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ENGAGING CITIZENS IN INNOVATION POLICY

WHY, WHEN AND HOW?

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Table of contents

Engaging citizens in innovation policy: why, when, and how?

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Abstract

Innovation policies need to be socially embedded for them to effectively contribute to addressing major societal challenges. Engaging citizens in innovation policymaking can help define long-term policy priorities, enhance the quality and legitimacy of policy decisions, and increase the visibility of innovation in society. However, engaging all groups in society and effectively integrating citizens' inputs in policy processes is challenging. This paper discusses why, when and how to engage citizens in innovation policy making. It also addresses practical considerations for organising these processes, such as reaching out to diverse publics and selecting the optimal mix of methods and tools.

JEL codes: O30, O38

Keywords: citizen engagement, participatory policy processes, STI policy, innovation policy, innovation, green transition

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Executive summary

What is citizen engagement?

Citizen engagement is the process by which public authorities engage citizens in a dialogue to shape science, technology and innovation (STI) policies. Citizens (or the "public") engage in their personal capacity rather than in their professional capacity as researchers or business representatives.

This engagement complements traditional representative democracy mechanisms, where elected officials act as representatives of citizens in decision-making processes.

Citizen engagement adds to and builds on three complementary citizen involvement activities:

- Communication activities – such as science festivals, exhibits in public spaces, science documentaries – aimed at informing citizens about STI;
- Consultation activities – such as surveys and online public consultations – aimed at collecting citizen inputs on specific issues or policy proposals; and
- Citizen science activities – such as open challenges, hackathons or living labs – aimed at engaging citizens as contributors, collaborators and co-creators in research and innovation activities.

Citizen engagement in innovation policy can take multiple forms as exemplified by these concrete examples that focus on green transition topics:

- The Climate Assembly UK, organised in 2020, engaged 108 citizens selected in a civil lottery to meet with experts and jointly develop policy recommendations to reduce greenhouse gas emissions in the United Kingdom.
- The BioKompass project (2017-20) in Germany involved more than 100 citizens to discuss the opportunities and challenges associated with the future bioeconomy and produce a shared vision for 2040.
- The Ideas for Change programme in Colombia relies on citizens' participation to identify social and environmental challenges in vulnerable communities requiring STI solutions.
- The project "Attitudes to new transport technologies" (2021-2022) launched by the Norwegian Board of Technology involved citizens in discussing future scenarios of transportation technologies, such as self-driving cars and shared mobility.

Key roles of other actors for societal engagement

Innovation policymaking relies on complementary inputs from experts and industry stakeholders to advance the innovation policy agenda. They also play key roles in citizen engagement processes (e.g. serving as facilitators, experts, etc.), provided that their involvement does not bias those process.

Since citizen engagement is about connecting with the public, it is closely linked to the press and social media. They provide information, act as platforms for public debates, hold policymakers accountable and have the potential to scale societal engagement processes.

However, the media also poses challenges for citizen engagement. In particular, social media can create echo chambers where users are exposed only to those sharing their beliefs, which can reinforce polarization in policy debates.

What are the goals of engaging citizens in innovation policy?

Well-designed citizen engagement processes in innovation policy can bring the following benefits:

1. Increase in the quality of innovation policies;
2. Emphasise on the societal focus and inclusivity of innovation policy;
3. Increase in citizen awareness of and support for innovation and innovation policy aimed at advancing societal goals; and
4. Enhancement of trust in the government and the public administration.

Societal engagement is even more important in today's context of the green and digital transition – defined as the shift towards a sustainable, environmentally-friendly and resource-efficient economy and society that leverages digital technologies to achieve shared socio-economic objectives. Given the far-reaching impacts of these transformations on society, citizens' contributions in designing and implementing innovation policies are essential.

The sub-optimal uptake of STI solutions like warning apps and vaccines during the COVID-19 pandemic have illustrated the impacts of limited public engagement and need for trust in STI and government for the deployment of innovation outcomes.

Cases of most value for participatory processes include the following:

- Decisions on long-term policy directions involving choices among a diversity of potential pathways and requiring societal endorsement.
- Policies that rely on local community knowledge and inputs for their successful design and/or implementation.
- Policy topics citizens deeply care about, that possibly create divides between "winners" and "losers" and where trust in public institutions may be at risk.

The feasibility of achieving effective citizen engagement and attaining the intended results needs to be carefully considered. This implies prioritising certain topics and purposes.

When to engage citizens in policymaking?

Citizens can contribute important inputs across all stages of innovation policymaking provided engagement processes are conducted in time for inputs to shape upcoming policy decisions. These include:

- Agenda and strategy setting to define the short- and long-term strategic priorities for STI policy and funding.
- Programme definition to identify priorities for research and innovation programmes or allocate funding across priority areas.
- Technology assessment to identify possible societal, economic and ethical risks of the application of emerging technologies.
- Strategic foresight to develop a shared vision for the future and determine the actions, steps and resources needed to reach it.
- Implementation to support the diffusion of innovations aimed at advancing socioeconomic goals.

Why is engagement challenging?

Engaging citizens in STI policy is challenging as it is often seen as a domain for experts and disconnected from people's everyday lives and concerns, unlike fields such as health or education. Moreover, an increase in consultation requests has led to "consultation fatigue", discouraging citizen engagement in STI policy processes.

How to best design engagement processes?

- Develop and implement a plan to reach out to target groups, including special means to engage underrepresented groups.
- Facilitate inclusive discussions while avoiding polarisation of debates.
- Select the optimal mix of engagement methods and tools and tailor them to best respond to the specific purpose of the engagement process.
- Ensure citizens' expectations are met and communicate the results of the process to the public.
- Have a process in place to integrate inputs into policy processes.

What are important policy implications?

- More and better citizen engagement in innovation policy that builds on robust evidence is needed.
- Quality is more important than quantity: focus on fewer, more impactful processes.
- Organising effective citizen engagement processes requires acquiring expertise or collaborating with supporting institutions.
- Direct involvement of public sector officials in citizen engagement processes should be promoted.
- Citizen engagement needs to be anchored in a wider communication strategy regarding innovation policy.
- The design of citizen engagement processes should be tailored to the specific purpose, target group and context of the exercise.

Engaging citizens in innovation policy: why, when and how?

1. Introduction

While science, technology and innovation (STI) policies play a crucial role in supporting environmentally sustainable development and addressing other societal challenges, they cannot bring about such substantive change if they are not socially embedded. The call for enhanced public engagement in science and innovation policy is not new, but the complex and urgent nature of the challenges ahead, their impact on people's lives and increasing concerns regarding declining public trust in governments have led to renewed attention on participatory policy processes in this policy field.

However, effectively engaging citizens in STI policy processes is challenging – even more so compared to other policy domains such as health or education, as STI is less connected to most people's everyday lives and concerns. The multiplication of consultation requests that citizens receive in their everyday lives –from filling in consumer satisfaction surveys to providing feedback on specific public services – also means people may face consultation "fatigue", possibly discouraging their engagement in innovation policymaking.

This paper examines why, when and how governments can best engage citizens in innovation policy. It explores the key actors involved in such participatory processes and provides a brief practical guidance on organising them to the benefit of innovation policies. Examples of citizen engagement processes from across the OECD are provided.

Evidence gathering was enriched with expert interviews and the organisation of a series of workshops that brought together policy practitioners and experts. Notably, the OECD Working Party on Innovation and Technology Policy (TIP) organised the workshops "Strategic approaches for future transitions: How to achieve collaborative policymaking?" on 25 April 2022 and "60th TIP: Rethinking innovation policy in times of transitions" on 7 December 2022. The OECD Committee for Scientific and Technological Policy organised the workshop "Engaging society in science, technology and innovation policy" on 21 March 2023.

The paper is part of the 2021-22 OECD-TIP project "Supporting co-creation in collaborative transitions: Exploring new tools and approaches" and contributes to the 2023-24 OECD-TIP project "STI policy for transitions: Inclusive and effective approaches". The paper contributes to the OECD's S&T Policy 2025 initiative, in particular the module on engaging society for sustainable transitions. It also connects with work conducted by the OECD Global Science Forum on science communication and open research agenda setting and by the OECD Working Party on Biotechnology, Nanotechnology and Converging Technologies (BNCT) on anticipatory technology governance (OECD, 2023[1]) (OECD, 2017[2]). It builds on prior OECD work on citizen participation in policymaking (OECD, 2020[3]) (OECD, 2021[4]) (OECD, 2022[5]) (OECD, 2022[6]).

The remainder of the paper is structured as follows. Section 2 defines what citizen engagement in innovation policy is, who is involved and how. Section 3 discusses when and how to engage citizens. Section 4 discusses practical considerations for implementing these processes. Section 5 explores complementary ways of involving citizens in science and innovation. Section 6 discusses implications for innovation policy and outlines best practices for citizen engagement.

2. Citizen engagement in innovation policy: What, who and why?

2.1. What is citizen engagement in innovation policy?

Citizen engagement is the process by which public authorities engage citizens in a dialogue to shape science, technology and innovation (STI) policies[1].

Dialogues can take different forms, such as citizen assemblies gathering a representative group of citizens to deliberate on a policy issue and develop policy recommendations, foresight workshops that gather citizens to discuss future scenarios, or urban mobility online deliberation processes where city inhabitants express their preferences through a dedicated virtual platform.

Specific international examples include the following:

- The Citizens' Convention on Climate, organised in France in 2020-21, brought together 150 citizens to develop measures for reducing greenhouse gas emissions.
- The Deliberative Poll on Nuclear Construction, held in Korea in 2017, gathered a sample of 471 citizens to collect the public opinion on the construction of two new nuclear power plants in the country and inform policy.
- The Citizens' Jury on Climate Actions, held in Finland in 2021, gathered 33 randomly selected citizens to discuss the Medium-term Climate Change Policy Plan and formulated an informed public judgement on them.
- The Smart City initiative of Parma (Italy) organised a scenario workshop in 2018 for citizens to envision desirable smart city scenarios for 2030.

In the area of STI policy, citizens can engage in policymaking processes for a range of purposes, such as selecting priority areas for public R&D investments, identifying societal impacts of new technologies and identifying societal challenges to be targeted by innovation programmes.

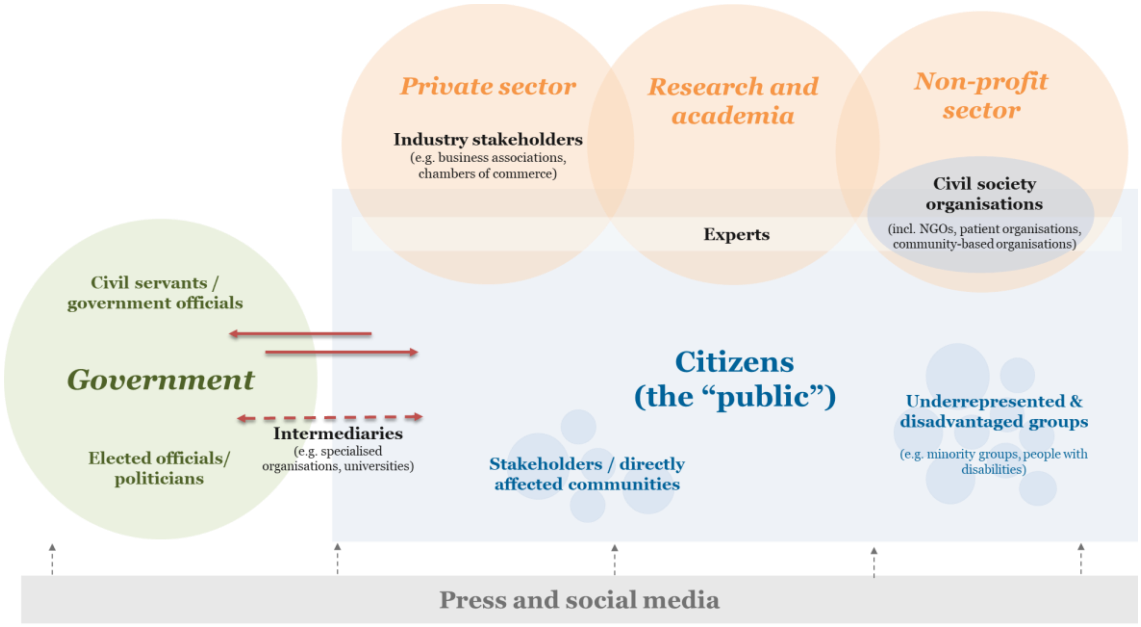
Other complementary ways of involving citizens in STI –communication, consultation and participation in research and innovation activities– are discussed in section 4.

2.2. Who is the "public" to engage and who engages with it?

Various groups are involved in participatory processes in innovation policymaking. Figure 1 maps the different actors of the innovation ecosystem that are relevant to citizen engagement in this policy field. The primary participants in the dialogue are citizens (the "public") and government (the "organisers"). There are, however, other entities that may act on their behalf, such as specialised intermediaries and civil society organisations. Experts and stakeholders from research institutions and the private sector, as well as the media, also play important roles in the process, as discussed in section 2.4.

[1] For the purpose of brevity, the term "innovation" is used throughout this paper to refer to "science, technology and innovation". Where needed, specific references to science and technology are made.

Figure 1. Mapping of actors that play a role in citizen engagement in innovation policy



The "public": Citizens and civil society organisations

Citizen engagement processes in STI policymaking directly target citizens or civil society organisations (CSOs).

Citizens (or the "public") are defined here as individuals engaging in participatory processes in their personal capacity. They do not act in their professional capacity, e.g. as experts or business representatives. With diverse backgrounds and life experiences, they are consulted in policy processes to contribute their ideas, knowledge, values, imaginaries and expectations. Engagement processes often place focus on involving underrepresented and disadvantaged groups.

Civil society organisations (CSOs) – such as non-governmental organisations (NGOs), patient organisations, community-based organisations, consumer associations, public and private foundations, think tanks – can also act as representatives of some groups of citizens that share some characteristics and/or interests. In some cases, dedicated bodies are established to institutionalise the representation of minority or disadvantaged groups in policy processes. For example, the Permanent Committee for Consultation with Indigenous Peoples from Colombia, created by decree in 1996, engages in all policy processes that may directly or indirectly affect indigenous populations. It includes representatives from five indigenous organisations from Colombia (MPC, 2023[7]).

The involvement of CSOs has advantages but is not always an option to represent citizens. Citizens have a comparatively higher participation threshold than CSOs, as they often do not have the time nor the sufficient resources to stay informed about issues beforehand. They may also be less aware of the role they can play in decision-making processes (OECD, 2022[5]). CSOs typically have the time and resources to devote to engagement activities (even if these also vary significantly across CSOs), are well-informed about issues relating to their area of activity and have previous experience engaging with public authorities. However, CSOs may not always be recognised as legitimate representatives by the groups they are supposed to represent or act as polarising forces in certain debates.

Government: civil servants and intermediaries

On the side of the organisers of the citizen engagement process, the following can play important roles: i) civil servants and government officials across the public administration, ii) specialised intermediary organisation mandated by governments to conduct public engagement and iii) elected officials and politicians

Civil servants and government officials may directly engage with citizens, thereby strengthening trusted relationships between citizens and public institutions. A study exploring 16 participatory technology assessment (pTA) procedures found that the chances of having resonance in public debates was high for those organised by institutions with decision making powers or institutions that played a very clear and respected role as consulting bodies (Joss and Bellucci, 2002[8]).

Intermediaries often engage to provide professional support in the design and implementation of engagement methods and tools and to be the direct point of contact of citizens (e.g. in their role as facilitators of citizen assemblies) (Capstick et al., 2020[9]). They have the capacities to design tailored engagement processes – from the outreach activities to the design of specific methods and tools to gather and process inputs collected. Oftentimes these capacities may be lacking or be insufficient within public administrations.

Specific institutional set-ups have also been established, such as Sciencewise – the UK government's public engagement programme aimed at supporting policy makers develop socially informed policies related to science and technology – which is run in a partnership between UK Research and Innovation, the Department for Business, Energy and Industrial Strategy and a consortium led by public engagement charity Involve, with the British Science Association and National Co-ordinating Centre for Public Engagement (NCCPE). Sciencewise organises public dialogues on issues of strategic importance. Examples have included the implications of whole genome sequencing for new-born screening, the ethics and privacy concerns around location data, and the social impact of offshore renewable projects.

Elected officials and politicians may also play roles in engagement processes, leveraging their direct connections with citizens. They may also provide for an alternative to citizen engagement by acting as citizens' representatives. This matters where consultations cannot easily be scaled for a full national consultation due to the complexity of the issue at hand.

Table 1 presents the strengths and weaknesses that each of those actors have when it comes to being the direct interlocutor of citizens in STI policy making processes.

Table 1. Actors engaging with the public: relative strengths and weaknesses

	Strengths	Weaknesses
Elected officials / politicians	• Democratic mandate of representing citizens in policy decision making • More time and resources to develop expertise and engage in parliamentary debate around complex policy topics (e.g. as members of parliamentary committees on science and technology), including those that are deemed less suitable to direct citizen engagement • Existing direct connections with their constituencies (e.g. party structures connecting to local and community levels)	• Some groups in society may not feel represented due to distrust in government • Risk of bias towards short-term, tangible and highly visible policy actions

	Strengths	Weaknesses
Civil servants	• Policy domain expertise (experience in a specific thematic area, knowledge about policy mix in place, etc.) • Knowledgeable about public administration and policy making processes • Longer-term horizon in policy making (as compared to politicians) • Ensure continuity in policymaking when political leadership changes, preserving legacies and institutional knowledge • Citizen's direct interaction with policymakers increases transparency of public civil service and brings citizens closer to policymaking process, possibly enhancing trust in public institutions • Civil servants' interaction with citizens allow them to have a better understanding of their diverse needs and concerns. This can help shape better policies and increase chances of successful implementation.	• Lack or limited experience in designing and implementing citizen engagement processes • Limited time and resources to develop skills and capabilities to directly design and implement participatory processes • May be more resistant to change and less prone to experiment with new approaches and tools to engage citizens • Existing incentive structures not set to encourage engagement with citizens and/or implement citizen inputs
Intermediaries (individuals or organisations specialized in designing and deploying participatory processes)	• Expertise in designing and implementing tailored citizen engagement processes (e.g. defining methods, facilitating discussions, processing inputs received) • Capacity to leverage lessons from similar past experiences • May be perceived as neutral and trustworthy interlocutors/facilitators (e.g. due to reputation and/or the fact of being independent from government)	• No direct connection to the policy process, reducing potentially impacts of consultations on policy making • Not directly accountable to the public • Possibly limited expertise in the specific policy area

2.3. What are the goals of engaging citizens in innovation policy?

Engaging citizens in innovation policy processes can be pursued to realise one or several of the following goals (Figure 2):

1. **Increasing the quality of innovation policy**. Engaging citizens in policymaking is a way of tapping into new sources of policy-relevant ideas, information and resources. Citizens can help public authorities identify a broader set of challenges – such as those affecting particular localities or groups – that require innovative solutions (Pereira and Völker, 2020[10]). These processes can avoid biases in policy decisions as these are affected by the perspectives of those taking them. An example is the historical problem of gender bias in medical research, in which women's health issues have been overlooked in what has been a sector dominated by male. Citizen engagement can also help make unexpected connections among diverse phenomena and trends, which is important in contexts of major transitions. They may also help reduce unconscious biases in policy choices.
2. **Emphasising the societal focus and inclusivity of innovation policy.** Engaging with citizens helps design innovation policies that prioritize societal needs and that account for their broader (direct and indirect) socioeconomic impacts (e.g. impacts of AI on jobs, or the installation of offshore windfarms on landscapes). Comparative analyses of research priorities proposed by citizens and experts show how these differ, with social needs being more at the forefront of citizens' proposals (CIMULACT, 2018[11]) (Gudowsky and Rosa, 2019[12]) (Rosa, Gudowsky and Repo, 2021[13]).

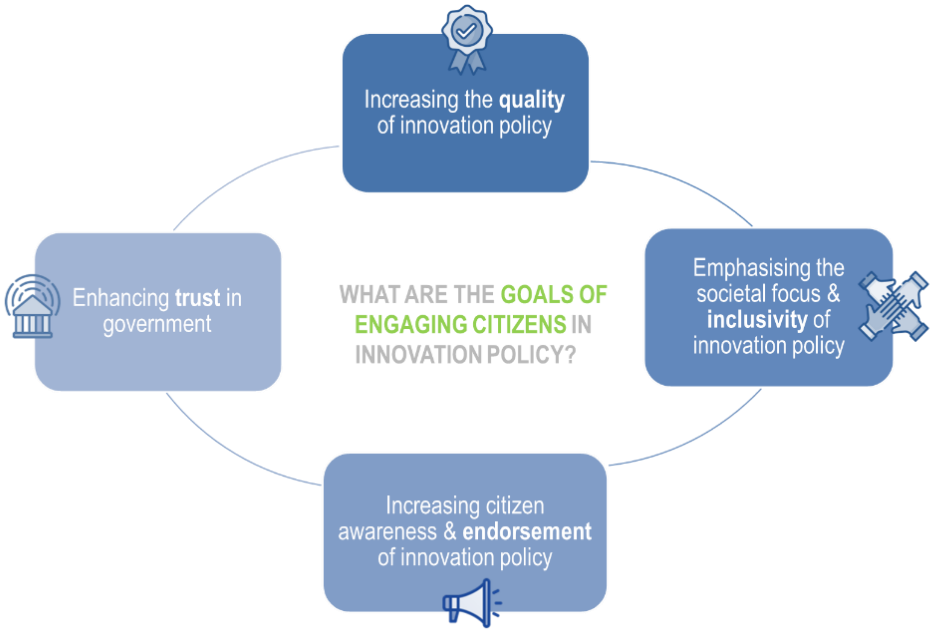
Well-designed participatory processes enable policymaking to incorporate a diversity of perspectives, thereby enhancing the legitimacy of policy choices. This includes engaging with those more affected by innovation policy measures. For instance, discussions on fuel carbon taxes should involve rural households, more affected by those measures than city dwellers due to their limited access to cleaner public transportation alternatives.

3. **Increasing citizen awareness of and support for innovation and innovation policy aimed at advancing societal goals**. Involving citizens in innovation policymaking processes, such as foresight or technology assessment, increases the visibility of STI and its policies and the public awareness of their role, purpose and impacts. This contributes to a more informed citizen understanding of innovation and the opportunities and risks involved, helping combat misinformation due to lack of awareness.

   Citizen engagement can also lead to greater support for innovation and innovation policies that aim to advance societal goals. For instance, these processes can increase social awareness about the urgency of combatting climate change, resulting in behavioural changes on the part of citizens. The Missions València 2030 initiative, which aims to make Valencia a climate neutral city by 2030, does so by recruiting citizens as "ambassadors" to support needed transformation processes within their reach (Missions Valencia, 2023[14]).

4. **Enhancing trust in government and the public administration.** The institutionalisation of participatory policymaking processes –in innovation and other policy fields– can increase the levels of trust in public institutions and responds to public calls for greater government transparency and accountability. This applies specifically where representatives from government and the public administration participate directly in these processes rather than delegating the task to intermediaries.

Figure 2. Four goals of engaging citizens in innovation policy



2.4. The key role of other actors for societal engagement

Experts and industry stakeholders

Innovation policymaking processes also require inputs from experts and industry stakeholders to advance the innovation policy agenda. Consultations with these actors are often complementary to citizen engagement processes and may take place at different stages of the policy cycle (Table 2).

Independent experts (e.g. researchers, academics, individuals with technical expertise in a specific area) are often solicited to provide impartial and domain-specific knowledge and expertise during the design and implementation of innovation policy initiatives. For instance, Impact Canada's challenges programme involved more than 3000 independent experts who tested and revised the design of challenges and participated in juries to assess the submitted applications (Impact Canada, 2023[15]).

Business associations, chambers of commerce, trade unions and professional organisations often act as representatives of stakeholder groups and business interests in policy processes. Their contributions are crucial in advancing innovation policy agendas, as consultations can help to better understand the obstacles facing industry and the appropriateness of policy tools to specific contexts. Engagement with business also matters for building joint agendas for important societal goals as dealing with the limitations of public funding requires industry engagement.

Table 2. Comparing the role of citizens vs experts and stakeholders in innovation policymaking: some examples

Objective	Citizen engagement	Expert and stakeholder engagement
Define a national research agenda	• Crowdsourcing of ideas • Develop a better understanding of citizens' needs and concerns, helping to define priority areas for research to have societal impacts • Prioritize among broad areas of research (e.g. relative focus on green vs health issues, and specific challenges as part of those)	• Gather evidence on the comparative strengths of the national research base (both public and private) and identify areas with higher potential • Set detailed short and longer-term goals for research in specific areas, based on societal priorities expressed by citizens
Design a mission-oriented innovation programme to support the green energy transition	• Crowdsourcing of ideas • Develop a shared vision of the desired energy mix of the future, to be used as a basis to define the "missions" • Prioritize areas for investment in research and innovation • Support implementation by aligning own action with policy objectives (e.g. reducing energy consumption, using green energy sources)	• Gather industry insights on the current state of development of specific green energy technologies • Understand barriers to technology development (e.g. regulatory, financial, market, technology barriers) and scaleup of solutions • Help test the validity of the design of a challenge-based programme to advance on the selected missions (independent experts) • Participate in juries to assess the applications submitted (independent experts)
Support the development of specific green technologies	• Gather citizens' perspectives about the impacts (social, ethical, economic) of the deployment of specific green technologies (e.g. windmills)	• Gather industry insights on technology readiness of specific green technologies • Understand barriers to technology development (e.g. regulatory, financial, market, technology barriers) and scaleup of solutions

How experts and industry stakeholders are involved is important in designing engagement processes. Experts may inform engagement processes and enhance the quality of the exchange, but they may also influence citizens' reactions to certain issues. Beneficial in this regard is the shift away from an "ivory tower" elitist identity of scientists towards scientists seeing themselves as engaging with society. Industry stakeholders may similarly

– depending in how they are integrated in the design of societal engagement processes – influence processes in ways that shape results in biased ways.

The press and social media

Since citizen engagement is about connecting with the public, it is closely linked to the press and social media. The press, which encompasses various media outlets that disseminate news, information, and opinions to the public (such as newspapers, magazines, television, radio, and online news sources), can play the following roles:

- Providing timely information to the public about innovation policies, uncovering developments of relevance to the public to encourage engagement.
- Offering an analysis of innovation policies to help the public understand the potential benefits and risks of different policies.
- Acting as a platform for public debate to facilitate discussion and engage different stakeholders in the dialogue about innovation policies.
- Holding policymakers accountable for their decisions and actions to ensure innovation policies are developed in the public interest and that public resources are used effectively.
- Helping scale societal engagement processes by giving them visibility in the press consulted by civil society.

Social media, which are digital tools and platforms that allow users to create, share, and exchange user-generated content, can reinforce these positive contributions of the press to societal engagement in innovation policy. Social media can also provide additional benefits to societal engagement that are not as easily achieved by the press. Social media can notably create virtual communities and enable real-time feedback, allowing for greater interactivity and engagement between citizens and policymakers.

While the press plays an important role in societal engagement, there are also several challenges that it may pose:

- *Sensationalism and bias*: Some media outlets may prioritize sensational stories over accurate reporting and may present information in a biased or slanted manner. This can distort public perception of innovation policies and lead to misunderstandings and misconceptions.
- *Limited access to information and narrow focus*: Journalists may have limited access to information or sources and may not be able to provide a comprehensive view of innovation policies. Additionally, the press may focus on a narrow set of issues or perspectives, which may not fully reflect the diversity of views and opinions among stakeholders.
- *Short attention span:* The press also faces a challenge of short attention spans among audiences. With the rise of digital media, many people consume news in short-form content, such as tweets or headlines. This can make it challenging for the press to communicate complex ideas and policies effectively, and may lead to a superficial understanding of the issues.
- *Declining trust*: Finally, declining trust in the press is a significant challenge. In recent years, there has been a growing perception among some segments of the public that the media is biased or untrustworthy.

Social media may suffer from these shortcomings and face additional challenges of their own, including the following:

- *Filter bubbles and echo chambers:* Social media algorithms can create virtual spaces where users are only exposed to content that aligns with their pre-existing views and beliefs. This can reinforce existing biases, limit exposure to diverse perspectives, and reinforce polarization, making it more difficult to foster an informed and inclusive public debate.
- *Trolling, harassment, privacy, and security:* Individuals and groups with dissenting views may be subjected to online abuse, harassment, and cyber-attacks, which can intimidate and silence them. Additionally, cybersecurity risks, such as data breaches, can compromise the privacy and security of users' personal information, further hindering their participation in public debate.
- *Lack of transparency:* Social media platforms' lack of transparency around how they operate, how content is curated, and how data is collected and used can undermine public trust in the platform and make it more difficult to foster an informed and inclusive public debate.

3. Citizen engagement processes in innovation policy: When and how?

3.1. What are the challenges of engaging citizens in innovation policy?

Engaging citizens in science, technology and innovation policymaking is not an easy task for the following reasons:

- **The scope of action of innovation policies is less directly connected to most people's everyday lives and concerns**, compared to areas such as education, health or labour market policies. Science, technology and innovation policies remain largely unknown by the public and may be perceived as less related to their needs and concerns. For instance, some citizens may associate innovation policies with support to large companies or technology start-ups.

  Nonetheless, there are some exceptions of science and technology fields that enjoy greater public visibility, either because people more easily relate to them (e.g. cancer research) or because they are controversial and spur public debate, such as genetically modified foods, nuclear energy or artificial intelligence (AI). Health is another such area with those affected having strong incentives to engage.

- **The effects of innovation and its policies may be difficult to demonstrate and tend to materialise in the longer term**. For example, many technologies necessary for decarbonisation are still at a low level of technological readiness and will require decades of investments before society can benefit. In addition of materialising in the longer term, the impacts of innovations and their policies can be difficult to disentangle from other factors.

  However, breakthroughs in certain technologies may have rapid and broad impacts on society. This is illustrated by the recent introduction of ChatGPT, a tool that has a wide range of applications across professions and is used by a range of social groups, such as students and researchers.

- **Citizens may perceive innovation policy as a highly complex and technical field dominated by scientists and experts**. Citizens with non-scientific or non-technical backgrounds may consequently consider they have little to contribute, especially in policy discussions where technical jargon is widely used.

There are also challenges to citizen engagement that apply to all policy areas:

- **Citizen engagement processes are costly and time consuming**. Participatory processes require that participants and public authorities organising them engage. In addition to the cost implications for both parts, such processes risk slowing down decision making processes. Costs increase with the complexity of the topics at hand.
- **Skills and capabilities within public administration are needed to plan and implement such processes successfully**. Participatory processes must be tailored to the specific context, goals and target population, requiring specific capabilities. These need to be build up over time.
- **Ensuring a balanced representation of all parties concerned is not easy**. Participatory policy processes disproportionally attract those with vested interests. The voice of large parts of society including more disadvantaged groups may remain unheard, unless specific measures are put in place to reach them and facilitate their engagement.
- **Citizens may suffer from consultation "fatigue"**. Citizens are regularly solicited their opinions and feedback– from filling in consumer satisfaction surveys to providing feedback about specific public services. The multiplication of such requests can lead to situations of consultation "fatigue", whereby citizens (as consumers or users) disregard such requests, viewed as time consuming and bringing little (or no) direct benefits to them.
- **Engagement processes may be instrumentalized.** Vested interest groups have specific interests in policy decisions and may consequently attempt to dominate public engagement processes with their own views. This can bias results and negatively affect the participatory process itself, requiring the implementation of specific provisions to ensure a fair and inclusive engagement process.

The sections that follow discuss how to design and implement engagement processes in view of mitigating these challenges and maximising their returns to innovation policy.

3.2. What direct citizen engagement cases should be prioritised?

While it is a prerogative in democratic societies to ensure policy choices reflect societal perspectives, direct public engagement is an option. Where this is not feasible, elected officials have an important role to play as citizens' representatives. Citizens delegate most policy decisions to representatives, who are supported by civil servants that specialise in specific policy domains and are knowledgeable about the functioning of public administration systems.

Cases of most value of participatory processes

Participatory processes are most valuable in the following cases:

- **Decisions on long-term policy directions among a diversity of possible pathways requiring societal endorsement.** These decisions can fundamentally shape the vision for the future that society has for itself, and should therefore be

socially embedded. Such decisions may involve value judgements, important trade-offs and significant costs in the short term, while benefits may only be reaped in the longer term. They may also disproportionally affect some groups or sectors (OECD, 2020[3]).

Technological progress is not neutral and there is evidence to document biases when decisions exclusively depend on experts. For instance, progress in medical research has historically been gender biased, with health issues affecting exclusively women being largely overlooked as the sector was dominated by male. In the case of long-term strategies for the green transition, relying only on experts' assessment could lead to decisions guided by specific (technical) perspectives, while disregarding other societal implications.

- **Policies requiring local community knowledge and inputs for their successful design and/or implementation.** Citizens are the most knowledgeable about dynamics and challenges that affect their everyday lives in their communities. Their perspectives can critically inform innovation programmes aimed at responding to specific community needs (e.g. addressing public transportation challenges in a specific region), and be an important complement to experts' perspectives.

  For example, the Ideas for Change programme in Colombia, launched in 2012, relies on citizens' participation to identify needs and social challenges in vulnerable communities, and to select the most suitable of the responses proposed by researchers and innovators (Minciencias, 2022[16]). The programme has addressed various environmental challenges. In 2014, it focused on bringing clean energy to vulnerable areas of Colombia. After identifying the key issues and receiving a series of proposals from STI actors, the initiative developed 14 solutions to bring clean and renewable sources of energy to community spaces, such as schools or health centres, benefiting almost 5 000 families.

  Another example is the engagement of citizens in the co-creation of Climate City Contracts (city action and investment plans to achieve climate neutrality by 2030, developed under the EU "Cities Mission"). Besides providing their local knowledge and ideas, citizens are seen in this context as key agents of urban transformation given their role as consumers (e.g. of electricity) and users (e.g. of public transportation) (Robinson, 2022[17]).

- **Policy topics citizens deeply care about, that possibly create divides between "winners" and "losers" and where trust in public institutions may be at risk**. The areas citizens deeply care about are important for engagement particularly where they risk polarising societal debates, including on social media. The limited uptake of COVID-19 vaccines is a case in point. It is also essential to address issues that negatively impact certain segments of the population. For instance, industrial transitions can affect regions specialised in declining industries and those employed by them, while benefiting the rising sectors. Engagement can help promote trust in government as a supporter during the transition.

  In recent years many public dialogues have focused on the impacts on society of advances in the fields of data, artificial intelligence and robotics. These have voiced public concerns about the unequal distribution of benefits and risks of such advances (Sciencewise, 2023[18]).

Feasibility considerations

The feasibility of effective citizen engagement to reach their objectives needs to be weighed in and suggest prioritising some topics and purposes. Policy topics that are more accessible to the public and in which they have a greater stake may be given a priority. In some cases, the complexity of the issue requires high preparation costs to ensure a well-informed participatory process where citizens can effectively engage. This includes, for instance, regulatory aspects related to complex technologies with future applications such as quantum computing. Moreover, selecting topics of strong interest to the public will also help facilitate the engagement of citizens.

Regarding purposes, seeking societal consensus around local challenges and exploring diverse ideas across all groups in society may be especially key. The advantage of focusing on local challenges is that convening those concerned is more straightforward than in larger national settings, particularly as engaging some groups requires in-person events of small participation sizes (see discussion below on virtual vs. in-person). In addition, gathering ideas and perspectives from diverse and commonly excluded groups can provide valuable contributions and is a worthwhile objective to pursue, even if full national representativeness cannot be achieved.

3.3. When should citizens engage in policy making?

Citizens are often solicited to engage in four stages of innovation policy making:

- **Strategy and agenda setting**, with the objective of defining the short- and long-term strategic priorities for innovation policy and funding. This also includes processes of research agenda setting.
- **Programme definition**, with the objective of defining priorities for research and innovation programmes or allocating funding across priority areas.
- **Strategic policy intelligence processes**, particularly in:
  - technology assessment (TA) – processes to identify and assess the short- and long-term consequences (e.g. societal, economic, ethical, legal) of the application of new technologies. TA involving citizens is known as participatory technology assessment (pTA) [for more about TA, see (Robinson, Winickoff and Kreiling, 2023[19])].
  - strategic foresight – the structured and explicit exploration of multiple futures to inform policy making. This is often linked to agenda setting.
- **Policy implementation**, with the objective of supporting the successful deployment of policies. Citizens may contribute by adopting and diffusing resulting innovations, providing feedback as consumers or users (e.g. of green public transportation), and/or changing behaviours to align with specific policy objectives.

Table 3 presents the purpose of engaging citizens in those processes and provides examples.

Table 3. Purpose of citizen engagement at different stages of the innovation policy cycle

Stage of STI policy cycle and purpose of citizen engagement	Examples
Strategy and agenda setting: • Define short- and long-term strategic priorities for innovation policy and funding. • Define research agendas that consider citizens' priorities/ concerns.	Creating our Future in Ireland was a government-led national brainstorm initiative organised in 2021-22 to encourage citizens in Ireland to share their ideas to inform future research and innovation agendas. Over 18,000 online submissions were received between July and November 2021. The process informed the "Impact 2030: Ireland's Research and Innovation Strategy" published in May 2022, as well as other challenge-based funding initiatives (SFI, 2022[20]) (Government of Ireland, 2022[21]). The development of the Flemish Science Agenda (2017) in Belgium involved citizens to learn which research issues they considered most important. More than 10,000 questions were submitted about 82 overarching topics. The "Five nights of science" was subsequently organised, in which people sat around the table with experts to engage in conversations about the questions raised. The Dutch Research Agenda (2016) was initiated by the Dutch Government to set out priorities for research and create a better match between research and social and economic needs (NWO, 2022[22]). Citizens submitted more than 12,000 questions for science through a web platform. Juries composed of top researchers from all fields sorted those questions into clusters, resulting in 140 overarching questions for research and innovation. In Colombia, citizens have recently engaged in the development of the National STI Policy (2021), the Social Appropriation of Knowledge Policy (ongoing) and the National Development Plan for 2023-26 (ongoing). The latter involved the creation of 51 regional dialogues (*diálogos regionales vinculantes*) and the organisation of 2,000 roundtables with citizens (Government of Colombia, 2023[23]).
Programme development: • Define priorities for research and innovation programmes (e.g. missions of mission-oriented programmes). • Allocate funding across projects / priority areas.	Citizens provided inputs to define the EU Missions, launched as part of Horizon Europe., launched as part of Horizon Europe. In the summer of 2020, ten citizen engagement events were organised to collect proposals from the public for the five missions. Citizens could also upload their ideas on a digital platform. These contributions fed into Mission Board reports presented in September 2020 (European Commission, 2021[24]). Each of the five missions envisages citizens and stakeholders to be involved in their implementation in different ways, as explored by Robinson (2022[17]). The potential of experimental approaches to strengthen citizen engagement in EU Missions will be explored going forward (European Commission, 2023[25]). In Korea, the X-Project is a national R&D programme that involves citizens in the identification of research problems to be solved through science and technology solutions developed by researchers (OECD, 2017[2]). Citizen participation in the allocation of budgets across projects or priority areas has mostly been implemented at the local level (Involve Foundation, 2022[26]). An exception was the Portugal Participatory Budget launched in 2017 at the national level to allow citizens to decide on public investments in different governmental areas (OPSI, 2018[27]).

Stage of STI policy cycle and purpose of citizen engagement	Examples
Technology assessment: • Identify and assess possible short- and long-term consequences (societal, economic, ethical) of the application of new technologies, to steer technology development toward socially desired outcomes. • Give public resonance and visibility to controversial policy (technology) issues, making them part of public debates.	Participatory technology assessment (pTA) gained traction in the 1980s, when the Danish Board of Technology started experimenting with consensus conferences, followed by efforts in the 1990s in the Netherlands (Rathenau Institute) and the United Kingdom (Joss and Bellucci, 2002[8]). In 2010, the Expert and Citizen Assessment of Science and Technology (ECAST) network was created – a network bringing together universities, science centers, and nonpartisan policy think tanks to conduct pTAs on complex, contested, and emergent science, technology, and society issues. It has conducted several large-scale public deliberations in the United States, on issues related to space exploration, healthcare innovations, driverless car technologies and climate change (ECAST, 2022[28]). An example of the latter was a public forum to deliberate about whether scientists should conduct geoengineering research to explore methods to directly manipulate the climate to reduce the negative impacts of global warming (CSPO, 2022[29]) (CSPO, 2019[30]). Other organisations regularly organise pTA exercises, including independent bodies that advise parliaments and governments on science and technology issues, such as the Swiss Foundation for Technology Assessment (TA-SWISS) and the Norwegian Board of Technology (Teknologiradet). Since 2016, TA-SWISS and Science et Cité have been conducting "Focus series" – one-day participatory events, organised as moderated workshops and plenary sessions in which citizens share their views and concerns regarding the development and potential impact of a new technology. They also prepare questions and recommendations for policy makers. Upon conclusion of a Focus event, a publication is issued with a summary of the expert input from the workshops as well as a general report on the participants' considerations, opinions and discussions (TA-SWISS, 2023[31]). The Norwegian Board of Technology launched the project "Attitudes to new transport technologies" (2021-2022) to involve citizens and stakeholders in forward looking discussions about new transportation technologies, such as self-driving cars and shared mobility. The project uses scenario workshops to depict potential futures, focus group discussions and public polls. Insights from citizens are used to understand people's perception and to inform public policy (Teknologirådet, 2021[32]).
Foresight: • Explore multiple futures and their implications for society. • Develop a shared vision for the future and determine the actions, steps and resources needed to reach it. Often linked to agenda setting.	BioKompass project (2017-20), funded by the German Federal Ministry of Education and Research (BMBF) to engage in a civic dialog regarding the transition toward a bioeconomy – defined as a shift away from fossil resources toward bio-based resources, products and processes. The research team developed a future dialogue with more than 60 citizens and experts to discuss how the bioeconomy might affect people's everyday life in specific areas, such as mobility, housing, consumption, and work. Building on this process, alternative scenarios for the year 2040 were co-developed using citizen inputs, stakeholder positions, and trend research. At a second civic dialog with more than 50 participants, the scenarios were discussed and enriched using a method of co-creative narrative generation. Each scenario addresses different development trajectories for topics central to any future bioeconomy development, and their impacts on policy spheres, technological development, economic structures, individual practices, and quality of life (Rosa et al., 2021[33]). At the EU level, the CIMULACT project (2015-18), funded by the EU H2020 programme, engaged citizens in re-defining the European Research and Innovation agenda based on shared visions, needs and demands (CIMULACT, 2018[34]). More than 1,000 citizens in 30 European countries participated in national vision workshops to discuss and formulate their visions for a desirable sustainable future. All countries applied the same format and materials (e.g. inspirational magazine and pictures, facilitators' scripts) to have a uniform and comparable method to generate those visions. Citizens' visions were then translated into recommendations for future research and innovation topics, including 23 suggestions for Horizon 2020 topics. The results were afterwards validated, enriched and prioritised by more than 3,400 consulted online (CIMULACT, 2018[34]).

Stage of STI policy cycle and purpose of citizen engagement	Examples
Implementation: • Support deployment of innovation policies by adopting and diffusing resulting innovations, changing behaviours, and/or providing feedback as users/consumers	In Valencia (Spain), citizens and civil society organisations are encouraged to become ambassador organisations of the Missions València 2030 initiative. Ambassadors commit to support transformation processes within their reach, engage when possible in research and innovation efforts to have a positive impact on one or several missions, and become informative multipliers to disseminate information regarding the programme (Missions Valencia, 2023[14]). Climate City Contracts are action and investments plans signed between cities and national governments co-created with citizens and other city stakeholders to achieve climate neutrality by 2030 (Robinson, 2022[17]). These were implemented as part of the EU Mission on Climate Nautral Cities. Examples include the Climate City Contract 2030 in Sweden which involves 23 cities, and the citiES 2030 initiative in Spain which involves 8 cities [as of December 2022].

In each of these stages in the policy cycle, effective citizen engagement requires careful timing. Decision-makers, however, often face tight and/or rigid timelines when developing new strategies or policy programmes. This can challenge the success of citizen engagement activities. Pressure to deliver quick and cheap participatory processes are counterproductive as they compromise the quality of outcomes and participants' satisfaction with the process.

3.4. How do citizens and policies benefit from engagement?

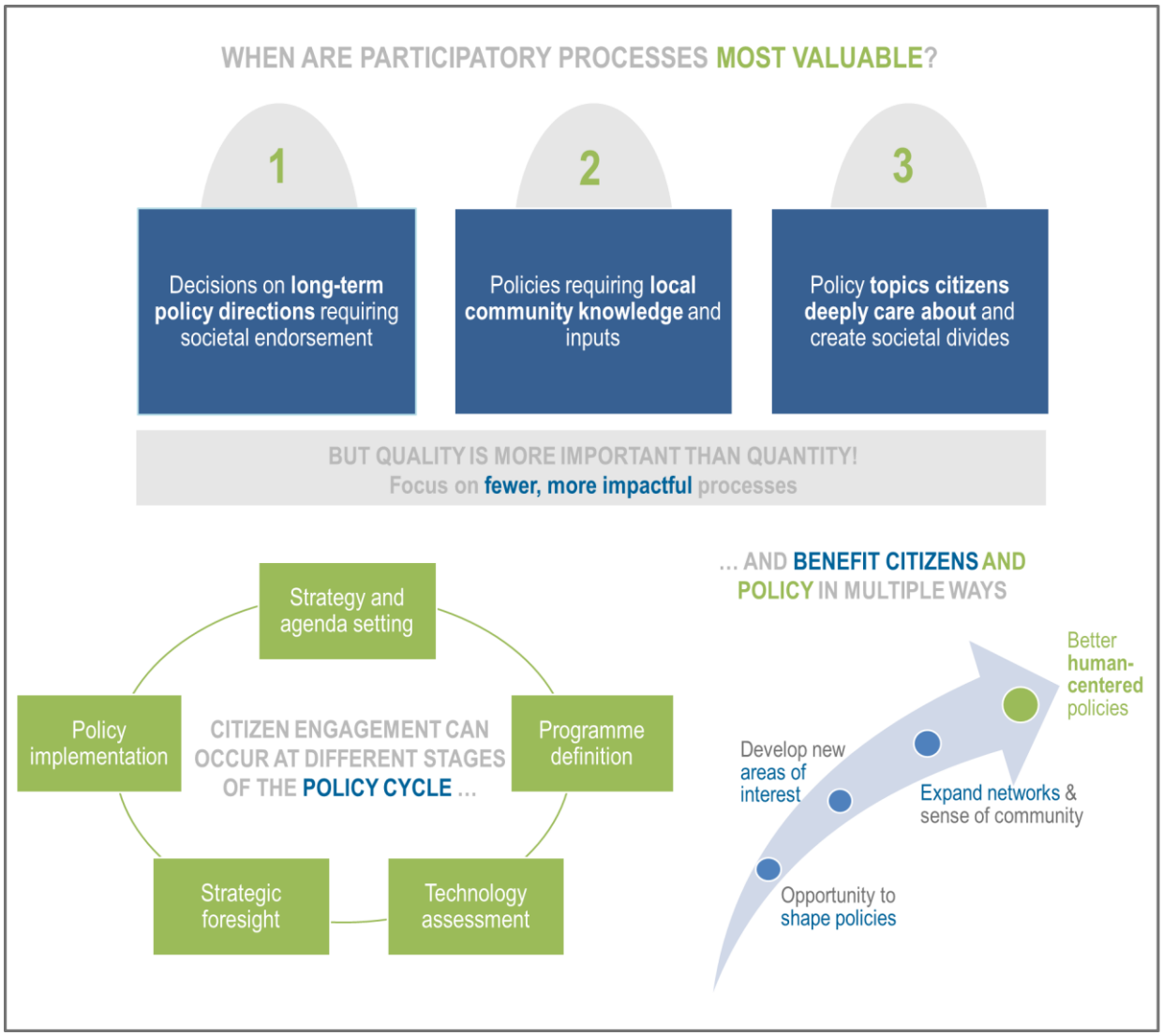
Citizens can benefit from engagement in multiple ways, notably by having opportunities to (Figure 3):

- Shape policies that will (directly or indirectly) have impacts on them. This requires that mechanisms are in place to integrate the outputs of the engagement process into policymaking.
- Expand capabilities and develop new areas of interest in the field of science and innovation. Effectively, a number of organisers of engagement processes have often observed that citizens are more interested in the topics of deliberation at the end of participatory processes.
- Expand citizens' networks and foster inclusion within communities, such as involvement in local communities.

Importantly, if citizens perceive that their contributions are somewhat overlooked, or that the exercise is conducted simply as a 'tick the box' formality, the participatory process can reduce trust in institutions and governments, negatively affect the legitimacy of adopted policies and reduce willingness to engage in processes in the future. This is an important consideration for implementation (see section 5.2).

The impacts and influence of citizen engagement processes on policy decision making are challenging to assess. While ex-post evaluations are rare, some analyses show the possibility of tracing such impacts that should be enhanced going forward. Many citizen engagement processes however still lack responsiveness by policy. The Knowledge Network on Climate Assemblies (KNOCA) (a European network for sharing best practice on the design and implementation of Climate Assemblies), for instance, argues that recommendations from climate assemblies are often ignored, rejected, or only partially considered, resulting in a loss of time and resources (KNOCA, 2022[35]).

Figure 3. Synthesis of when to engage citizens and how they benefit



4. Implementation of citizen engagement processes

This section discusses key aspects to implement citizen engagement processes. Section 3 of the Annex provides further generic references on citizen engagement.

4.1. How to succeed in reaching out to the target population?

Tailored outreach processes are needed to involve a wide diversity of citizens beyond those that are already interested in the topic or have stakes in the decisions. Specific efforts are needed specially to engage underrepresented and minority groups as well as those that are less engaged with government. Those representing more moderate views are also important contributors to the debate but may be less willing to engage than those with a strong view on the issue at hand.

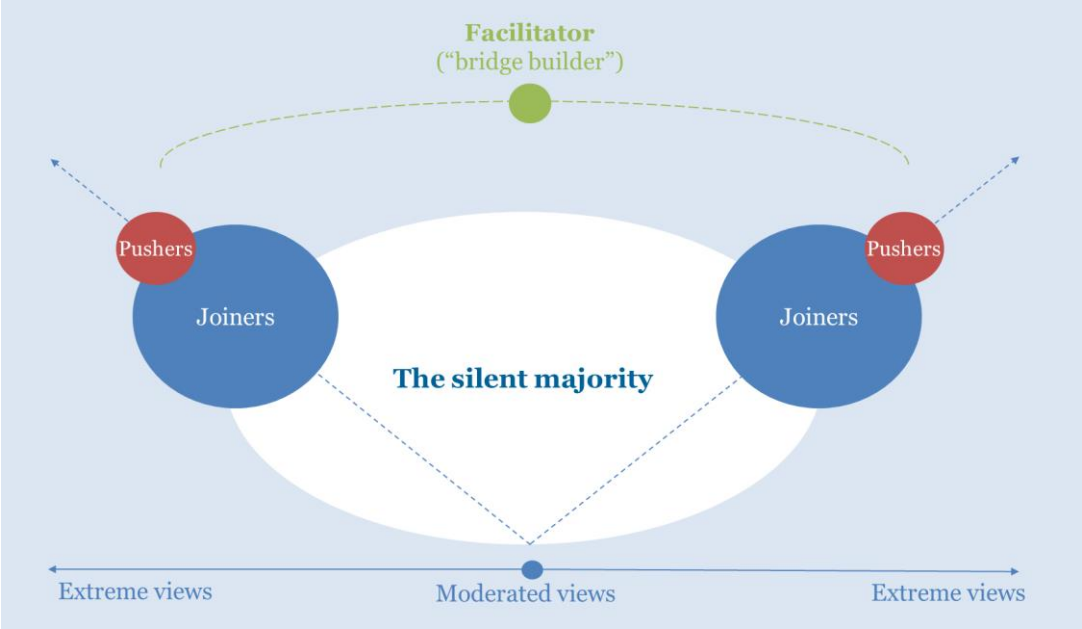
Several outreach approaches can be effective:

- **Building engaging and inclusive narratives**. To engage citizens effectively, it is important to tell a clear and engaging story about why a policy issue is relevant and how it will benefit society. This means framing innovation policy in a way that is relevant to people while avoiding the use of jargon. It is also important to show how citizens' inputs are relevant and can be used in the policy-making process. Design thinking – an iterative problem-solving and innovation approach that places human needs at the centre and involves empathy, creativity, experimentation and testing – and behavioural science can be used to develop these narratives and incorporate citizen perspectives (Mintrom and Luetjens, 2016[36]) (Liedtka et al., 2019[37])]. For example, the City of Helsinki has implemented design thinking methodologies to engage with citizens and better understand their needs and co-create urban spaces that best respond to them (City of Helsinki, 2023[38]). Collaborating with artists and educators can also benefit the quality of engagement materials.
- **Engaging "trusted voices" as intermediaries**. Community leaders, academics from a local university, or local industry leaders can play a key role in helping effectively connect to communities that feel more distant from government, such as minorities, specific ethnic communities but also specific groups in society. Such figures may benefit from higher levels of trust from citizens than government and public institutions and can help bridge possible barriers to engagement.
- **Profiling diverse groups in society**. Traditionally, citizen profiles have been defined using limited criteria such as gender, age, and education level. However, these do not capture important differences in social and cultural identities, beliefs, and attitudes. Impact Canada, a Canadian government initiative, has used surveys to identify diverse societal attitudes towards climate change, allowing for targeted and tailored approaches to engage different segments of society in policymaking (Impact Canada, 2023[39]).
- **Engaging local communities.** Local-level engagement processes may stimulate the participation of entire communities into the conversation, rather than only attracting specific groups. This is because local communities have a shared interest in designing their local environment.
- **Leveraging the press and social media.** As described in section 2.4, the press and social media can contribute to increase citizens' interest in citizen engagement processes, but also challenge them. They can also help scale impacts of such processes by reaching out to a wider group of citizens.

4.2. How to avoid the polarisation of debates?

Polarisation is a risk for engagement processes as it can lead to divided debates around an issue and hinder the objective of reaching consensus. The highly motivated "pushers" with extreme views often drive the conversation, pushing the majority of citizens who hold more moderate views to join one of the extreme perspectives. This dynamic may result in policy decisions leaning towards one side, excluding those with opposing perspectives and hindering the possibility of reaching a central and more inclusive position (see Figure 4). Social media may strengthen such dynamics by creating eco-chambers – spaces where those with a specific opinion only hear and interact with like-minded people (Iandoli, Primario and Zollo, 2021[40]).

Figure 4. Polarisation of discussions: extreme pushers and the silent majority



The design of the process of dialogue consequently becomes essential. Key considerations include the following:

- **Preparatory stage**: Participants in citizens' assemblies, for instance, are provided beforehand with learning materials and diverse expert perspectives that introduce them to the topic. Such preparation provides more balanced inputs for citizens to judge and develop their own informed views, contributing to empowering them to express their views during discussions instead of remaining part of the "silent majority".
- **Timing and discussion framing**: Setting up discussion prior to citizens having formed strong opinions is often helpful to avoid polarised debates. A study of 16 participatory technology assessment (pTA) processes found that topics on which actors had not taken yet a strong position have higher resonance with their audience (Joss and Bellucci, 2002[8]). Moreover, the framing of discussions can be set in ways that avoid polarised debates on a contentious issue, for instance, by discussing the wider set of issues around a problem to address, such as debating solutions to COVID-19 versus debating the use of vaccines only.
- **Expert facilitation**: Experienced facilitators that ensure 'louder voices' do not dominate the process are also essential (Andersson and Bassu, 2014[41]). These should be considered neutral and trustworthy by groups involved in the dialogue.
- **Neutral convening spaces**: Neutral and recognizable spaces are crucial for citizen engagement, whether physical public spaces or online forums that citizens feel comfortable joining. Libraries and museums may serve this purpose in urban settings.

4.3. What in-person and virtual engagement methods to use?

Engagement methods

Using an optimal mix of engagement methods that best responds to the specific purpose of engagement processes is essential for successful citizen engagement processes. This includes methods for in-person large-scale engagement processes defined as those involving more than 100 people and those for smaller-scale engagement often around 10-50 people):

- Methods for in-person large-scale engagement processes have the advantage of gathering representative samples, enabling policymakers to gather insights on public opinion to inform policy and help raise societal awareness about complex or controversial policy topics.
- Methods for smaller-scale engagement processes do not aim for representativeness but allow for useful in-depth discussion and allow gathering diverse ideas and perspectives, including from underrepresented groups that often do not engage.

A commonality across all methods is that if organised in person, these processes are quite resource intensive in terms of time, cost and expertise needed to organise them and to process the results. Digital tools such as deliberative online platforms and serious games make it easier to engage larger groups but have limitations as discussed next.

Section 1 of the Annex presents some of these methods and concrete examples.

Digital technologies

Digital technologies impact citizen engagement by i) offering an alternative channel for governments to communicate with citizens, and ii) providing efficient tools to gather and analyse societal perspectives and inputs.

Digital tools, such as deliberative online platforms like CitizenLab and CitizensFoundation (described in Annex 1), offer an alternative means of communication to in-person meetings and potentially enable wider citizen participation. They are less costly and quicker to organise compared to large scale in-person events, but efforts are needed to ensure citizens engage and biases from speaking only to those "online" need to be factored in. These platforms offer a variety readily-available tools for interaction – such as voting on polls, creating proposals or commenting on other people's posts, and generating real-time visualisations of people's opinions – that facilitate crowdsourcing ideas and engaging in conversations with citizens.

Despite these opportunities, in-person engagement methods are more effective for engaging certain groups, such as those who are disengaged, less trusting in government, or from underrepresented communities. In-person consultations can provide a more personal and interactive experience that may encourage greater participation and help build trust between citizens and government. Additionally, in-person engagement can be more effective in reaching those who may face barriers to digital participation, such as limited access to technology or discomfort with digital engagement forms.

Digital tools can also contribute to gathering and analysing perspectives and inputs from the public. For example, surveys to identify different societal attitudes towards innovation policy issues could be conducted to allow for a better understanding of the different groups to engage and design tailored approaches for each of them. In addition, digital tools offer the ability to gather and interpret societal inputs from consultations, enhancing their impact and use by policymakers. Large online consultations that result in millions of contributions

have been analysed using natural language processing tools, as was the case in France for the analysis of online contributions submitted by citizens as part of the Citizens' Convention on Climate organised in 2020-21. However, the capacity to use these tools effectively is essential.

4.4. What matters for communicating with citizens?

The communication set up with citizens matters critically for citizen engagement. This includes establishing a clear "contract" between organisers and participants at the beginning of the process, which outlines the purpose of engagement, expectations from both sides, and how outcomes will be used. Failing to uphold this contract can result in poor engagement results and reluctance from participants to engage in the future.

After deliberations have taken place, it is crucial to communicate effectively with participants regarding the use of their inputs and to be transparent and responsive to their feedback. This not only demonstrates the value of citizen inputs but also helps to build trust and reduce frustration. Furthermore, soliciting feedback from participants through surveys or questionnaires can provide valuable insights for improving future citizen engagement processes.

5. Complementary citizen involvement activities

This section describes three complementary ways of involving citizens in STI that can enhance the effectiveness of citizen engagement in policymaking. These are 1) communication activities, 2) consultation activities, and 3) citizen participation in innovation activities. Each of these activities has its own purpose (Table 4).

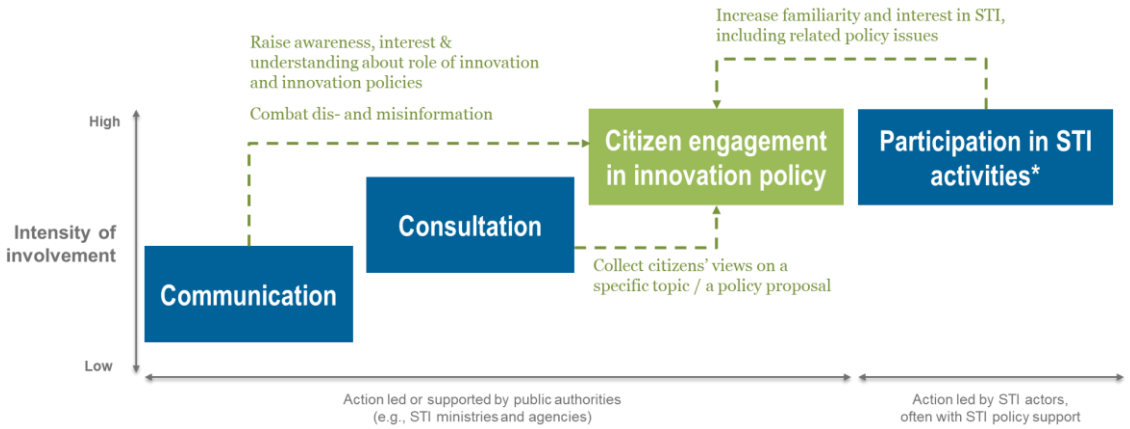
Table 4. Complementary citizen involvement activities: main characteristics and examples

Definition	Main purpose	Strengths	Weaknesses	Examples
Communication activities: government-supported activities aimed at informing citizens about science, technology and innovation	Increasing public awareness, interest and understanding of specific STI issues Tackle the spread of misinformation and disinformation	Potential to reach a large share of the population (depending on nature and design of the activity) Low cost for citizens that benefit from those activities	Unidirectional flow of information Passive involvement of citizens May be difficult to track who benefitted	Public seminars and conferences Open days at scientific institutions Science and innovation fairs, science festivals Exhibits in public spaces Science and innovation awards Documentaries on science and innovation shared via traditional media channels (e.g. TV and radio programmes) or social media.
Consultation activities: government-led activities aimed at collecting citizens' views on specific issues or feedback to policy or legislative proposals	Collect citizens' views and feedback to policy or legislative proposals, often via an online platform	Potential to reach a large share of the population if targeted outreach activities are in place Generally lower cost to organise and process inputs compared to engagement activities	Participants often limited to those with specific interest and informed opinions on the topic of consultation Often one-off interactions Often organised too late in the policy process to really affect the outcomes	Targeted surveys Online public consultations open to all citizens. The national consultation on digital and data transformation launched by the Government of Canada in 2018 is an example

Definition	Main purpose	Strengths	Weaknesses	Examples
Participation in STI activities: direct engagement of citizens in science and innovation activities	Engage citizens in science and innovation efforts, e.g. as collaborators in research and innovation initiatives led by professional researchers, contributors of inputs to scientific research activities or as testers of new solutions	Enable large-scale mobilisation of efforts (e.g. for data collection), speeding up research	Pro-bono engagement in activities needs strong motivation and cannot require too substantive contributions	Open challenges (programmes that reward those that can first or most effectively solve a specific problem) Hackathons (24- to 48-hour events open to all, in which participants are provided with data with which they have to create an innovative product) Living labs (open innovation ecosystems in which citizens can engage in co-creation and experimentation activities in real world settings) Fablabs (spaces providing citizens with access to infrastructure and equipment needed to experiment and create new things).

Communication, consultation and citizen participation in STI activities can contribute to successful citizen engagement processes, as illustrated in Figure 5. In brief, the following contributions emerge:

Figure 5. The role of complementary involvement activities in supporting citizen engagement in innovation policy



Communication activities inform citizens about STI issues. They can increase their awareness, interest, and understanding of specific topics, and help combat the spread of misinformation and disinformation. While they can reach a large audience, they are often unidirectional and passive, and may fail to involve those not already interested in those topics. Nonetheless, some innovative models such as gamification may help reaching a wider audience. For example, in the Netherlands, various games have been designed to entice households to be more aware of their energy use and adopt more resource-efficient behaviours (Engage2020, 2014[42]).

Consultation activities refer to methods used to collect citizens' views on specific issues or feedback on policy or legislative proposals. They are a relatively low-cost and quick way to enhance engagement processes and allow for better preparation, as they help gather information about the range of opinions that need to be reconciled. Online surveys are a popular example of consultation activities, which can be easily accessed and completed by

a wide range of citizens. By enabling citizens to voice their opinions and concerns, consultation activities can increase transparency and accountability in decision-making processes, and ultimately lead to more effective policies and solutions.

Participation in science and research activities offers an alternative and more active way for building awareness and interest in STI. While these activities tend to attract citizens with a specific interest, they can also serve as an entry point for those new to the field and help reduce the perception of research as disconnected from communities' needs and priorities (the "ivory tower"). Directly participating in science and innovation processes can also help build awareness and interest in related policies, and better equip citizens to engage in STI policy processes, ultimately facilitating citizens to connect the techno-scientific and socio-political aspects of STI. Policy tools can critically support such participation (see Section 2 of the Annex).

6. Policy recommendations and best practices for citizen engagement

This section describes policy recommendations that emerge from the analysis and an overview of best practices in implementing these processes.

6.1. Policy recommendations

- **More and better citizen engagement in STI policy that builds on robust evidence is needed.**

  Involving citizens in science, technology and innovation policymaking matters for transitions as policy decisions need to be socially embedded for the intended transformative impacts. Gathering systematic evidence on initiatives' impacts is important to allow for effective further experimentation. There is also much scope for cross-country learning.

- **Quality is more important than quantity: focus on fewer, more impactful processes.**

  Priority should be given to organising fewer, well-designed engagement processes with higher policy impacts. This includes deliberations of local community matters, deciding on major long-term policy directions and addressing developments with potentially negative impacts on societal actors.

- **Organising effective citizen engagement processes requires acquiring expertise or collaborating with supporting institutions.**

  Key expertise to organise citizen engagement includes capacities to effectively reach out and mobilise target groups (including underrepresented groups), select and tailor the methods and tools used, and facilitate discussions and process inputs received. Specialised intermediary organisations and research institutions can provide such expertise to help the public administrations progressively expand internal capacities.

- **Direct involvement of public sector officials in citizen engagement processes should be promoted.**

  The participation of public sector officials in citizen engagement is beneficial as it helps gain a deeper understanding of the diverse needs and concerns of citizens, helping them shape policies that better respond to them and increase the likelihood of successful implementation. Their direct participation can also foster greater trust

in public institutions, combating distrust in government, as proximity to citizens is created.

- **Citizen engagement needs to be anchored in a wider communication strategy regarding innovation policy.**

  Such a communication strategy needs to consider various perspectives as reflected on the press, social media and other citizen engagement processes, including consultations and citizen science. Consultations and citizen science contribute critically to informing and engaging citizens in STI. The press and social media can also strengthen and are critical to scale engagement. However, there are risks posed that governments need to address if they are to succeed in citizen engagement.

- **Citizen engagement processes must be designed in view of their intended purpose.**

  There is no one-size-fits-all recipe for engagement processes. Design choices (e.g. in-person versus online format, tools used, level of "orchestration", number of interactions and expected outputs) need to respond to the specific purpose and context of the participatory exercise (see next section for do's and don'ts).

6.2. Best practices for citizen engagement

Table 5 summarises a set of practical do's and don'ts to support the design and implementation of citizen engagement processes.

Table 5. Summary of do's and don'ts in planning citizen engagement in innovation policy

Do's	Don'ts
Defining the purpose and scope of engagement	
Prioritize societal engagement activities to undertake in view of available time and resources	Organise citizen engagement processes as a "tick the box" formality.
Organise citizen engagements activities with the intention of integrating the results in policy process and at the right moment	Engage with citizens without consideration to how outcomes will inform policy or when there is little scope for inputs to shape policy decisions as decisions need to be taken prior to having those outcomes
Account for costs of the participatory processes, allocate sufficient time and resources to organise, effectively engage and anticipate costs for processing inputs from citizens.	Organise many processes without sufficient funding or planning.
Develop compelling and clear "narratives" – stories that explain why a specific policy issue deserves citizens' attention – with diverse citizen audiences in mind	Communicate using jargon and technical/ scientific style from official document directly for consultations.
Set realistic targets for citizen engagement in processes	Solicit too much from citizens during the engagement
Targeting the relevant public and ensuring inclusive engagement	
Clearly define the "public" to involve and implement robust recruitment methods to avoid unbalanced samples, overrepresentation of specific interest groups and the polarization of debates.	Design participatory processes without defining the target population and resulting biases in engagement for certain groups in society

Do's	Don'ts
Plan specific actions to ensure under-represented groups can engage and have their voice heard (e.g. specific outreach activities, support throughout the process to ensure informed views, expert facilitation to guarantee level playing field in the participation space). Provide support for participation when needed (e.g. financial or other compensations such as recognition)	
Use hybrid strategies and leverage trusted voices to mobilize underrepresented groups.	Use a single method to reach all types of groups and disregard biases from using specific engagement methods.
Designing and implementing inclusive citizen engagement processes	
Choose the engagement method (e.g. citizen assembly, focus working group, etc.) that is more suitable given the purpose of the exercise and target group. Adapt standardized methods to best respond to specific needs.	Apply existing participatory methods inflexibly, without adapting to specific context, purpose, and target groups.
Set up a 'contract' between organisers and participants from the start, specifying what the organisers expect from participants and how outcomes of the process will be integrated in policy processes.	Lack of clarity about the process (objectives, expected outcomes, role of citizens, etc.)
Present and inform citizens about issues to be discussed, with all its complexity/nuances so they can develop their own well-informed perspectives. Ensure information provided is clear, unbiased, evidence-based, and accessible to all. Sufficient time should be allocated to the preparatory/information stage.	Issues are presented using technical jargon and without attempts at making complexities accessible or, conversely, they are presented in oversimplified ways, resulting in biases of engagement processes and outcomes Provision of partial selection of evidence available (e.g. evidence supporting the political agenda of specific groups)
Create a level-playing field for all participants to express their views and avoid 'louder voices' (often those with more polarized views) to dominate the process and have an excessive influence on its results. Engage neutral and trustworthy facilitators and neutral spaces for discussions	Lack of measures to ensure that all voices are heard. Lack of action to prevent the overrepresentation of vested interests. Lack of action to avoid the polarization of debates, dominated by those with more extreme views and leaving more moderated views unheard.
Devise methods for dealing with divergent perspectives and communicating decisions to citizens with different perspectives.	Solicit citizen inputs as "formality" without developed plan on integration to the detriment of future engagement.
Integrate inputs from citizens in the policy process. Communicate to participants how their inputs were used and how they shaped the policy process.	Unclear/non-transparent or lack of integration of citizen inputs in policymaking. Lack of follow-up and communication on how inputs were integrated.
Solicit feedback from participants regarding the engagement process. Identify what worked and what could have worked better to inform future similar citizen engagement processes.	Missing to solicit feedback from participants, therefore losing opportunities to learn from the experience.

Annex. Additional materials

Annex Section 1: Examples of citizen engagement methods

This Annex presents several citizen engagement methods, classified between those targeting large samples (over 100 individuals) and those involving smaller groups (usually between 10 and 30 people). Brief descriptions and specific examples are provided.

Table A.1. Examples of citizen engagement methods: large-scale engagement processes (groups of 100+ individuals)

Method	Description	Examples
Citizens' assembly	A randomly selected group of citizens (often between 50 and 150 people) who are brought together to deliberate on complex social issues and jointly develop practical policy recommendations. During the preparatory process they are provided with learning materials and expert presentations to help them develop and debate ideas.	The Citizens' Convention on Climate was organised in France in in 2020-21. It brought together a panel of 150 citizens of diverse regions, age groups and profession to debate, define and develop a series of measures for reducing greenhouse gas emissions in France. The 150 participants were selected randomly by a lottery and asked to attend multiple discussion sessions with experts of opposing opinions before developing their own climate regulation proposals. The process ran for about 9 months. The Climate Assembly UK was organised in spring 2020. It engaged 108 citizens selected in a civil lottery to discuss ways to reduce greenhouse gas emission in the UK. Assembly members met over six weekends in Spring 2020. They had the chance to hear and question a range of specialist with varied viewpoints, discuss amongst each other and later propose their own recommendations about what the UK should do to become net zero by 2050.Similar initiatives have been held in many other countries around the world, including Austria (2022), Denmark (2020-21), Germany (2021) and Ireland (2022).
World wide views	Citizens meet at the same day at multiple sites across the world (100+ citizens per site) to debate specific policy related questions and vote on a set of predefined questions. Votes are reported on a dedicated website. Results are analysed and presented to policymakers.	The first World Wide Views on Global Warming were held in 2009, with the aim of gathering citizen inputs to inform the COP15 meeting in Copenhagen. It gathered around 4,000 citizens in 38 countries. The results were summarized in 9 policy recommendations. The method was developed and implemented by the Danish Board of Technology and other partners. Similar events were held on the topic of Biodiversity (2012) and Climate Change (2015).
Deliberative polling	A representative sample of citizens are provided with information about a complex/controversial policy issue, engage in facilitated discussions and exchange with experts. They complete a survey at the end of the process that measures changes in their opinions following the deliberation process.	In 2012, a deliberative poll was used by Japan's government to consult the public opinion on nuclear energy's future after the Fukushima Daiichi disaster. It involved a random sample of 285 individuals who were given the opportunity to deliberate with experts and fellow citizens. The deliberative poll on nuclear construction, held in Korea in 2017, gathered a stratified random sample of 471 citizens to collect public opinion on the construction of two new nuclear power plants in the country.
Deliberative online platforms	Online platforms that facilitate virtual engagement through a diversity of tools (e.g. discussion forums, voting on polls, real-time visualisations of people's opinions, online games). Such tools are tailored to specific processes	CitizenLab is a community engagement platform that has collaborated with more than 300 local governments. The "Ideas para mi Comunidad" (2019) project in Chile used CitizenLab's tools to receive contributions from young Chileans to tackle community sustainable development challenges. The project engaged more than 28,000 citizens in a variety of activities such as online workshops, virtual meetings, mentoring opportunities and youth advocacy projects.

		CitizensFoundation is an Iceland-based non-profit organisation providing the technology for democratic deliberation that has been used for local, national and international projects. The platform was used for the project CODE Europe (2021-2024), which encouraged citizens in 10 European cities to crowdsource their ideas and concerns on the topic of air quality, which were later used for problem mapping and to develop policy recommendations in the EU.
Serious games	Serious games are tools designed to help citizens engage in policymaking processes in an accessible and entertaining way	The European Commission Joint Research Centre's (JRC) Scenario Exploration System, (2015) is a foresight gaming system developed to facilitate the application of futures thinking to policy-making. Originally designed to engage EU policy-makers in strategic foresight exercises, it has been used to engage citizens in such processes.

Source: (Engage2020, 2014[42]) (Involve, 2023[43]) (Davies and Procter, 2020[44]) (KNOCA, 2022[35])

Table A.2. Examples of citizen engagement methods: small and medium-scale engagement processes (groups of 10-30 individuals)

Method	Description	Examples
Citizens' jury (or planning cells)	A randomly selected group of citizens meet for 3-5 days to learn about and choose between multiple options regarding an urgent & important issue.	Finland's Citizens' Jury on Climate Actions (2021) gathered 33 randomly selected citizens who discussed the climate actions included in the Medium-term Climate Change Policy Plan and formulated an informed public judgement on them.
Consensus conference (or citizens panel)	A group of citizens debates, consults experts and formulates recommendations on a controversial or sensitive policy topic (e.g. ethical impacts of emerging technologies)	The consensus conference "Our Ocean" organised in 2020 by the Danish Board of Technology involved 14 citizens (accounting for diversity of gender, age, place of residence, education and interests) in dialogue with experts to produce policy recommendations about marine management. In 2020, the Japanese government organised the first consensus conference at national level on genetically modified foods.
Deliberative workshop (or public dialogue workshop)	A selected group of citizens interact with specialists and policy makers on complex/ controversial issues.	The public dialogue on drone use, held in the United Kingdom in 2016, explored citizens' attitudes towards and concerns about current and future usage of drones. A total of 118 people participated in three waves of workshops held in 5 locations. Experts and stakeholders participated to listen and support an informed debate. Participants suggested four strategies to address priorities identified throughout the debates.
Future workshop / Scenario workshops	A group of citizens gathers to analyse an issue/ situation and is then asked to form a vision of the future and develop action proposals This can be around pre-developed scenarios (scenario workshop).	The Smart City initiative of Parma (Italy) organised a scenario workshop in 2018 for citizens to envision desirable smart city scenarios for 2030. Another example is the experimental scenario workshop for water resources management held in the island of Naxos (Greece) in 2006.

Source: (Engage2020, 2014[42]) (Involve, 2023[43])

Annex Section 2: Policy instruments to encourage citizen participation in research and innovation activities

Governments have various ways of encouraging citizen involvement in research and innovation activities. These instruments can help citizens become contributors, collaborators, co-creators, autonomous researchers/innovators, or testers in relevant research and innovation activities.

One policy approach is to incentivize and reward public researchers for engaging with society, which can lead to socially impactful research and innovation activities involving public participation. Facilitating the sharing of good practices within and across institutions, universities and public research institutions can also contribute to expanding these practices (UKRI, 2020[45])

For example, in the United Kingdom, the Engaging the Public with Environmental Science annual call of the Natural Environment Research Council (NERC) supports projects that aim to develop new ways to engage the public with environmental science research (UKRI, 2022[46]). This provides an opportunity for citizens to contribute to environmental research and innovation activities in the country.

In addition to incentivizing researchers, governments can also encourage citizens to engage in innovation activities directly. One way to do this is through citizen science programs, collaboration and co-creation programs involving citizens or CSOs, open challenges, hackathons, online collaborative platforms, living labs, fablabs, serious games, and crowdfunding initiatives (see Table A.3). An example of this approach is the BrusSEau project in Brussels, Belgium, which was a participatory rainwater management project to mitigate flooding in the city (Crespin, 2020[47]). In this project, residents contributed to measuring hydrological flows in public and private spaces, and their participation was rewarded by recognizing and valuing their contribution to the research.

Table A.3. Policy instruments to encourage citizen participation in research and innovation activities: overview and examples

	Description	Examples
Citizen science programmes	Citizen science can be defined as the direct voluntary participation of individual citizens (in their personal capacity) in research projects in ways that may include formulating research questions, conducting scientific experiments, collecting and analysing data, interpreting results, making new discoveries, developing technologies and applications, and solving complex problems. Digital platforms and apps have greatly facilitated citizen science over the past years. SciStarter, for instance, is an online citizen science hub with around 140,000 registered participants. More than 3,000 projects have been published in the platform, searchable by location, topic, age group, and related sustainable development goal, among others (SciStarter, 2020[48]).	Governments support citizen science in many ways. For example, CitizenScience.gov is an official US government website designed to accelerate the use of crowdsourcing and citizen science across the US government. The Center for Citizen Science (OeAD), established in 2015 by the Austrian Federal Ministry of Education, Science and Research (BMBWF), serves as an information, advisory and service centre for Citizen Science, primarily addressing researchers and scientific institutions aiming to implement citizen science research approaches. In Switzerland, the Citizen Science Center Zurich created in 2017 and run jointly by the University of Zurich and the Swiss Federal Institute of Technology (ETH) in Zurich, supports the collaboration of academic scientists and the public to implement co-created projects. Some governments provide grants and prizes to stimulate citizen science. The Citizen Science Grants in Australia, which are part of the Inspiring Australia – Science Engagement Programme, provides competitive grants from AUD 150,000 to AUD 500,000 for citizen science research projects that contribute to areas of national significance. The 2022 round supports projects in the areas of disaster resilience and preparedness, environmental change, food and agribusiness, and cybersecurity and artificial intelligence. Examples of prizes include the Eureka Prize for Innovation in Citizen Science in Australia, and the Citizen Science Awards in Austria that mainly target students. Some portals have also been created by governments or non-profit organisations to publicise citizen science projects, so that citizens can easily identify projects in which they could be interested to participate. It is the case of the Citizen Science Portal of the Government of Canada. It is also one of the functionalities of the "Citizens create Knowledge" platform (*Bürger schaffen Wissen*) in Germany. The Plastic Pirates – Go Europe! initiative is an example of Citizen Science project. School classes and youth groups collect plastic samples from streams and rivers and document their findings. The collected data is then analysed by scientists and researchers. In this way, young European citizens are making an important contribution to researching the state of European rivers and the extent and pollution caused by plastic waste.
Collaboration and co-creation programmes involving citizens / CSOs	Programmes that promote collaboration and co-creation engaging multiple stakeholders, including civil society organisations and/or citizens.	In Sweden, the project call "Civil society's solutions to climate transition", launched by VINNOVA in April 2022, supports innovative initiatives led by civil society organisations in collaboration with other actors that show potential to accelerate the pace of the green transition. The call had four focus areas: sustainable industry, sustainable mobility, sustainable built environments and sustainable food systems. Civil society organisations (including social enterprises) could apply in collaboration with at least one additional party from another sector such as public or private. The civil society organisation has to be the project coordinator. It was possible to apply for up to USD 140,000 (SEK 1.5 million) per project, corresponding to a maximum of 80% of projects' total eligible costs, for a project duration of a maximum of 24 months. The call is part of Vinnova's new work area "Transformative public sector and civil society". A total of 20 projects were awarded as part of a similar call launched in 2021. In Korea, the R&SD Frontier Programme launched in 2020 engages researchers and local communities in identifying and solving science and technology problems. It implements "Living Lab Projects", with a specific focus on solving urban challenges using existing R&D outcomes.

	Description	Examples
Innovation prizes / open challenges	Instruments used to encourage innovation that tackles a concrete, ambitious goal without specifying the path to reach it. Innovation prizes or challenges reward those that can first or most effectively solve a problem. They attract new innovators by lowering barriers to participation, while raising the visibility of specific challenges. They can have a systemic impact by raising public awareness about neglected and/or complex problems. Prizes should provide incentives that motivate teams to engage – these often go beyond cash awards to also include capacity building support and technical support for the testing and validation of solutions, or facilitate access to funders and networks (Challenge Works, 2022[49])	The United States has a long tradition of using prize competitions and challenges. In 2010, the federal government launched the Challenge.gov website, which provides resources and collaborative opportunities to facilitate the use of prize challenges government-wide. This includes a comprehensive Challenges and Prizes Toolkit – a guide to planning and executing federal prizes. Some of the recent prizes launched at federal level focus on green transition issues. A relevant example is the American-Made Challenges programme, launched in 2018 by the Department of Energy to accelerate entrepreneurship and innovation in clean energy. Since its creation, it has awarded about USD 100 million in cash prizes and team support activities to competitors in more than 30 prizes spanning solar, water, geothermal, buildings, hydrogen, energy storage, and transportation, among others. For instance, the Inclusive Energy Innovation Prize funds projects that make the clean energy innovation ecosystem more inclusive and accessible to disadvantaged communities and individuals from groups historically underrepresented in STI activities. Many other countries have innovation prizes or open challenges programmes in place. These have become even more popular during the COVID-19 pandemic. Examples that target green transition goals include the Climate Smart Cities Challenge, launched in the United Nations (UN-Habitat) and Sweden (Viable Cities), and several of the challenges launched by the Government of Canada and publicised through the Impact Canada Challenge Hub, such as the Smart Cities Challenge open to indigenous communities and the Afri-Plastics Challenge. An example of open challenge organised at local level is the Helsinki Energy Challenge (2020-21) in Finland, aimed at finding sustainable urban heating solutions, reducing the use of coal and using as little biomass as possible.
Hackathons	24- to 48-hour events open to all, in which participants are provided with data with which they have to create an innovative product. Winners are often compensated with funding and support to develop and scale their ideas. They are used by governments as well as firms, non-profits, universities and international organisations to draw innovative ideas from diverse contributors.	The GreenHack was an international hackathon tackling sustainable development and future challenges. It was part of the EU Green Week 2022 initiative by the European Commission and organised under auspices of The Ministry of the Environment and the Ministry of Industry and Trade of the Czech Republic, the City of Prague and the Embassy of Netherlands. City Councils are leading many hackathons with green transition goals. Examples are the Seoul City Energy Information Platform Hackathon Competition (2021), launched by the Seoul Metropolitan Government (Korea) and the Hacking the Future (2021) launched by the Glasgow City Council (United Kingdom).
Online collaboration platform	Virtual spaces that support the engagement of citizens in innovation activities by facilitating networking and matchmaking with other actors.	The Civic Innovation Platform, developed by the Policy Lab of the German Federal Ministry of Labour and Social Affairs, aims to stimulate social innovation based on AI technologies. Anyone can create a personal profile to share preliminary rough ideas as well as specific proposals for which they are looking for partners. The platform provides an infrastructure with a matchmaking functionality ("the ideas market") that enables partners from different sectors – such as the public sector, business, the scientific community as well as civil society actors – to discover aligned interests and to work jointly on developing and implementing ideas. Once the resulting team has formulated the project idea in sufficient detail, the proposal can be submitted to the "ideas contest" through the same platform. Similarly to innovation prizes described above, the awarded teams receive up to 20,000 of financial support to develop their idea, as well as non-material support in the form of advice and workshops.

	Description	Examples
Living labs	Open innovation ecosystems in which citizens can engage in user-centered co-creation and experimentation activities in real world settings. Living labs operate as intermediaries among citizens, research organisations, companies, and regional and local authorities. They are localised areas of experimentation in which actors collaboratively develop new (often technology-enabled) solutions.	The Citizen Innovation Lab aims to empower people in Limerick (Ireland) to take part in co-creating a climate-neutral city by 2050. It is co-located with the School of Architecture at University of Limerick, and operates as a collaboration between Limerick City, the County Council and the University. The Citizen Innovation Lab includes a Citizens' Observatory, an Engagement Hub, a digital platform and a programme of events. The Citizens' Observatory provides access to digital tools so people can make and share observations on their local environment and buildings. It is also the location of the 3D-printed city model. The Engagement Hub is a meeting space and a hub for collaboration and co-creation where co-design workshops and creative engagement events take place. Aspern.mobil LAB, a living lab created in 2017 in Seestadt Aspern, Viena (Austria), provides a space for citizens to collaborate with researchers, the administration and private companies to develop innovative sustainable mobility solutions. The initiative is one of the five urban mobility laboratories funded by the Austrian Federal Ministry of Transport, Innovation and Technology, and counts with the support of a multidisciplinary team of researchers from the Vienna University of Technology, companies that help implement the initiative, and the administration of Seestadt Aspern. Citizens of Aspern are encouraged to attend the laboratory and participate in the projects that include hackathons and ideation workshops, using mobility surveys and tracking technologies to understand resident's mobility patterns, and scenario experiments, among others. The initiative further shows how digital tools – such as smartphone apps, sensors and other devices – can support citizen's engagement with a sustainability goal.
Fablabs	Fablabs and other digital fabrication spaces (e.g. hackerspaces, makerspaces, makerlabs) provide people with access to infrastructure and equipment they need (e.g. 3D printers, laser cutters) to experiment and make things. Such facilities have the potential of democratizing access to such tools, offering a physical space where innovations can be developed as prototypes or in small series. They are also social spaces where people come together, exchange ideas and work collaboratively, contributing to expand networks between expert and non-expert users.	The Lorraine Fab Living Lab Fablab, located at the University of Lorraine (France) is a collaborative innovation space that brings together in the same space complementary tools that make it possible to co-create, prototype and test products and services between citizens, businesses and researchers. Fab Lab Limerick in Ireland, which is part of the Citizen Innovation Lab presented above, is a maker space and open digital fabrication laboratory run by the School of Architecture at University of Limerick. It offers cultural, educational and research programmes on digital fabrication.
Serious games	Serious games consist in the application of entertaining, enjoyable techniques to encourage the involvement of the public in research-related activities.	Radchuk, Kerbe and Schmidt (2017[50]) identify 87 science games. Aspern.mobil LAB, for example, has developed its own game to encourage playful idea generation among citizens. The game board, a representation of Seestadt Aspern, encourages players to communicate and learn from each other to decide on setting scenarios, answer research questions and find mobility solutions. The goal of the game is to explore micro-mobility and sharing transportation options in Aspern, but it could be adapted to other topics and scenarios.
Crowdfunding	Crowdfunding is another mechanism enabling citizens to connect with science and contribute to advancing specific research paths by providing their financial support. It also encourages researchers to formulate their research projects in ways that respond to specific societal needs.	The Spanish Foundation for Science and Technology (FECYT) launched the crowdsourcing platform Precipita. The platform allows citizens to learn about different ongoing research projects and provide financial contributions to support them.

Annex Section 3: Useful generic references on citizen engagement processes

Guidance for policymakers – OECD resources

OECD (2022), *OECD Guidelines for Citizen Participation Processes*, OECD Public Governance Reviews, OECD Publishing, Paris, https://doi.org/10.1787/f765caf6-en

OECD (2021), "Eight ways to institutionalise deliberative democracy", *OECD Public Governance Policy Papers*, No. 12, OECD Publishing, Paris, https://doi.org/10.1787/4fcf1da5-en.

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

OECD (2020), *Innovative Citizen Participation and New Democratic Institutions: Catching the Deliberative Wave*, OECD Publishing, Paris, https://doi.org/10.1787/339306da-en.

Guidance for policymakers – other resources

Engage2020 (2015), *Science, Society and Engagement: An e-anthology*, http://engage2020.eu/media/Engage2020_withVideo.pdf

European Commission (2019) *Bibliography on Citizen Engagement*, Community of Practice of the Competence Centre on Participatory and Deliberative Democracy, https://cop-demos.jrc.ec.europa.eu/resources/bibliography-citizen-engagement

United Nations Democracy Fund and newDemocracy Foundation (2019), *Enabling National Initiatives to Take Democracy Beyond Elections,* https://www.newdemocracy.com.au/wp-content/uploads/2018/10/newDemocracy-UNDEF-Handbook.pdf

More about methods

Engage2020 (2014) *Public Engagement Methods and Tools*, Engage2020 Consortium, http://engage2020.eu/media/D3-2-Public-Engagement-Methods-and-Tools-3.pdf

IAF (2022) Methods Library, International Association of Facilitators, https://www.sessionlab.com/team/iaf/library

Involve (2023), *Resources - Methods*, https://involve.org.uk/resources/methods

References

Andersson, E. and S. Bassu (2014), "Facilitation methods", in Engage2020 (ed.), *Science, Society and Engagement: An e-anthalogy*, http://engage2020.eu/media/Engage2020_withVideo.pdf (accessed on 19 July 2022). [41]

Capstick, S. et al. (2020), "Climate Change Citizens' Assemblies", *CAST Briefing Paper 03*, https://cast.ac.uk/wp-content/uploads/2020/03/CAST-Briefing-03-Climate-Change-Citizens-Assemblies.pdf (accessed on 3 August 2022). [9]

Challenge Works (2022), *Challenge prizes: A practical guide*, https://challengeworks.org/what-we-do/our-method/practice-guide/ (accessed on 22 August 2022). [49]

CIMULACT (2018), *CIMULACT - Citizen and Multi-Actor Consultation on Horizon 2020*, http://www.cimulact.eu/ (accessed on 29 August 2022). [34]

CIMULACT (2018), *Deliverable 5.2-Report on comparison of research topics from CIMULACT with those from expert oriented foresight studies*, http://www.cimulact.eu/wp-content/uploads/2018/04/D5.2_Report-on-comparison-expert-oriented-foresight-studies-compressed.pdf (accessed on 15 September 2022). [11]

City of Helsinki (2023), *Helsinki's design journey - Design Helsinki*, https://design.hel.fi/en/helsinki-city-of-design/helsinkis-design-journey/ (accessed on 9 May 2023). [38]

Crespin, D. (2020), *Case study from Belgium on BrusSEau - project on water management in Brussels. Contribution to the OECD TIP Co-creation project*, https://stip.oecd.org/assets/TKKT/CaseStudies/37.pdf (accessed on 27 March 2023). [47]

CSPO (2022), *Exploring Democratic Governance of Solar Geoengineering Research*, Consortium for Science, Policy & Outcomes, https://cspo.org/research/governance-of-geoengineering-research/ (accessed on 20 September 2022). [29]

CSPO (2019), "Cooling a Warming Planet? Public Forums on Climate Intervention Research Final Results Report", https://cspo.org/wp-content/uploads/2019/10/SRM_book_EPUB.pdf (accessed on 23 March 2023). [30]

Davies, J. and R. Procter (2020), "Online platforms of public participation: A deliberative democracy or a delusion?", *ACM International Conference Proceeding Series*, pp. 746-753, https://doi.org/10.1145/3428502.3428614. [44]

ECAST (2022), *Expert and Citizen Assessment of Science and Technology*, https://ecastonline.org/ (accessed on 20 September 2022). [28]

Engage2020 (2014), *Engage2020 - Tools and instruments for a better societal engagement in "Horizon 2020"*, http://engage2020.eu/media/D3-2-Public-Engagement-Methods-and-Tools-3.pdf (accessed on 13 July 2022). [42]

European Commission (2023), *Innovating through Experimentation: The European Commission's new project promoting more experimental innovation policy*, https://research-and-innovation.ec.europa.eu/news/all-research-and-innovation-news/innovating-through-experimentation-european-commissions-new-project-promoting-more-experimental-2023-01-25_en (accessed on 31 March 2023). [25]

European Commission (2021), *EU Missions in Horizon Europe*, https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe_en (accessed on 31 August 2022). [24]

Government of Colombia (2023), *DNP publica resultados de los Diálogos Regionales Vinculantes*, https://www.dnp.gov.co/Paginas/DNP-publica-resultados-de-los-dialogos-regionales-vinculantes.aspx (accessed on 1 March 2023). [23]

Government of Ireland (2022), *Creating Our Future Campaign Report*, Department of Further and Higher Education, Research, Innovation and Science, https://creatingourfuture.ie/wp-content/uploads/2022/07/Creating-Our-Future-Campaign-Report.pdf (accessed on 25 August 2022). [21]

Gudowsky, N. and A. Rosa (2019), "Bridging epistemologies—Identifying uniqueness of lay and expert knowledge for agenda setting", *Futures*, Vol. 109, pp. 24-38, https://doi.org/10.1016/J.FUTURES.2019.04.003. [12]

Iandoli, L., S. Primario and G. Zollo (2021), "The impact of group polarization on the quality of online debate in social media: A systematic literature review", *Technological Forecasting and Social Change*, Vol. 170, p. 120924, https://doi.org/10.1016/J.TECHFORE.2021.120924. [40]

Impact Canada (2023), *Challenge Guide - Phase 3: Test*, https://impact.canada.ca/en/challenges/challenge-guide/phase-3 (accessed on 15 February 2023). [15]

Impact Canada (2023), *Program of Applied Research on Climate Action in Canada (PARCA)*, https://impact.canada.ca/en/behavioural-science/parca (accessed on 8 March 2023). [39]

Involve (2023), *Resources - Methods*, https://involve.org.uk/resources/methods (accessed on 23 March 2023). [43]

Involve Foundation (2022), *Participatory Budgeting*, https://involve.org.uk/resources/methods/participatory-budgeting (accessed on 5 October 2022). [26]

Joss, S. and S. Bellucci (eds.) (2002), *Participatory technology assessment: European perspectives*, University of Westminster (Centre for the Study of Democracy) & Swiss Centre for Technology Assessment, London, https://www.researchgate.net/publication/37415082_Participatory_Technology_Assessment_European_Perspectives (accessed on 19 September 2022). [8]

KNOCA (2022), *KNOCA - Knowledge Network on Climate Assemblies*, https://knoca.eu/ (accessed on 24 August 2022). [35]

Liedtka, J. et al. (2019), "The Use of Design Thinking in the U.S. Federal Government", *https://doi.org/10.1080/15309576.2019.1657916*, Vol. 43/1, pp. 157-179, https://doi.org/10.1080/15309576.2019.1657916. [37]

Minciencias (2022), *Ideas para el Cambio*, Ministry of Science, Technology and Innovation - Colombia, https://ideasparaelcambio.minciencias.gov.co/#features (accessed on 25 August 2022). [16]

Mintrom, M. and J. Luetjens (2016), "Design Thinking in Policymaking Processes: Opportunities and Challenges", *Australian Journal of Public Administration*, Vol. 75/3, pp. 391-402, https://doi.org/10.1111/1467-8500.12211. [36]

Missions Valencia (2023), *Ambassador Organisations*, https://www.missionsvalencia.eu/ambaixadors/?lang=en (accessed on 28 February 2023). [14]

MPC (2023), *Mesa Permanente de Concertación: Diálogo de gobierno a gobierno*, https://www1.mpcindigena.org/ (accessed on 1 March 2023). [7]

NWO (2022), *Dutch Research Agenda (NWA)*, Dutch Research Council, https://www.nwo.nl/en/researchprogrammes/dutch-research-agenda-nwa (accessed on 25 August 2022). [22]

OECD (2023), "Emerging technology governance: Towards an anticipatory framework", in *OECD Science, Technology and Innovation Outlook 2023: Enabling Transitions in Times of Disruption*, OECD Publishing, Paris, https://doi.org/10.1787/d67d5380-en. [1]

OECD (2022), "Engaging citizens in cohesion policy", *OECD Public Governance Working Papers*, No. 50, OECD Publishing, Paris, http://ic Governance, No. 50, OECD Publishing, Paris, https://doi.org/10.1787/486e5a88-en (accessed on 4 July 2022). [5]

OECD (2022), *OECD Guidelines for Citizen Participation Processes*, OECD Public Governance Reviews, OECD Publishing, Paris, https://doi.org/10.1787/f765caf6-en. [6]

OECD (2021), *Evaluation Guidelines for Representative Deliberative Processes*, OECD Publishing, Paris, https://doi.org/10.1787/10ccbfcb-en. [4]

OECD (2020), *Innovative Citizen Participation and New Democratic Institutions: Catching the Deliberative Wave*, OECD Publishing, Paris, https://doi.org/10.1787/339306da-en. [3]

OECD (2017), "Open research agenda setting", *OECD Science, Technology and Industry Policy Papers*, No. 50, OECD Publishing, Paris, https://www.oecd-ilibrary.org/science-and-technology/open-research-agenda-setting_74edb6a8-en (accessed on 15 March 2023). [2]

OPSI (2018), *Portugal Participatory Budget*, OECD Observatory of Public Sector Innovation, https://oecd-opsi.org/innovations/portugal-participatory-budget/ (accessed on 5 October 2022). [27]

Pereira, Â. and T. Völker (2020), "Engaging With Citizens", in Šucha, V. and M. Sienkiewicz (eds.), *Science for Policy Handbook*, Elsevier, https://doi.org/10.1016/B978-0-12-822596-7.00008-5. [10]

Radchuk, O., W. Kerbe and M. Schmidt (2017), "Homo Politicus meets Homo Ludens: Public participation in serious life science games", *Public Understanding of Science*, Vol. 26/5, pp. 531-546, https://doi.org/10.1177/0963662516653030. [50]

Robinson, D. (2022), "Characterising Mission Implementation Contexts", *report for the MOSAIC project - Mission-Oriented SwafS to Advance Innovation through Co-creation (Grant 101006382)*, https://doi.org/10.5281/ZENODO.7446513. [17]

Robinson, D., D. Winickoff and L. Kreiling (2023), "Technology assessment for emerging technology : Meeting new demands for strategic intelligence", *OECD Science, Technology and Industry Policy Papers*, No. 146, OECD Publishing, Paris, https://www.oecd-ilibrary.org/fr/science-and-technology/technology-assessment-for-emerging-technology_e738fcdf-en (accessed on 10 May 2023). [19]

Rosa, A., N. Gudowsky and P. Repo (2021), "Sensemaking and lens-shaping: Identifying citizen contributions to foresight through comparative topic modelling", *Futures*, Vol. 129, p. 102733, https://doi.org/10.1016/J.FUTURES.2021.102733. [13]

Rosa, A. et al. (2021), "Participatory foresight and reflexive innovation: setting policy goals and developing strategies in a bottom-up, mission-oriented, sustainable way", *European Journal of Futures Research*, Vol. 9/1, pp. 1-15, https://doi.org/10.1186/S40309-021-00171-6/TABLES/3. [33]

Sciencewise (2023), *How should we shape our digital world? Insights from a decade of Sciencewise supported dialogues*, https://sciencewise.org.uk/2023/03/how-should-we-shape-our-digital-world-insights-from-a-decade-of-sciencewise-supported-dialogues/ (accessed on 30 March 2023). [18]

SciStarter (2020), *SciStarter - Science we can do together*, https://scistarter.org/ (accessed on 13 September 2022). [48]

SFI (2022), *Creating Our Future*, Science Foundation of Ireland, https://creatingourfuture.ie/ (accessed on 25 August 2022). [20]

TA-SWISS (2023), *Participatory TA*, https://www.ta-swiss.ch/en/ta-swiss/participatory-ta (accessed on 22 February 2023). [31]

Teknologirådet (2021), *Attitudes to new transport technologies*, https://teknologiradet.no/en/project/attitudes-to-new-transport-technologies/ (accessed on 22 February 2023). [32]

UKRI (2022), *Engaging the public with environmental science: 2022*, https://www.ukri.org/opportunity/engaging-the-public-with-environmental-science-2022/ (accessed on 31 August 2022). [46]

UKRI (2020), *Concordat for Engaging the Public with Research*, UK Research and Innovation. [45]