities (SSH) expertise dedicated to enabling improved stakeholder engagement.

Get inspired!

Applying lessons learned from past projects to foster transparency and public engagement in the ALFRED project (Advanced Lead-cooled Fast Reactor European Demonstrator) in Romania

As part of the research and innovation activities dedicated to the diversification of nuclear energy technologies, Romania has committed to contributing to the development of Lead Fast Reactor technology, to host and build the ALFRED demonstration reactor by 2040. Based on knowledge and experience gained in European projects on local governance in radioactive waste management such as COWAM2, CIP and IPPA, the research institute RATEN ICN launched a public engagement process from the very beginning. It initiated in 2015 the creation of the ALFRED Local Dialogue Group as an interface between the local community and the implementer (FALCON consortium). The role of this group is to inform citizens about the status and evolution of the ALFRED project. During the group meetings, the sustainability of the development from the community's point of view was discussed, as well as the benefits, potential risks perceived by citizens and expectations regarding the investment. The composition of the ALFRED Local Dialogue Group includes: from the city of Mioveni: the mayor, two local councillors and three citizens' representatives, and from RATEN ICN: the scientific director and two specialists involved in the project. This initiative was welcomed by the community, who appreciated the ALFRED project as a potential for further development of the local economy and for raising the standard of living due to direct and indirect contributions. Contact with the Local Dialogue Group is maintained by informing its members on the progress made in the implementation of the ALFRED project and facilitating their participation in relevant events dedicated to the ALFRED project (such as Conferences, workshops, etc.) or technical visits to the Institute laboratories and experimental installations.

The dialogue committee of the ALFRED project provided a structured platform for continuous exchange between stakeholders and project developers. This process helped build trust and demonstrated how recommendations can move from paper into practice. This example shows that stakeholder engagement must go beyond formal compliance to ensure transparency. Processes should clearly demonstrate how stakeholder input has influenced decisions, including explanations for why certain suggestions were not adopted. Equally important is the preparation of stakeholders themselves: accessible tools and resources, such as a practical handbook for engagement, are needed to enable meaningful participation in technically complex issues like nuclear governance. The way recommendations are framed also matters; they should be expressed in a diplomatic way that seeks to fill gaps and build bridges between industry, authorities, and the public, rather than criticising any party. Finally, engagement strategies must remain sensitive to national contexts, since mechanisms such as community veto rights may exist in some countries but not in others, requiring approaches that are adaptable to different legal and cultural frameworks.

Source: ECOSENS Milestone 6 report, Romanian case study. https://ecosens-project.eu/wp-content/uploads/2025/08/In-depth-case-studies-MS6_all_for-review_final.pdf

Oversight infrastructures for participatory governance in Germany's radioactive waste siting process

Currently, Germany is in the process of searching a repository site for its high-level radioactive waste. This process is subdivided in three phases, of which the first is ongoing. In this first phase, potential areas and regions to site a geological repository are being identified. This selection process strongly builds on geological information, conducting initial safety assessments based on existing geological data of particular areas. At the same time, a broad participatory structure is being set up, to allow various stakeholder groups to follow-up on the ongoing efforts of the waste management company and participate in a dialogue on the siting process.

The various opportunities offered for stakeholder involvement have been laid out in the Site Selection Act, which foresees the organization of sub-areas conferences, regional conferences and a council of the regions conference. Also broader procedures for public commenting and discussion are foreseen.

A specific body has been created to keep an oversight over the various siting phases and its participatory processes and initiatives. This is the 'National Citizens' Oversight Committee' (Nationales Begleitgremium). It acts as an independent body, with members from various societal fields and demographic groups, largely consisting of 'recognised public figures' (scientists, politicians, religious leaders, ...) and citizens. Members are appointed by the Federal Parliament and the Federal Council in Germany or -in case of citizens- by the Federal Minister for the Environment. The main task of the committee is described as 'providing mediatory and independent assistance in the search procedure for a deep geological repository for high-level nuclear waste', with a particular focus on monitoring public participation. For this purpose, the Committee can question institutions with a role in radioactive waste governance, such as the federal office for the safety of nuclear waste (BASE), the waste management company BGE, or the State Geological Services. The committee has full access to relevant files at these institutions and can issue recommendations to the German parliament on the site selection process. The meetings of the oversight committee are publicly broadcasted and available.

Source: The National Citizens' Oversight Committee (Nationales Begleitgremium) Office. English version website. https://www.nationales-begleitgremium.de/EN/TheCommittee/thecommittee_node.html Accessed 02/09/2025

The Federal Office for the Safety of Nuclear Waste Management (BASE). The info platform for finding a repository (English version website). https://www.endlagersuche-infoplattform.de/webs/Endlagersuche/EN/participation/citizen-participation/node.html Accesses 02/09/2025

2 MOVE FROM INSTRUMENTAL TO SUBSTANTIVE ENGAGEMENT IN NUCLEAR DECISION MAKING

The importance and value of public and civil society stakeholder participation can be misunderstood. Public engagement initiatives are too often focused on creating public and stakeholder acceptance of projects or decisions, rather than meaningful participation towards fully-informed, robust decision making. An instrumental view of participation hampers effective stakeholder engagement in nuclear decisions and examples of participation as a means to persuade stakeholders or as a box ticking exercise, are easily found.

In practice, this has also meant that participation processes have been mostly reactive, initiated when nuclear projects are moving into the final or implementation phase. At this point they are more likely to encounter social opposition, being asked to engage when it is too late to do so meaningfully. Some areas of nuclear R&D have become more easily opened up to participatory approaches, with the siting of radioactive waste repositories as a notable example, but it is not clear that the substantive motivation of participation is recognised more broadly.

Perceived 'technical complexity' is often used to limit engagement and to ensure engagement activity only with 'marginal' issues, Stakeholders are often invited into processes where key decisions (e.g. technology choice, project location) are already made, continuing a Decide-Announce-Defend approach, despite claims to its demise. The technical 'contents' of projects are rarely subject to participatory or democratic forms of engagement, which reinforces technocratic approaches, further reducing opportunities for open dialogue.

Some governments rely increasingly on strategic messaging and public relations marketing to shape nuclear narratives, which undermines informed debate and shifts discourse away from contested risks and alternatives. However, stakeholders have the right to participate in decisions that affect them. Moreover, broad engagement contributes to improving the quality of decisions, by bringing in local knowledge, lived experiences and societal values.

WHY?

- Stakeholder engagement increases the quality and sustainability of decisions and contributes to creating social trust;
- Sustainable transitions inherently require *transdisciplinary* approaches, integrating diverse disciplines and sources of knowledge, as well as stakeholders' values and aspirations.

HOW?

- Place emphasis on the substantive value of stakeholder engagement in international and national guidelines and dissemination of good practices, i.e. how bringing together different knowledges, experiences, and/or frameworks leads to better decisions.
- Ensure active participation from all relevant constituencies, including diverse stakeholders, demographics and sources of knowledge.
- Replace industry-led publicity campaigns with independent science communication and media programming. This may include public broadcasting on nuclear policy debates and funding to civil society media platforms, to ensure balanced public reporting.
- Enable substantive engagement with non-technical audiences by communicating decision timelines, underpinning rationales, potential trade-offs to be made, and long-term implications for each outcome. Make complex technical information relevant for non-expert audiences.
- Disseminate lessons learned and experiences from real life case studies, thereby documenting how decisions were enabled through stakeholder engagement.

- Stimulate inter- and transdisciplinary thinking and competencies among nuclear energy stakeholders by creating interdisciplinary education programs to ensure future experts can understand and address both technical and societal aspects of nuclear projects.

Get inspired!

Long term substantive engagement of local stakeholders in siting decisions on deep geological disposal in Sweden

Sweden's approach to siting its deep geological repository for spent nuclear fuel is a widely recognised example of good practice in public participation. Rather than a focus solely on gaining 'public acceptance', the Swedish Nuclear Fuel and Waste Management Company (SKB) adopted a voluntary, transparent and deliberative process that empowered local communities to participate meaningfully in siting processes and to withdraw at any stage. For over a decade, SKB has maintained open, two-way communication, engaged independent experts and established local stakeholder forums, ensuring that public concerns have impacted project decisions. Crucially, municipal consent, which is protected by law, ensured that participation would shape final outcomes. This approach resulted in two municipalities competing to host the repository, ultimately fostering broad, sustained social legitimacy for the decision (OECD NEA, 2004; Elam & Sundqvist, 2006).

Sources:
OECD Nuclear Energy Agency [OECD NEA]. (2004). Learning and Adapting to Societal Requirements for Radioactive Waste Management.
https://www.oecd-nea.org/jcms/pl_13878/learning-and-adapting-to-societal-requirements-for-radioactive-waste-management?details=true
Elam, M., & Sundqvist, G. (2006). Stakeholder involvement in Swedish nuclear waste management, Technical Report available at: https://www.osti.gov/etdeweb/servlets/purl/20886600

3 FOSTER ENGAGEMENT OF STAKEHOLDERS (INCL. CITIZENS AND CIVIL SOCIETY) IN SUSTAINABILITY ASSESSMENTS INFORMING ENERGY POLICY

Energy policy relies substantially on policy advice considering baseline, possible, rejected and desired states or evolutions (scenarios) of our energy future, taking stock of the current situation and a specific time horizon (e.g. 2050 or 2100). A future energy scenario involves a specific mix of energy technologies and the proportion of final energy they are assigned to provide. The fitness-for-purpose (regarding set goals, such as the European Green Deal, or selected UN SDGs) and the sustainability of the given mix is assessed with respect to technical, environmental, economic, and socio-political aspects. Such assessments need to consider not only available data (such as scientific knowledge of environmental impacts), but also projections of the influence of observed trends (such as GDP, demography, energy demand, level of electrification of technologies, etc.) and the potential influence of pertinent policy decisions (such as treaties or fiscal measures). They rely on dozens or hundreds of reference reports or models.

Scenarios are thus complex in construction, and the quality for decision making of the simulation and interpretation will be impacted as well by uncertainties (known or unknown unknowns), by the quality of numerous reference documents (such as inventories or taxonomies) and by value-based evaluations and choices shaped by specific interests and opinions. Clarifying value- and interest-laden choices calls for stakeholder engagement. To attain credible, trustworthy

and acceptable outcomes, assessments for energy policy advice should rely not only on needed technical expertise, but also on participatory deliberative reflections. There thus arises the challenge of how best to gather and integrate views from all relevant stakeholders, including civil society and the public. As for all governance, transparency and accountability are key dimensions of participatory exercises.

Sustainability assessments are methodologically complex, demanding many steps (goal and scope setting, data acquisition, modelling, interpretation). There are opportunities within the procedure to incorporate public input, directly or through representation. For instance, the development of the EU Reference Scenario 2020[5] included deliberation on techno-economic assumptions by some 100 stakeholders from industry and "relevant NGOs".

The major energy policy making processes underway in Europe advocate for transparency and democratic deliberation, but assessment remains dominated by expert-driven models and institutional constraints, exposing a gap between inclusive ambition and actual practice. The result is a partially participatory process that still struggles to reconcile technocratic approaches with societal legitimacy. A significant example is that of the EU Taxonomy Regulation (listing economic activities considered sustainable and thus eligible for green investment) and complementary legislation which added previously not-included nuclear power and natural gas. Although the taxonomy development included civil society representation, five major groups resigned from the Platform on Sustainable Finance process when their reasoned recommendations were shelved, and the outcome is challenged in law by not only eNGOs but also by Austria as EU Member state.

WHY?

The development of transparent and inclusive sustainability assessment methodologies for energy systems is both a political and a societal imperative. This stems from several, connected aspects:

- Participation is an intrinsic aspect of sustainability. As emphasized by the European Environment Agency[6] and the European Green Deal, "citizens are and should remain a driving force of the transition to sustainability," a challenge that "calls for the full creative potential and involvement of all sectors of society, including citizens".
- Formal quantitative approaches such as life-cycle sustainability assessments of energy systems or energy technology options draw on selected criteria and indicators of which some may be open to multiple interpretations. Such qualitative criteria and indicators (such as "tolerable risk" or "visual pollution") should be translated into unambiguous metrics, which may be best achieved by integrating perspectives from diverse actors, notably civil society organisations, local communities, marginalised groups, and interdisciplinary expertise.
- As related decisions make inherent value judgments, in a democratic setting they should be open to wider stakeholder input.
- Technocratic approaches to assessment may be perceived as tools for legitimising technological pathways and reinforcing power structures.
- Public trust in energy governance depends on clear evidence that assessments inform, rather than simply entrench decisions.
- Stakeholder involvement facilitates the assessment of social, cultural and political preferences and impacts, acknowledges uncertainties, and reveals contested values and multiple possible futures. The additional realism can loosen deterministic pathways, making assessments and resulting policy advice more adaptive and robust.

HOW?

- Seek fair (inclusive and just) and competent (well-informed and resourced) stakeholder engagement approaches to support legitimacy, accountability, and quality of assessment outcomes.
- Foster co-design of methodologies, involving stakeholders in designing the assessment framework itself, from the meaning given to "sustainability" in context, to the selection of high-level objectives, through to defining relevant

[5] European Commission: Directorate-General for Mobility and Transport, Directorate-General for Climate Action, Directorate-General for Energy, De Vita, A., Capros, P. et al., *EU reference scenario 2020 – Energy, transport and GHG emissions – Trends to 2050*, Publications Office, 2021, https://data.europa.eu/doi/10.2833/35750

[6] https://www.eea.europa.eu/publications/the-case-for-public-participation

quantitative and qualitative criteria and indicators and their weighting.

- Publish all data included in sustainability assessments as open data to enable citizens and interest groups to verify them, and make and interpret their own model runs with selected weights.
- Ensure a plurality of informed perspectives in expert panels and evaluation bodies by integrating voices beyond traditional technocratic circles: local knowledge holders, youth, NGOs, ethicists and other social scientists. Treat differing perspectives as reality tests that can be further investigated if needed.
- Bring policy actors and decision makers into the deliberation early so that interpretation is policy-relevant.
- Ensure scenario-based deliberation spaces that acknowledge uncertainty, allow for critical debate, and make room for alternative visions beyond those defended by powerful nuclear or fossil fuel interests and lobbies. For transparency and accountability, make deliberations public, multilingual, and accessible.
- Include value-driven perspectives in sustainability assessment. A holistic approach can explicitly and inclusively gather views on how normative values like those at the basis of the consensual SDGs (*equity*, justice, solidarity, well-being and the intrinsic value of nature) should be operationalised and weighted. Include ethical considerations (e.g. life cycle concerns such as the intergenerational dimension, long-lived waste responsibility).
- Organise collaborative workshops for scenario modelling and sustainability scoring, enabling stakeholders to test and understand the implications of various assumptions.
- Deploy narrow-extensive or "double wing" approaches. A limited but inclusive panel of stakeholders with appropriate knowledge or expertise is resourced to participate in a deep deliberative process. Their input and the outputs of the process can be tested and legitimated, e.g. by a larger representative circle, or representative survey polling.
- Clarify trade-offs in sustainability assessment models and reference documents through public debate, and survey citizens on preferences for the identified options.
- Allocate resources within the professional context to enable researchers and officials to devote time to invited participation in formal sustainability assessment projects and processes. Provide dedicated resources to civil society organisations, NGOs and local communities ensuring their sustained, long-term and informed participation in energy decisions and their implementation.
- Envision oversight by a democratic multi-stakeholder body to manage participation processes and data transparency.
- Establish formal accountability mechanisms, showing how sustainability assessment outcomes have shaped policy proposals and provided responses to dissenting views, and offering the possibility of revisiting points that remain contentious.
- Implement participative evaluation of process and policy[7] to increase effectiveness and promote accountability and trust.

[7] Improving Governance with Policy Evaluation: Lessons From Country Experiences (2020) https://doi.org/10.1787/89b1577d-en

Get inspired!

Participatory scenario development in energy policy in Germany

The German state of North Rhine-Westphalia used a stakeholder-based process to explore decarbonisation pathways for energy-intensive industries. Between 2012 and 2013, six workshops brought together representatives from industry, trade unions, environmental NGOs, academia, and local governments to collaboratively define assumptions, assess technological options, and shape long-term low-carbon scenarios. The process allowed stakeholders to influence modelling parameters and identify policy measures needed to support feasible transition pathways, strengthening both the legitimacy and social robustness of the resulting scenarios (Lechtenböhmer et al., 2015).

Source: Lechtenböhmer, S., Schneider, C., Yetano Roche, M., & Höller, S. (2015). Re-industrialisation and low-carbon economy—Can they go together? Results from stakeholder-based scenarios for energy-intensive industries in the German state of North Rhine Westphalia. Energies, 8(10), 11404–11429. https://doi.org/10.3390/en81011404

Stakeholder engagement in developing scenarios and assessment tools in the European project EUCalc

Another example of stakeholder engagement in developing scenarios and assessment tools is provided by the European Commission-funded project "EU Calculator: trade-offs and pathways towards sustainable and low-carbon European Societies" (EUCalc). It involved key stakeholders in co-design of a transparent open-source model enabling quantitative analysis of decarbonisation strategies, and a Transition Pathways Explorer (TPE), an online tool providing instant results from EUCalc model runs. Two short workshops engaged 15 stakeholders from the public sector (mainly European Commission directorates), the civic and the private sector. They deliberated the modelling approach and scope, and key trends and developments that the model ought to address to assist stakeholders in their decision making. The set of participants may perhaps be criticised as skewed towards actual policy users, and the time devoted to (probably subgroup) discussion of each question appears somewhat short. Nonetheless, substantive input was achieved, and the report of user requirements fosters accountability by detailing how all comments were addressed in producing the model and tool.

Source: Mwabonje, O. et al. (2019) User demand documentation. D9.1 of the EUCalc project. Ref. Ares(2019)5243537 - 14/08/2019. https://www.european-calculator.eu/wp-content/uploads/2019/12/EUCalc_D9.1.pdf

Stakeholder engagement in the development of assessment tools for the life cycle sustainability assessment of energy sources the European project ECOSENS

The ECOSENS project conducted two international stakeholder workshops in March 2023. The first day used multiple methods to engage reflection on desired energy futures, meanings of sustainability, and ways to involve society.
https://ecosens-project.eu/wp-content/uploads/2023/08/ECOSENS_D1.4a_29_March_2023_Workshop_Report-1.pdf
The second day requested structured stakeholder input to select high-level goals, methodology, indicators and weights for a life cycle sustainability assessment of energy sources. Stakeholder observations on challenges, improving and legitimising participative assessment were recorded.
https://ecosens-project.eu/wp-content/uploads/2023/07/web_ECOSENS-D2.1b_30-March-2023-Workshop-Report.pdf

4 FOSTER TRANSPARENCY, PUBLIC INFORMATION AND DIALOGUE ON SMR TECHNOLOGIES AND RELATED POLICIES

Small Modular Reactors (SMRs) are emerging as future nuclear technology, yet public awareness and engagement in discussions on SMR benefits and risks and related decisions remain low. There is a lack of publicly available information about research and development on SMR technologies, the related uncertainties, the costs of SMRs, the development of siting processes, as well as the future waste management, decommissioning and repurposing of such installations. This lack of information is experienced not only by citizens, but also experts.

Additionally, the differences between SMRs and large traditional reactors, e.g., in terms of size, technical design, nuclear fuel and waste, safety, licensing, construction costs, or functions within the energy system, remain blurred to citizens. Communicating with the public on issues related to expanding nuclear energy may be challenging and some actors may seek to avoid it. However, addressing public concerns and expectations is part and parcel of nuclear energy new build and the SMR siting process.

Currently, a complex and often inconsistent approach to stakeholder engagement characterizes decision making on SMRs. The technical complexity of nuclear topics reinforces technocratic approaches, reducing opportunities for open dialogue about values and feelings. While citizens and other stakeholders ask for opportunities to weigh in on decisions, the overall process remains driven by top-down political dynamics and techno-optimistic narratives.

It is critical to strengthen public and stakeholder involvement and enhance transparency, in line with international standards such as the Aarhus Convention. Without clearly defined mechanisms for co-decision and continuous engagement, acknowledging uncertainties, public participation risks becoming symbolic rather than substantive, and used for persuasion, rather than informed decision making.

WHY?

- Knowledge on SMRs among various stakeholders and their potential use is insufficient, fragmented, and often factually incorrect. This is the case not only among citizens but also among stakeholders linked to nuclear energy, such as local communities close to the existing nuclear facilities, municipalities potentially interested in or affected by potential SMR construction projects, or environmental NGOs.
- The lack of information and debate leaves space for propaganda, speculations, conjectures, and rumours that affect public perceptions and image of the nuclear industry or result in over-expectations. There is a need for more open, inclusive, and balanced communication.
- Information on project benefits and risks is selectively shared; broader strategic choices, such as prioritisation of technologies or financing models, remain under-discussed in public forums.
- There is almost no experience with benefits stemming from an SMR project to the society and the potential host community. As part of clarifying these issues, due attention should be paid to how SMRs can contribute to tackling energy security and climate change challenges.
- Current stakeholder engagement on SMRs often lacks meaningful interaction and early involvement, resulting in public distrust.
- Transparency deficits and insufficient deliberation opportunities including citizens and civil society prevent effective dialogue, empathy and mutual understanding, leading in some countries to perceptions of secrecy, exclusion, conspiracy, corruption and manipulation.
- Structural barriers for public and stakeholder engagement such as fragmented responsibilities, poor regulation, lack of resources, propaganda and decision-making biases undermine consistent implementation of best practices.
- There seems to be less public scrutiny on SMRs than for large reactors.

HOW?

Transparency and communication

- Ensure transparency by providing clear, timely, accessible, and neutral information on SMR projects, objectives, processes, costs, risks, and benefits, acknowledging uncertainties.
- International (e.g. IAEA) or national policy organisations should take leadership in recommending modelling assumptions and parameters to be taken into account in modelling SMR impact, with proper justification.
- Regular two-way communication, and visible responsiveness to public concerns.
- Build on existing organisations that promote transparency and public involvement.
- Maintain constructive and continuous dialogue through institutional mechanisms.
- Communication channels should be sought to present in an adequate form information on SMR technologies and siting plans to the public, including official information and posts on social media by relevant institutions, publishing of media releases and other information materials, granting of interviews by relevant experts and policymakers, organization of public dialogues.
- Include a section comparing SMRs and large traditional reactors in policy documents, action plans, and information campaigns.
- Fund two-way communication efforts that inform and listen, rather than persuade. Focus on neutral, balanced, multi-way communication rather than promotional campaigns.
- Foster open and plural knowledge production by establishing public research consortia where scientific institutions, scientists (including social sciences and humanities disciplines), civil society, and local actors jointly shape research questions and interpret findings.
- Decentralise communication and funding by supporting grassroots initiatives, local media, and citizen monitoring platforms through public grants.
- Combat false information and promote balanced public discourse through facilitation training, transparent communication and stakeholder engagement strategies, and active support for independent science communication. Ensure integrity of speakers and participants of a dialogue.
- Foster debates in multiple fora in the public sphere on SMRs regarding their development, siting, operation and decommissioning / site repurposing.
- Establish a consistent approach to communicating with the public adapted to the given country's situation.
- Collaborate with researchers and experts, including those from social sciences and humanities, to design the stakeholder involvement and communication strategy with the public. In all stages, the role of the host local community is crucial.
- Invest in targeted SSH research on perceptions of SMRs.

Impact

- Enable co-decision frameworks, where civil society input can substantively shape policy choices, not merely respond to predetermined outcomes.
- Expand Environmental Impact Assessments (EIAs) to include social impact components, co-produced with local communities, NGOs, and independent experts.

Legal

- Make participation a binding requirement for regulatory approval of siting new installations, require governmental response to all

stakeholder input, and empower ombudspersons to investigate participatory breaches.

- Implement Aarhus Convention principles more systematically; ensuring open access to environmental reports and transparent explanations of how public comments are included in the final decisions.

Institutional

- Set up dedicated institutional structures for long-term public engagement – rather than project-bound-, capable of operating independently from both industry and government influence. 
- Clarify SMR technology choices. 
- Foresee capacity-building mechanisms to equip local actors and citizens with the knowledge and tools to engage meaningfully, particularly on complex and evolving technologies like SMRs. 
- Establish citizen assemblies or panels in potential host regions before technology selection or siting decisions are made. These should be empowered to influence national strategies, not just local implementation. 
- Enhance coordination and capacity-building within institutions to avoid fragmented responsibilities and ensure consistent engagement practices. 
- Initiate structured public debate to discuss nuclear options. 
- Ensure cross-party political agreements for mid- and long-term nuclear strategies; avoid ad-hoc decision making influenced by short-term political interests. 

Oversight

- Develop and use accountability tools to track how stakeholder input is used, and ensure that promises of participation are respected. 
- Establish a social participation and oversight body, independent from investors and promoters, to provide balanced information, and monitor the transparency, participation, and legitimacy of SMR projects. 

Integration of social sciences and humanities (SSH)

- Integrate SSH expertise, not as an add-on, but as a core part of technology development, risk assessment, and energy planning. 
- Invest in targeted research on societal perceptions of SMRs and nuclear energy, and regularly monitor public opinion using trusted institutions. 
- Develop adaptive stakeholder engagement tools able to address the increasingly polarised viewpoints in the socio-political environment, allowing to restore trust and re-open real, meaningful dialogue in such polarised settings. 
- Collaborate with SSH researchers and experts to design stakeholder involvement and communication strategies with the public. 

Empowerment

- Build local communities' partnerships for SMRs in the form of well-resourced partnerships with co-decision powers on siting, safety monitoring, and community benefits. 

Get inspired!

Fostering transparency, public information and dialogue on SMR technologies and related policies in Canada

The Canadian Energy Commission and the National Research Council of Canada (NRC) highlight how authorities and companies have promoted public participation through forums, consultations and workshops to inform and listen to communities about the benefits and risks of SMRs. In addition, organisations such as the Canadian Nuclear Association (CNA) have promoted initiatives to engage the community and foster an open dialogue around nuclear energy and its innovations, including SMRs.

Canada has taken a leading role in early and inclusive stakeholder engagement on SMRs through mechanisms like the CNSC's transparent licensing hearings, participant funding, and the creation of an Indigenous Advisory Council under NRCan's SMR Action Plan. These processes include accessible information sharing, structured consultation, and ongoing two-way dialogue with Indigenous communities and civil society—thus establishing a benchmark for participatory inclusion in SMR development.

It should nevertheless be mentioned that according to Iakovleva (2024) found that discussions about the potential of small modular nuclear reactors (SMRs) in remote communities have generally focused on the characteristics of the technology rather than aspects of the social context of indigenous communities, highlighting that for communities to fully understand the advantages and disadvantages of this technology, much more attention needs to be paid to building a safe space in which communities can frame the discussion within indigenous worldviews and lived experiences. A community governance approach is essential, with intermediaries facilitating safe spaces for dialogue, where community interests are aligned with energy projects. These national level practices and specific findings can be extrapolated to other regions and communities.

Sources: https://smrroadmap.ca/; https://smractionplan.ca/smr-action-plan-full-list-actions; https://natural-resources.canada.ca/energy-sources/nuclear-energy-uranium/canada-s-small-modular-reactor-action-plan; https://cna.ca/event/international-conference-on-stakeholder-engagement-for-nuclear-power-programmes/ https://fnpa.ca/ready4smr/)

Iakovleva, M. (2024). Community Governance for Small Modular Reactor (SMR) Development: Lessons from Northern and Indigenous Energy Projects. Northern Review, (55), 35-65. https://doi.org/10.22584/nr55.2024.012

5 OPEN UP SPACES IN NUCLEAR R&D FOR PARTICIPATORY INITIATIVES ENABLING DELIBERATIVE DECISION MAKING AND INTEGRATION OF SOCIAL SCIENCES AND HUMANITIES

Nuclear innovations are developed in laboratories and research centres and are largely removed from the actual societal context. It is often considered 'too early' to involve stakeholders, as there are still many technical issues that need to be researched, that are considered 'too complex', and/or perceived as 'confidential'. Stakeholder involvement takes place mainly "downstream", when developed technologies need to be implemented in society, rather than midstream (during the research process) or upstream (when research directions are set).

While the notion of participation has been translated in some fields of nuclear R&D (notably radioactive waste management or emergency planning) into collaborative discourses and practices, involving social sciences and humanities (SSH) and diverse stakeholders, other domains of research remain much less open to such engagements. Nuclear technology innovation, in

particular, e.g. SMRs, is often fenced off from the involvement of social sciences and humanities -beyond communication efforts- or broader public debate.

WHY?

- Early engagement of diverse stakeholders and disciplines (including SSH) in nuclear R&D brings added value for the R&D projects and the various stakeholder groups.
- Engaging with stakeholders makes nuclear research and innovation more responsible regarding its societal entwinements.
- Early deliberation on technical R&D helps moving R&D towards societally desirable directions and -hence effective allocation of resources.
- Early and impactful involvement helps build local trust, increase understanding, and may lead to genuine public support.
- Inclusion of SSH in nuclear innovation projects facilitates identifying and addressing related societal challenges and opportunities.

HOW?

- Require or encourage national projects related to SMRs and nuclear installations to include dedicated space for social scientists and civil society actors.
- Create national forums for discussion on R&D between the experts and civil society.
- Consider the potential of opening up nuclear R&D to the contribution of citizen science and citizen scientists.
- Integrate SSH research groups in nuclear R&D spaces.
- Promote and support inter- and transdisciplinary research.

Get inspired!

Opening up spaces in nuclear R&D for integration of Social Sciences and Humanities in the European PIANOFORTE partnership for radiation protection research

The European Partnership for Radiation Protection Research (PIANOFORTE) recognised that Social Sciences and Humanities (SSH) research is an important constituent of research and innovation and encouraged applicants to pen research calls to take into account social, behavioural, institutional, historical and/or cultural dimensions of the proposed research.
Through collaboration with social scientists and the European platform for Social Sciences and Humanities in Ionising Radiation Research (SHARE), PIANOFORTE also drafted "Guidelines for the effective integration of Social Sciences and Humanities (SSH) in nuclear research and innovation". These guidelines serve as a resource for researchers in various scientific disciplines, as well as professionals working in fields related to nuclear energy.

Source: https://www.ssh-share.eu/wp-content/uploads/2024/11/SSH-guidelines.pdf

Integration of Social Sciences and Humanities perspectives in nuclear waste management in Sweden

The Swedish nuclear waste management system progressively integrates perspectives from the humanities and social sciences, which were previously absent in a predominantly technical and engineering-focused approach. Notably, the establishment of the KASAM advisory council in 1985, which included social scientists and ethicists, facilitated inclusive debates on ethical and political dimensions. Furthermore, the requirement of local community acceptance for site selection in the 2000s marked a cultural shift towards valuing social and ethical competencies alongside technical expertise, demonstrating a comprehensive and participatory approach to risk governance.

Source: Kaiserfeld, T., & Kaijser, A. (2021). Changing the system culture: mobilizing the social sciences in the Swedish nuclear waste system. Nuclear Technology, 207(9), 1456-1468. https://doi.org/10.1080/00295450.2020.1832815

The EURAD Model of Civil Society Participation

The European EURAD project (European Joint Programme on Radioactive Waste Management) introduced a model of informed civil society participation in nuclear R&D. Success factors were considered to be the adaptive processes, interactive settings, pluralistic preparation of research frameworks, seminars and workshops, and the integration of multiple aspects (technical, social, legal, economic).
This model is continued in EURAD 2, with civil society represented by local communities, civil society members of European organisations, and civil society members in agreement with EURAD vision. Although the latter requirement has received some criticisms for limiting participation of dissenting voices, this funded participation of informed civil society enables upstream public access to information, contributes to a shared culture for safety and security and improves the quality of research projects by including contributions and knowledge produced by civil society.

Sources:
Zeleznik N., Geisler-Roblin A., Haverkamp J. (2024). Lessons learnt from EURAD programme which included interaction with civil society as part of the implementation and some findings for future. EASST 2024 conference, 16-19 July 2024, Amsterdam. https://www.easst4s2024.net/programme/#14389
Dewoghelaere J., Geisler-Roblin A., Fontaine G., Mraz G., Zeleznik N (2025). Interactions with Civil Society in EURAD. FISA EURAD Waste Conference, 2025.
https://fisa-euradwaste2025.ncbj.gov.pl/sites/fisa-euradwaste2025.ncbj.gov.pl/files/2025-05/012_poster.pdf

6 PROVIDE NATIONAL POLITICAL SUPPORT AND APPROPRIATE MEANS FOR SUSTAINED LOCAL COMMUNITIES' ENGAGEMENT IN NUCLEAR DECISION MAKING

National political support and sufficient resources are needed for local communities' which are either candidates for or are hosting nuclear facilities (e.g. SMRs, large reactors, radioactive waste repositories or storage facilities) to be engaged in the nuclear decision-making process.

Providing appropriate means to support local communities' participation includes resources such as funding, information, or platforms for engagement, which enable them to participate effectively in the decision-making processes. In addition, legal and administrative frameworks ensuring that local communities have the necessary support and mechanisms to engage in the decision-making process effectively are necessary.

WHY?

- The active participation and support of local communities is crucial for the implementation of nuclear projects. The early engagement of civil society stakeholders allows that concerns, perceptions and opinions are considered, which leads to more informed, balanced and accepted decisions.
- Lack of trust, poor communication from authorities and nuclear industry, and a lack of meaningful participation opportunities, hamper the engagement of stakeholders, including local communities. Addressing these barriers requires national political support and sufficient resources to create an environment conducive to effective stakeholder engagement.

HOW?

- Create forums, cooperation groups or committees between local authorities, citizens and nuclear companies to provide information and facilitate public debate and engagement in the decision-making processes.

- Provide stable funding, through local taxes, benefits packages or other mechanisms, to support communities hosting nuclear facilities to access, review information and get involved in participatory processes impacting their communities.
- Empower local authorities with real influence, for instance, including mechanisms like the right to veto (e.g. Finland and Sweden).
- Involve youth, as potential leaders, in the discussions about their future energy scenarios.
- Ensure messaging is adapted to different age groups of residents.
- Facilitate the exchange of experience and learnings across local communities in different regions and countries hosting nuclear facilities.
- Communicate how nuclear projects will affect local life, with particular attention to aspects such as jobs, services, education, transport and mobility, planning, housing demands and supply chains.

Get inspired!

Shaping the energy future of the community through the citizen assembly in The Netherlands

The municipality of Borsele (The Netherlands) initiated in 2023 an inclusive process regarding the possible siting of two new nuclear reactors in their area. The municipality reflected on how to get involved in this debate at the national level and how to explore residents' opinions. For this, the mayor, aldermen and the responsible environmental manager in the energy transition in Borsele visited all 15 villages which form Borsele and talked with the inhabitants. Citizens requested the local authority to be proactive, to use the local knowledge and to start a process to involve the community. The local authority opted for constituting a citizen assembly consisting of 100 people, 50% male, 50% female and 50% people under 35 years old because they are the future decision-makers. Borsele has 13,000 families with a total of 22,000 inhabitants. The local council sent a letter to all the families asking who would be interested in participating in this process. At least 50 people from the 350 reactions met the criteria of being younger than 35 years old. Finally, 100 people were selected. The letter also included the local council's interest in engaging local experts on different topics (e.g. nuclear waste, landscape). 35 people responded, and a specialised company subcontracted by the local authority selected 15 local experts living in the municipality.

The citizen assembly met several times. In the first meetings, citizens discussed how to organise themselves, vote and make decisions. Local knowledge was brought into these meetings through the 15 local experts. The proactive involvement of councillors in setting criteria and deciding how to develop the process was essential. The participation process did not aim to discuss whether citizens are pro or anti-nuclear, but which terms and conditions would be presented to the government in case new nuclear reactors were to be sited in Borsele. After the second meeting, 7 participants were selected to visit Hinkley Point C to learn about the implications of building a nuclear power plant. They reported back to the group of 100 and continued to work on 39 terms and conditions under 10 topics (construction space and logistics; health and safety; climate, energy and sustainability; landscape, wildlife and recreation; communication and support; construction and other nuisance; ownership; housing, living, quality of life and facilities; education, knowledge and economic development and compensation and recompense). Subsequently, the citizen assembly met with the council members and the municipal council adopted a document setting out the 39 terms and conditions.

The national Ministry of Climate and Energy participated at the outset of the process, emphasising the importance of community involvement and consideration of the terms and conditions by the national authorities. When the terms and conditions were finalised, the city assembly travelled to the Hague to present the conditions to the government and the parliament. After that, national elections were held in June 2024, and a new minister was elected. The terms and conditions need to be reviewed, and new citizens will be involved in the assembly to continue working until the central government makes the final decision on the location of the new nuclear reactors. The process in Borsele highlighted, among others, that:

• Local governments need to be proactive and develop their own strategy of engagement, separately from the processes undertaken by the central government or the nuclear industry;
• Involving the community and the citizens with local knowledge and expertise adds value when discussing the quality of life of the community;
• The young generation has in general a different opinion about nuclear compared to older generations, and it is important to involve the future decision-makers.

Sources: https://www.borsele.nl/sites/borsele/files/2024-03/Borselse%20conditions%202023%20-%20English%20version.pdf
https://www.borsele.nl/sites/borsele/files/2024-05/Borsele%20Conditions%20Group%20Looking%20back%20on%20a%20unique%20citizen%20participation%20process%20in%202023.pdf
Durdovic et al. (2025). Public attitudes towards small modular reactors. An emerging research field and evidence from six countries. ECOSENS Deliverable D1.1
Mullin, J. R., & Kotval, Z. (2024). The next generation of nuclear power plants and the role of the local planner. Planning Practice & Research, 39(3), 547–557. https://doi.org/10.1080/02697459.2024.2306455

Developing European guidelines and tools for local communities' engagement

The European-funded project CIP (New governance approaches to radioactive waste management in Europe: COWAM in Practice) (2007-2009) was part of COWAM, a ten-year participative European reflection on RWM governance. CIP gathered a wide spectrum of stakeholders from five European countries to identify issues important for the good governance of RWM in their specific national contexts, and to conduct cooperative research. Among others, CIP developed European-level Guidelines to help prepare inclusive governance processes for radioactive waste management.

Although CIP was focused on radioactive waste management, the lessons learned, the recommendations and the participatory tools assessed may inspire inclusive governance in all areas of nuclear decision making.

Sources:
Reports available on https://zenodo.org/communities/cowam_communities_and_waste_management/
Mays, C., Hériard-Dubreuil, G., Gadbois, S., & Schneider, T. (2010). European-level Guidelines for the Inclusive Governance of Radioactive Waste Management - COWAM in Practice (CIP). Zenodo. https://doi.org/10.5281/zenodo.17209329
Mays, C. (2006). Roadmap for Local Committee Construction: Better paths towards the governance of radioactive waste (COWAM 2 - WP1). Zenodo. https://doi.org/10.5281/zenodo.17208795
Laes, E., Meskens, G., & Kos, D. (2006). Guidance on the selection of PTA tools for stakeholders involved in radioactive waste governance (COWAM 2 - WP1). Zenodo. https://doi.org/10.5281/zenodo.17225079

Using funding for local competence building in Sweden

In Sweden, municipalities like Östhammar actively engage in the nuclear waste management process by applying for funding for review and information activities. Östhammar has taken an involved role as a host community, aiming to strengthen its competence, challenging policies and decisions, and involving local actors in project planning. This active participation has allowed the community to gain a degree of independence from the nuclear waste management company (Kari, Kojo & Lehtonen, 2021).

Sources: Kari, M., Kojo, M., & Lehtonen, M. (2021). Role of the host communities in final disposal of spent nuclear fuel in Finland and Sweden. Progress in Nuclear Energy, 133, 103632.

Enabling continued community participation in Belgian radioactive waste management

In 2006, a site was selected for a surface repository for Belgium's low- and intermediate-level short-lived radioactive waste. The selection process was conducted with input from local community partnerships. Although the repository will be located in Dessel, it was decided—due to its location close to the municipal border—that the local community partnerships in both Dessel (STORA) and Mol (MONA) would continue their activities after site selection, aiming to ensure follow-up and local involvement in the development and construction of the repository. While such prolonged and long-term community participation poses challenges—e.g., in terms of task definition and membership of partnership structures—efforts have been made to support continued local involvement.

Actions taken to enable long-term citizen involvement include inter alia the establishment of a steering committee in which both local partnerships (MONA and STORA) are represented, the provision of working budgets and paid secretaries, and the creation of long-term local funding arrangements. The latter has taken the form of a 'local fund,' financed by the waste producers, which is used to support and invest in initiatives that benefit local community life (e.g., sports clubs, recreational infrastructure, health projects). The fund is invested, and the yearly interest is used to provide funding for local community projects over a period of 300 years (the expected time it will take for the waste in the repository to decay to radiation levels similar to natural background radiation).

Sources: STORA partnership https://www.stora.org/ Available in Dutch. Accessed 02/09/2025; MONA partnership https://www.monavzw.be/ Available in Dutch. Accessed 02/09/2025;
Local Fund Stichting Lokaal Fonds - Homepage | Stichting Lokaal Fonds Available in Dutch . Accessed 02/09/2025

7 FACILITATE AND SUPPORT THE ENGAGEMENT OF CIVIL SOCIETY ORGANISATIONS, INCLUDING ENVIRONMENTAL NGOs, IN NUCLEAR DECISION MAKING

Stakeholder engagement helps ensure transparency and accountability in spent nuclear fuel disposal planning and other nuclear sector decisions. Civil Society Organisations (CSO) watchdog functions are vital for ensuring compliance with international agreements like the Aarhus Convention and related EU directives. They play a key role at the European level in providing critical perspectives and democratic oversight of nuclear energy policy and projects.

Currently there is a critical public funding gap for environmental NGOs (eNGOs) that used to be active in nuclear oversight. This gap has significantly reduced their capacity to participate meaningfully in nuclear, particularly regarding Environmental Impact Assessments (EIA) and Strategic Environmental Assessments (SEA) procedures under the Aarhus Convention. In several countries there is a lack of eNGOs engagement in EIA for new nuclear reactors.

WHY?

- Due to EU accession, eNGOs in former Soviet bloc EU member states lost access to multi-annual core funding from U.S. foundations. Moreover, they might have lost access to project funding from some German foundations in consequence of Germany's nuclear phase-out.
- Current eNGOs financing seems to be mostly short-term and project-specific, which prevents eNGOs from recruiting and retaining personnel with expertise necessary for engagement in nuclear sector public procedures.
- The phenomenon known as 'Unlimited Nuclear Consultations Leading to Exhaustion', acronym UNCLE, might be on the rise due to a growth in requests to eNGOs to participate at many different consultations at the EU level (EU policy documents, Horizon projects, etc.).
- eNGOs often emphasize their role as issue-focused contributors whose expertise stems from empirical work. They not only lack stable funding to maintain this capacity, but moreover seem to be pushed by the current funding schemes and expectations from

them into more theoretical contributors to policy debates.

- Reduced eNGO participation weakens public participation in nuclear oversight, contrary to Aarhus Convention principles
- ECOSENS national case studies do not mention any attempt of any EU-based funding source to try to address the funding gap left by U.S. (and German) foundation withdrawals.

HOW?

- **Relevant public sector funding sources from the EU should initiate transparent and wide-open discussion with eNGOs about their access to public funding for nuclear oversight, with a full respect to:**
  - a need to establish multi-annual funding mechanisms from public sources that would enable eNGOs to maintain specialized personnel for nuclear oversight participation (not rejecting options that would keep positive externalities of the former U.S. foundation model that provided non-project, long-term funding for strategic continuity).
  - consider remarks and proposals of eNGOs and other stakeholders presented within the EURAD programme that concerned a need to address the 4th pillar of the Aarhus Convention – access to finance.
  - address a principal refusal of several eNGOs to be involved at EURATOM-funded activities, while being interested in being involved in EU-funded activities (since EURATOM fosters preference of nuclear energy over all other modes of electricity generation).

Get inspired !

Within ECOSENS activities, we have not observed any good practice in this specific area at an EU level. We are concerned to learn that some past good practices in the nuclear back-end observed at a national level have been discontinued.

Facilitating and supporting the engagement of environmental NGOs in nuclear decision making in Sweden

A public sector scheme used to finance environmental NGO activities concerning Spent nuclear fuel final repository siting existed in Sweden. This enabled them to commission independent analyses, build expertise, and contribute constructively to decision-making processes. The result was greater legitimacy, transparency, and resilience of long-term governance structures. However, this funding scheme has been discontinued, although scholars argue that providing resources for local communities and environmental NGOs to participate fully in the process improved the quality of decision making (Swahn, 2023).

Source: Swahn, J. (2023). Radioactive Waste Management in Sweden: Decision Making in a Context of Scientific Controversy. In: Arentsen, M., van Est, R. (eds) The Future of Radioactive Waste Governance. Energiepolitik und Klimaschutz. Energy Policy and Climate Protection. Springer VS, Wiesbaden. https://doi.org/10.1007/978-3-658-40496-3_10

Practical implementation of recommendations

Summary of the panel discussion held on September 9 at the final ECOSENS conference in Milan

At the final ECOSENS conference in Milan (8-9 September 2025), an international panel debated on the implementation of the ECOSENS recommendations in practice.

The questions discussed related to experiences where engagement or participation processes have worked particularly well; challenges to implement best practice guidelines in stakeholder engagement; the responsibilities for implementing participatory governance processes; and the limits to transparency.

Participants highlighted that when considering whether a stakeholder engagement process has been successful it is important to clarify from whose point of view, e.g. a project, the project owner, or specific stakeholder groups. Challenges mentioned were the different national contexts and how these might hinder a harmonised implementation; a dominant focus on individual projects and technologies instead of meeting the broader interests of citizens(e.g. energy, health); motivating citizens to participate in engagement initiatives and structures; power imbalances between different stakeholder groups; ensuring stakeholders (including younger generations) have information and skills to engage; an overemphasis on trust as the prime goal of stakeholder engagement; the lack of citizens' awareness on issues which require societal attention (e.g. disposal of high-level radioactive waste); the persistence of Decide-Announce-Defend decision processes; or the lack of impact of engagement processes.

Participants shared examples of stakeholder engagement which were initiated by various organisations and/or stakeholder groups, either reactively (e.g. following external prescriptions) or proactively. They argued that in both cases, examples can be found in which stakeholder engagement has brought added value to all involved. It was suggested that although authorities have the responsibility to initiate engagement processes, they often seem unaware of their role or lack knowledge of participatory processes or willingness to initiate them. Some participants argued that over-defining responsibilities has some limitations, as this may exclude forms of engagement that do not fit into these predefined roles.

As regards SMRs, participants highlighted distinctive features such as urban or remote area siting. Such elements of novelty, beyond the potential use of advanced technologies, offer a chance to start with civil society and local communities' engagement in a proper way and from the very beginning. It was pointed out that there is no "one size fits all" model for stakeholder engagement, and in the case of SMRs, the diversity of technologies, uses and sites foreseen will add to this complexity. Participants also highlighted the role of social sciences and humanities researchers in providing an understanding of the context and helping create engagement processes that bring positive added value.

The need to put more emphasis on the added value of various forms of expertise and knowledge was pointed out, with participants calling for the creation of partnerships, and education for active citizenship.

As regards transparency, participants concluded that this entails being as open as possible; communicating about what is planned; communicating not only about benefits but also risks of technologies; and not withholding information from the public out of fear of backlash or critique.

ECOSENS References

Durdovic, M., et al. (2025): Public attitudes towards small modular reactors. An emerging research field and evidence from six countries. ECOSENS Deliverable D 1.1, DOI: http://dx.doi.org/DOI:10.20348/STOREDB/1212/1329;

Durdovic M. et al, (2024): Case studies of public attitudes to existing and new nuclear energy technologies. ECOSENS Milestone MS4

Sala et al. (2025): Survey on stakeholder engagement and transdisciplinary collaborations in nuclear decision making, ECOSENS Milestone M5; EASST report; RICOMET panel report

Zeleznik et al, (2025): In depth case studies report, ECOSENS Milestone M6, DOI: http://dx.doi.org/doi:10.20348/STOREDB/1215/1334;

Zeleznik et al. (2024): Analysis of recommendations for stakeholder engagement, ECOSENS Report, DOI: http://dx.doi.org/DOI:10.20348/STOREDB/1214.

Meskens G. et al (2025). Report from participatory workshops on social dimensions and sustainability assessments of nuclear energy (SCK CEN) ECOSENS Deliverable 1.4.

Annex A: Glossary

Civil Society	Civil society refers to all forms of social action carried out by individuals or groups who are neither connected to nor managed by state authorities.
Civil Society Organisation	A civil society organisation (CSO) is an organisational structure whose members serve the general interest through a democratic process, and which plays the role of mediator between public authorities and citizens. Article 15 of the Treaty on the Functioning of the European Union recognises civil society's role in the good governance of the European Union (EU). Article 11 of the Treaty on European Union stresses the need for the EU to have an open, transparent and regular dialogue with civil society organisations, for example when preparing proposals for EU laws. *Source: Access to European Union law, Glossary of summaries https://eur-lex.europa.eu/EN/legal-content/glossary/civil-society-organisation.html*
Equity	Equity in this context refers to social inclusion. Social inclusion can refer to the *possibilities* for people to participate in society in general and in decision making in particular. Equity consequently refers to equal possibilities irrespective of social, economic or other status, and of age, sex, disability, ethnicity, origin or religion. In a second perspective, and equally essential in this context, equity and social inclusion also refer to the actual *capabilities* of people to participate in society in general and in decision making in particular. This idea is based on the capability approach (developed by Amartya Sen and Martha Nussbaum) that states that prime attention should be given to people's actual capabilities to achieve lives they value rather than solely having a right or freedom to do so. Important to note here is the difference between equity and equality. Equality means people are 'treated' the same way, giving them equal resources and opportunities. From the perspective of the capability approach, one can understand that, depending on their social situation, people require resources and opportunities that fit their specific needs or circumstances, in order to ensure an equal outcome. In other words, equality is about being equal in status, rights and opportunities, whereas equity is about how to get there through fairness and impartiality. *Sources: UNESCO social inclusion and equity* *https://whc.unesco.org/en/glossary/365* *World Economic Forum* *https://www.weforum.org/stories/2023/03/equity-equality-women-iwd/* *Sen, A. (1999). Development as Freedom. New York: Knopf.*
Governance	Governance refers to the actions, processes, traditions and institutions by which authority is exercised, and decisions are taken and implemented. *Source: International Risk Governance Council (IRGC). https://irgc.org/risk-governance/what-is-risk-governance/*
Inclusion	The practice or policy of including people who might otherwise be excluded to promote equal participation. Inclusion is an active term. It requires actively thinking about and proactively lowering or eliminating possible obstacles for all people.

Source: University of Antwerp Glossary of Terms on Diversity.
Glossary of Terms on Diversity | Diversity and inclusion | University of Antwerp

Levels of involvement

Participation can take different forms, involving uni- or multi-directional interactions; being institutional or citizen-led; having lower or higher influence on agenda-setting and decision making. Formal participation can range from information provision, gathering information, to dialogue, collaboration or partnership. The impact on actual decisions generally increases from information provision (no impact on decisions) to partnership (co-decision).

Source: Health Canada, 2000. Policy Toolkit for Public Involvement in Decision-Making.

Risk governance

The ways in which actors, individuals, and institutions, public and private, deal with risks in the presence of uncertainty, complexity, and/or ambiguity.

Source: Van Asselt, M. B., & Renn, O. (2011). Risk governance. Journal of risk research, 14(4), 431-449.

Principles of 'good' governance

Include participation, *"transparency, effectiveness and efficiency, accountability, strategic focus, sustainability, equity and fairness, respect for the rule of law and the need for the chosen solution to be politically and legally realisable, as well as ethically and publicly acceptable"* (pp.12).

Source: Renn O. (2005). International Risk Governance Council. (2005). Risk governance: Towards an integrative approach. White Paper No. 1.

Stakeholder

Actors (individuals or groups, institutional and non-institutional) with a tangible or intangible (yet to be shaped or discerned) interest in the decision problem and its resolution. These actors may affect decisions, be affected by the formulation and resolution of a problem or represent an affected party (humans or the environment). Stakeholders are constructed in interaction with actors, issues, contexts.

Source: Turcanu C et al. 2020. Stakeholder engagement in radiological protection: Developing theory, practice and guidelines. Radioprotection 55(HS2). https://doi.org/10.1051/radiopro/2020008.

https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ahc-asc/alt_formats/pacrb-dgapcr/pdf/public-consult/2000decision-eng.pdf

For comparison, OECD-NEA uses the definition: "any actor – institution, group or individual – with an interest or a role to play in the radioactive waste management process" (OECD, NEA, Stakeholder Confidence in Radioactive Waste Management: An Annotated Glossary of Key Terms, 2022 Update, OECD, 2022, p. 49.) IAEA- definition: "any group or individual who feels affected by an activity, whether physically or emotionally" (IAEA, Stakeholder Engagement in Nuclear Programmes, IAEA, Vienna, 2021, p. 5.).

Stakeholder engagement

Generally refers to levels of involvement that have higher impact on decisions, e.g. dialogue, collaboration or partnership.

Source: Health Canada, 2000. Policy Toolkit for Public Involvement in Decision-Making.

Types of stakeholders

One possible categorisation draws on the quintuple helix of knowledge generation and innovation. This proposes a "*framework for transdisciplinary (and interdisciplinary) analysis of sustainable development and social ecology*''. It distinguishes five subsystems (helices) 1. Political system, e.g. in our case government officials (local, regional, national), political action groups; 2. Economic system, e.g. nuclear energy producers, nuclear energy suppliers, nuclear energy industry associations; 3. Education (and research) system, e.g. universities and research centres; 4. Culture and media-

based publics (or "Civil society"), e.g. community groups, local residents, civil society organisations, NGOs, and media; 5. The natural environment, e.g. plants, animals, biodiversity, which could be represented as proxy in our case e.g. by environmental NGOs.

Source: Carayannis, E. G. & Campbell, D.F.J. (2010). Triple Helix, Quadruple Helix and Quintuple Helix and How Do Knowledge, Innovation and the Environment Relate To Each Other?: A Proposed Framework for a Trans-disciplinary Analysis of Sustainable Development and Social Ecology. Int. Journal of Social Ecology and Sustainable Development 1 (1): 61–62.

Other descriptions distinguish for instance between statutory (with legal obligations) vs. non-statutory stakeholders (IAEA Glossary).

Transdisciplinarity

An approach to research involving the integration of insights from multiple knowledge systems throughout the entire research process, i.e. different disciplines (natural sciences, social sciences, humanities, and arts); and multiple actors (civil society, practitioners, researchers, and policy makers).

Transparency

Refers to "ensuring effective public information and providing the necessary opportunities for all stakeholders concerned, including local authorities and the public, to participate in decision-making processes regarding spent fuel and radioactive waste management, in accordance with national and international obligations".

Source: Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste.

Transparency also refers only to the obligation of EU Member States to *"make available the necessary information in relation to the regulation of nuclear safety of nuclear installations to the workers and the general public, with specific consideration to local authorities, population and other stakeholders in the vicinity of a nuclear installation, in accordance with national legislation and international obligations, and provided that this does not jeopardise other interests such as, inter alia, security, recognised in national legislation or international obligations."*

Source: EURATOM Nuclear Safety Directive

Annex B: Process for deriving the ECOSENS recommendations

Within ECOSENS, Work Package 1 (WP1) *"A Collaborative Assessment of (Imagined) Energy Worlds"* is dedicated to exploring the societal dimensions of nuclear energy within broader energy transitions, ***with stakeholder engagement in nuclear energy governance*** as a focus point.

An overarching aim of WP1 is to formulate recommendations for improved stakeholder engagement.The process of deriving these recommendations was as follows.

I. Collection of relevant results from ECOSENS - WP1

This included:

- **Task 1.1 "Public Attitudes towards the use and development of nuclear energy technologies, including new and emerging technologies":** Case Studies conducted in six countries (Belgium, Spain, Czech Republic, Slovakia, Slovenia, and the UK) explored citizens' views on existing and emerging nuclear technologies, notably Small Modular Reactors (SMRs), in the context of climate change, sustainable energy policy, and energy security. These results were reported in ECOSENS Milestone MS1.4 report and Deliverable D1.1.
    - Case studies used a multi-method approach including focus groups (Belgium, Spain, Czech Republic, Slovenia), interviews (UK and Slovenia), media analysis (Spain and Belgium), surveys with nationally representative samples (Belgium, Spain, and the Czech Republic) or specific population groups (Slovakia, students).
- **Task 1.2. "Impact of new social movements and interest groups on attitudes towards energy matters and towards nuclear energy in particular",** focusing on motivations for and experiences with public engagement in protest and advocacy movements concerned with energy, sustainability and climate change in general and with nuclear energy in particular. These results are part of Deliverable 1.2.
    - Data collection included the Protest Survey Method; direct observation of events; analysis of documentary sources.
- **Task 1.3: "Analytic and critical review of stakeholder engagement in energy governance and inter-disciplinary collaborations".** The task conducted a critical assessment of the implementation and impact of stakeholder engagement strategies and the integration of social sciences and humanities (SSH) in nuclear research and decision making. These results were reported in ECOSENS Milestone reports 1.5 and 1.6 and additional summaries from events organised in collaboration with the SHARE platform.
    - Data collection methods included: i) a review of recommendations for stakeholder engagement in international EURATOM projects and guidelines from international organisations; ii) an online survey distributed among regulators, research institutions and other societal stakeholders in order to assess the uptake of these recommendations; iii) a dedicated part in an international workshop organised by GMF (the group of municipalities with nuclear facilities); iv) in-depth case studies in countries with varying nuclear policies (Slovenia, Slovakia, the UK and Spain) to examine cultural and structural barriers to effective engagement; v) dialogues events held in partnership with the SHARE platform for social sciences and humanities in ionising radiation research to explore *transdisciplinary collaborations* (EASST-4S 2024, Amsterdam), *sustainability assessment methodologies on energy technologies* (panel at RICOMET 2023 conference, Dessel); *stakeholder engagement in SMR* (panel discussion, RICOMET 2024, Ljubljana).
- **Task 1.4: "Deliberative Engagement Workshops**" which aimed to engage societal stakeholders in order to explore their evidence- and value-based perspectives on sustainability and energy governance assessments. These results were reported each in a dedicated report uploaded on ECOSENS website and as part of Deliverable D 1.4 (forthcoming).
    - The workshops informing these recommendations were focused on: 1) current societal challenges and possible and desired energy futures, considering existing and new energy technologies; 2) scenario workshops to gauge the influence of disruptive climate change events on potential evolutions in citizen

energy choices. These results were reported each in a dedicated report uploaded on ECOSENS website and as part of Deliverable D 1.4 (forthcoming).

II Interdisciplinary dialogue among ECOSENS WP1 researchers, to synthesize findings in the form of recommendations.

III International workshop dedicated to co-development of recommendations on stakeholder engagement in (nuclear) energy governance, to discuss recommendations and receive stakeholder input.

- taking place online on 11 & 12 June 2025.
- recommendations were updated based on input received.

IV Final comments on recommendations at the ECOSENS final conference in Milan

- 8-9 September 2025.