Nordic Perspectives on Open Science

Insights into Participatory Policymaking: Analysing the National Citizen Science Policy Development in Finland

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Nordic Perspectives on Open Science 2025, https://doi.org/10.7557/11.8084

Abstract

This article explores how Finland created its first citizen science policy by involving the stakeholders in the policymaking process. The aim is to assess how engaging stakeholders can shape science policy.
The basis of the study is in the shift of responsibility for coordinating open science in Finland from the Ministry of Education and Culture to the Finnish research community, specifically the Federation of Finnish Learned Societies (TSV). We examined documents from the TSV citizen science working group, including meeting notes, survey results, and the final policy paper, to understand how stakeholder participation influenced the policy-making process.
The results show that involving stakeholders helped shape policy recommendations, especially in improving institutional support, guidelines, and funding visibility for citizen science. However, challenges like uneven awareness and engagement among stakeholders could limit the effectiveness of participatory approaches. By placing these findings within the context of participatory policymaking and stakeholder theory, the article provides insights into how inclusive policy design works. This study adds to the understanding of how participatory governance and science policy development can be integrated into institutional frameworks to drive practical change.

Keywords

citizen science, participatory policymaking, stakeholder engagement, open science, science policy development, institutional frameworks, participatory governance, Finland, Federation of Finnish Learned Societies (TSV), policy design, stakeholder theory, public participation.

Introduction

Implementation of citizen science, that is included under the open science (OS) spectre, has progressed at a different pace in the Nordic and Baltic countries. According to the EOSC Open Science observatory data (2023), Norway, Finland, Sweden, and Latvia have national citizen science policies with 44 % of EU countries. The role of institutional open

science policies as a key factor for the development of open science practices is examined for example by de Castro (2022) presenting that not having or having a weaker national-level open science policy framework tended to indicate a lower position in the CWTS Leiden university ranking for universities in these countries. The national open science policy environment in the Nordic and Baltic countries is typically jointly coordinated by science and education focused ministries and related national expert organisations such as a research council, with possible support from national libraries and leading higher education facilities. Finland has its own coordination model that engages the research community in the development and monitoring of national open science policies and recommendations, representing a strong focus on policy production alongside policy maturation. (Hansson et al., 2022; Avoimen tieteen ja tutkimuksen koordinaatio, 2021).

Participatory policymaking in the realm of science policy has gained traction to enhance democratic governance and improve the relevance and effectiveness of science-related decisions. This approach emphasises the active involvement of stakeholders and experts in the policymaking process, fostering a collaborative environment that can lead to more informed and accepted policy outcomes. The shift towards participatory governance reflects a broader trend in which traditional hierarchical models of decision-making are being replaced by more inclusive and networked approaches (Krick et al., 2019; Ansell et al., 2017; Lalor & Hickey, 2014). One of the key advantages of participatory policymaking is its potential to improve the quality of public decisions by incorporating diverse perspectives and stakeholder knowledge. Research indicates that when stakeholders are engaged in the policymaking process, they can provide valuable insights that enhance the relevance and effectiveness of policies (Macaulay et al., 2022; Lasisi et al., 2022).

However, challenges remain in ensuring effective participation. Issues such as unequal access to participation, the potential for elite capture, and the risk of superficial engagement can undermine the effectiveness of participatory processes (Calyx, 2022; Jacquet, 2017; Visser & Kreemers, 2019; Filipiak & Dylewski, 2018; Krenjova & Raudla, 2017). Critics argue that self-selection in participation can lead to biases, where only certain demographics engage, potentially skewing the outcomes (Batory & Svensson, 2019). To address these challenges, it is essential to design participatory processes that are inclusive and equitable, providing adequate resources and support to facilitate meaningful engagement from all segments of society (Liu, 2021; Veeckman & Temmerman, 2021). These initiatives not only empower stakeholders but also foster a sense of ownership and accountability in public affairs (Riduan, 2024).

Our case study focuses on one of the policy development processes resulting from the transition of national coordination for open science in Finland from the Ministry of Education and Culture to the Finnish research community. The vision of the coordination is articulated in The Declaration for Open Science and Research, a document collaboratively drafted and owned by the Finnish research community. The Declaration outlines a commitment for Finnish research organisations to actively participate in national coordination activities and to develop policies that support its vision. In this study, we ask to what extent the participatory process in this case impacted the final policy paper. We also examine the implications for national policy

development, the potential for large-scale collaborative efforts, and the role of participatory policymaking in shaping science policy.

The article is structured as follows. We begin by introducing the key concepts of citizen science, participatory policy development, and stakeholder engagement. Next, we provide an overview of the case profile, data, and methods used in our study. Following this, we present our findings on the participatory processes within the Finnish research community, focusing on the collaborative drafting and development of the first national Recommendation for Citizen Science in Finland (Kansalaistieteen työryhmä, 2022; Open Science Coordination in Finland, 2022). For clarity and brevity, this national recommendation will hereafter be referred to as "the policy". We address potential challenges, such as the inclusivity of stakeholder engagement and the effectiveness of the national coordination efforts. Finally, we conclude by discussing the implications of our findings and suggesting further avenues for research in enhancing participatory approaches in science policy development.

Key Concepts

Introduction to Citizen Science

Citizen science is becoming a widely used scientific method that involves the engagement of individuals outside of academia in scientific research activities, contributing to data collection, analysis, and various other stages of the research process (Hicks et al., 2019). This form of collaboration between the public and the scientific community has gained popularity due to its ability to generate new scientific knowledge and enhance public understanding of science (Hu, 2024; Mumelaš & Martek, 2024). The involvement of the wider community in scientific endeavours not only provides valuable data for researchers but also fosters meaningful interactions between the scientific community and the general public (Mumelaš & Martek, 2024).

Over time, citizen science has evolved from mere engagement with citizens to active involvement in the research process by citizens themselves (Driesche & Kerklaan, 2022; McKinley et al., 2017). This evolution has led to the recognition of citizen science as a domain with great potential to address complex research questions while making science more accessible and relevant to society (Bhangale, 2024). Citizen science projects are increasingly being seen as transformative initiatives that can have a significant social impact (Lee & Lu, 2020). Additionally, citizen science has been noted for its contributions to ecological research and public engagement, particularly in studies related to global climate change, biological studies, and various ecological disciplines (Dickinson et al., 2012).

Participatory policymaking framework

Participatory policymaking is a process that involves engaging citizens and other stakeholders in the policy development process, ensuring that their voices are heard and considered in the decision-making process (Brenya, 2024; Ansell et al., 2017). Science

policy is a particularly suitable area for participatory approaches, because scientific research affects society in multiple ways, and decisions about research infrastructures, data, and funding often require input from many groups, including researchers, institutions, funders, and sometimes citizens. Several frameworks and models have been developed to guide participatory policymaking, emphasising principles that enhance both effectiveness and inclusivity. One of the most widely used models is Collaborative Governance (Ansell & Gash, 2008). This model describes policymaking as a joint effort between government bodies and stakeholders. This model highlights the importance of building trust, sharing information and providing the participants a real opportunity to shape outcomes. Although originally developed for general public administration, it has many linkages to science policy context where many stakeholders hold different kinds of authority and ownership to the policy.

Blomkamp's (2021) ideas echo the Collaborative Governance model and stem from co-creation and co-production. This means that policies are developed with the stakeholders rather than for them. This model emphasises early involvement, continuous dialogue and collective problem solving and is especially relevant in the Finnish citizen science context where cooperation expands across institutions, researchers and citizens.

Science policy development can also benefit from the approaches developed in Participatory Technology Assessment (pTA). This approach investigates how to include public and stakeholder perspectives in decisions about new or complex technologies (Joss & Belucci, 2002). To ensure meaningful participation, workshops, scenario discussions and expert briefings are used. pTA offers tools for informed participation that go beyond simple opinion gathering. To evaluate the quality of participation, Arnstein's (1969) Ladder of Participation (see also e.g. White & Langenheim, 2021) or the IAP2 Spectrum of Public Participation (International Association for Public Participation, 2018) offer frameworks to distinguish between processes where people are only informed or consulted and processes where they have real power to shape decisions. Although simplified, these models address important questions that often arise in participatory policymaking, such as:

- Who gets to participate?
- Whose voices are heard the most?
- Are some groups left out or underrepresented?
- How much influence do participants actually have?

Real-world examples illustrate the application and benefits of participatory policymaking in different contexts. In Scotland, initiatives such as the Experience Panels and the Community Empowerment Act have been implemented to actively engage citizens in policy development, demonstrating that engagement can strengthen trust and produce decisions that better reflect community needs (McHugh et al., 2023). In Colombia, local Planning Councils have become key spaces for public involvement in policy discussions and decision-making (Mayka, 2019). In Finland, experiences highlight how participatory processes can contribute to policymaking. Studies on crowdsourced lawmaking (Aitamurto, 2016), participatory planning (Häkli et al., 2019), and Delphi-based policymaking (Pernaa, 2020) show that Finnish institutions have experimented with many forms of participation. Research on participatory knowledge production in

environmental policy (Saarela, 2018) and citizen science approaches in health (Marks et al., 2022) demonstrates that involving stakeholders can increase the relevance and legitimacy of policy decisions. At the same time, these studies point to challenges such as limited resources, uneven participation, and the need for clear communication. These findings align with broader research showing that participatory processes must be carefully designed to support real deliberation rather than token consultation (Farina et al., 2014; Kim & Lee, 2012).

Together, these frameworks highlight a central idea: participatory policymaking depends on understanding who the relevant actors are, what interests they hold, and how they can be meaningfully involved in shaping policy. This point leads to stakeholder theory, which offers a structured way to identify these actors and analyse their roles, expectations, and influence in policy development. Stakeholder theory therefore provides the conceptual bridge between broad participatory models and the specific forms of engagement examined in this study.

Stakeholder theory in participatory policymaking

Stakeholder theory is a concept of participatory policymaking, emphasising the importance of engaging stakeholders in the policy development process (Lemke & Harris-Wai, 2015). Stakeholders are individuals or groups who have an interest in the outcomes of a particular policy and can influence or be influenced by the policy decisions (Buckland-Merrett et al., 2017). Stakeholder theory was developed by R. Edward Freeman in the 1980s. Freeman's seminal work, "Strategic Management: A Stakeholder Approach," published in 1984 (referred to in Freeman et al., 2010), laid the groundwork for this theory, arguing that organisations should recognise and address the interests of various groups, including employees, customers, suppliers, and the broader community, rather than solely prioritising shareholder profits. Evolution of stakeholder theory has been documented extensively, with scholars like Harrison and Wicks noting its infiltration into various disciplines, including health care and public policy, indicating its broad applicability beyond traditional business contexts (Harrison & Wicks, 2013).

In the context of policy development, stakeholder engagement is crucial as it ensures that diverse perspectives are considered, leading to more inclusive and legitimate policy outcomes (Jumadi et al., 2024; Riyadh et al. 2023; O'Sullivan et al., 2020). The benefits of stakeholder engagement in policy development are multifaceted and include increased transparency, trust, and community ownership of policies (Lemke & Harris-Wai, 2015). Transparency in policymaking is enhanced when stakeholders are actively involved in the decision-making process, as it allows for greater visibility into how policies are formulated and implemented (Schött et al., 2023). This transparency fosters trust among stakeholders, as they feel more informed and included in the policy development process (Moore, 2017). According to Wehn et al. (2017), stakeholder engagement promotes community ownership of policies, as individuals and groups who have been involved in the decision-making process are more likely to support and take ownership of the policies that are developed.

Case Profile, Data and Methods

Case Profile

This article examines the participatory aspect of the development of the first national citizen science policy in Finland (2022).

The Federation of Finnish Learned Societies (TSV), operating under the mandate of the Ministry of Education and Culture, has been trusted with the coordination of Finland's open science policy. The citizen science policy is part of a suite of policies that define the strategic principles, goals, and action plans needed to fulfil the aims set forth in the Declaration for Open Science and Research, which outlines a shared vision for the Finnish research community. Policies have been developed across four key areas: (1) fostering a culture of open scholarship, (2) ensuring open access to scholarly publications, (3) promoting openness of research data and methods, and (4) advancing open education along with access to educational resources. The policies can be found in *Responsible Research Series* – a series for open science policies and recommendations published by the Federation of Finnish Learned Societies (TSV) and the Committee for Public Information (TJNK).

The citizen science policy process was launched to create a comprehensive national framework supporting citizen science activities, falling under the first key area – fostering a culture of open scholarship. Following a collaborative and participatory approach, it engaged academic institutions, researchers, citizen scientists, and research funders. The Citizen Science Working Group, operating under the Open Science Coordination, led the drafting and consultation process, while the Steering Group for Open Science provided oversight. The process involved iterative drafting, broad public consultation, and multiple review rounds to ensure inclusivity and legitimacy. The outcome Recommendation for Citizen Science (2022) complements the national Policy for Open Scholarship (2022) with joint goals and objectives for citizen science development in the Finnish research community supported by introduction, detailed information of the recommendation's development and theme as well as a definition for citizen science.

Data Sources and Collection

To analyse this policy process, a qualitative multi-source design was adopted. Data used were originally generated between December 2020 and February 2022 and collected again in 2025 for the study analysis to reconstruct the policy's development and identify key mechanisms of participation and decision-making.

Documentary data consisted of:

- Internal and public drafts of the citizen science policy;
- Minutes from monthly working group meetings (2020–2022);
- Notes from steering committee sessions;
- Public feedback from open consultation rounds; and
- Records from digital collaboration platforms (Google Docs and Microsoft Teams).

These sources provided a detailed chronological record of the policy process and enabled triangulation across formal and informal communication channels.

Survey data were collected through a Citizen Science Survey conducted in February 2021 via Webropol. The survey targeted researchers, general public (including citizen scientists), research funders and research organisations to explore challenges and opportunities in citizen science. The survey used both Likert-scale and open-ended questions and received 152 responses in Finnish, Swedish, and English. Out of a total of 152 respondents, the largest group consisted of 73 individuals (48 %) who participated as private individuals or citizen scientists. 51 respondents (33.6%) identified themselves as researchers, while 21 respondents (13.8%) represented research organisations. A smaller share, 7 respondents (4.6%), came from funding organisations. Responses were anonymised and analysed descriptively to contextualise stakeholder perspectives, informing rather than determining the qualitative analysis.

Analytical Strategy and Process Tracing

The study applied process tracing to examine how participatory mechanisms shaped the content and legitimacy of the citizen science policy. Process tracing was chosen as it focuses on uncovering the sequence of events, decisions, and mechanisms that produced the observed result.

The analysis followed three iterative steps:

1. Chronological Mapping: Documentary and meeting records were organised into a timeline of major events, including drafting stages, consultations, and revisions. This mapping established the empirical sequence of decisions and interactions that defined the policy process.
2. Textual Analysis: Documentation was analysed by two researchers, who independently reviewed and annotated the documentary materials, and survey summaries. The purpose was to identify significant instances of stakeholder engagement, deliberation, and coordination rather than to develop thematic categories. No formal coding framework was employed. Instead, a close reading and comparative approach were used to trace how participatory practices evolved and influenced decision-making over time. Analytical notes were compared and discussed iteratively to ensure the consistency of interpretation and enhance the reliability of the analysis.
3. Assessing Links Between Actions and Outcomes: Evidence for causal links were checked from different sources. Documents, feedback insights, and survey responses were compared to assess how strongly each claim was supported.

This structured approach made it possible to move beyond descriptive reconstruction toward identifying why and how specific participatory practices influenced the final policy outcomes.

Reflexivity and Researcher Role

The authors held active roles within the working groups of the Open Science Coordination and one (Elena Svahn) participated directly in drafting of the citizen science policy. This dual position, as both contributors to the policy process and researchers

analysing it, provided valuable insider insight but also required continuous reflexive awareness of potential bias. Analytic memos and joint discussions were used throughout the research process to document interpretive decisions, enhance transparency, and maintain critical distance from the policy outcomes.

Ethical considerations

The study was conducted in accordance with the ethical principles of the Finnish National Board on Research Integrity (TENK). Working groups in the national OS coordination operate under principles of openness and transparency. Participation in the survey was voluntary, and informed consent was obtained from all survey participants. All personal identifiers were removed prior to analysis. The anonymised survey data are openly available through the Finnish Social Science Data Archive (FSD) to ensure transparency, reproducibility, and responsible data sharing.

Results

Stakeholder engagement was systematically integrated in the development of the policy through a structured multi-stage participatory process coordinated by the efforts of The Citizen Science Working Group. The working group consisted of representatives from research organisations, such as Finnish universities and universities of applied sciences as well as learned societies. The participation was conducted in three main stages: the stakeholder survey, public round of feedback and a steering group review informed by desktop study and partial stakeholder deliberation. During the initial research phase of policy development, stakeholders within the national coordination of open science were also involved in an active deliberation as informants.

Table 1. Stages of Stakeholder Engagement in the Policy Development

Stage	Description	Stakeholder Involvement	Outputs
1. Initial research & informant deliberation	Early exploration of needs, gaps, and priorities	Stakeholders in national OS coordination participated as informants	Basis for survey design and document review
2. Stakeholder survey	Assessment of current practices, support structures, and awareness (Feb 2021)	Researchers, research organisations, general public, research funders	Empirical evidence for drafting
3. Analysis phase	Iterative analysis bridging research and drafting	Citizen Science Working Group	First policy draft
4. Drafting phase	Collaborative drafting of recommendations	Representatives from RPO's and learned societies	Completed draft
5. Public feedback round	Open review (Jan–Feb 2022)	9 organisations, 21 comments	Minor revisions; need for participant guide identified
6. Steering group review	Validation and consensus-building	OS coordination steering group	Final approval
7. Follow-up work	Creation of complementary guide	New working group	*How to Become a Citizen Scientist?* (2024)

The stakeholder survey (N=152) provided the most substantial and detailed input for the policy development process. The results revealed significant gaps in organisational readiness, researcher support, and understanding of citizen science across Finnish research institutions. Key findings are summarised in Table 2.

Table 2. Survey Findings on Citizen Science in Finnish Research Organisations

Findings	Percentage	Interpretation
Lack of formal policies or guidelines (researchers, research organisations)	**85%**	Clear institutional gap
Organisation has no CS projects (researchers, research organisations)	**45%**	Limited practical engagement
Lack of support or training (researchers, research organisations)	**70%**	Need for capacity-building
CS not visible in funding structures (funders)	**86%**	Weak incentives
Respondents unaware of CS (all respondents)	**40%**	Awareness gap
Citizen scientists involved only in data collection (general public)	**87%**	Narrow participation practices
Researchers not sharing results with CS participants (researchers)	**15%**	Weak feedback culture
Researchers not conducting/planning CS (researchers)	**71%**	Low attractiveness of CS

These findings demonstrate a strong disconnect between the potential of citizen science and the level of institutional support, awareness, and strategic commitment within research organisations. 85% of researchers and research organisations indicated the absence of formal guidelines or policies for citizen science projects and 45% responded that their organisation did not have any ongoing citizen science projects. Moreover, 70% noted a lack of available support or training for such initiatives. 86% of research funder respondents reported that citizen science is only sporadically or not at all visible in funding projects, and 40% of all respondents were unaware of what citizen science entails. 87% percent of the general public reported involvement limited to data collection, rather than contributing to data interpretation, problem definition, or co-creating the research process, highlighting the narrow scope of participation. The relationship between identified gaps and the policy's responses is summarised in Table 3.

Table 3. Alignment of Survey-Identified Gaps with Policy Response

Identified Gaps from Survey Responses	Policy Response
Lack of CS policy (85%) (researchers, research organisations)	Organisations encouraged to adopt a CS policy
Lack of support & training (70%) (researchers, research organisations)	Training, resource sharing, support structures
Lack of funding visibility (86%) (funders)	Recognition/merit for CS methods
Low awareness (40%) (all respondents)	Clear terminology; separate participant guide

Identified Gaps from Survey Responses	Policy Response
Low researcher engagement (71%) (researchers)	Increase attractiveness and support for CS
Narrow participation of citizen scientists (87%) (general public)	Promote broader involvement & communication
Weak feedback practices (15%) (researchers)	Encourage sharing results with participants
Lack of legal support	Recommend equal legal support for CS

In the analysis phase, which bridged the research and drafting stages, the working group undertook an iterative analysis process, resulting in a draft of the policy document based on the survey results. Upon completion of the drafting process, the draft was circulated for stakeholder review and feedback within research organisations. Public feedback from January and February 2022 included 21 comments from 9 organisations that advocated for a clear terminology and increased emphasis on participant perspective. Feedback resulted in minor terminological revisions of the draft. For the participant perspective, it was decided that a complementary guide will be drafted in the future since the policy was set to mainly target research performing organisations. *How to Become A Citizen Scientist? A Beginner's Guide* (Svahn et al., 2024) was later drafted by another working group in the OS coordination and published in 2024.

The policy addresses gaps identified in the survey by proposing several strategic and practical recommendations. It emphasises enhancing researcher freedom and interaction, enabling citizen science in a manner that supports and increases researchers' freedom and opportunities to engage with, and disseminate research-based knowledge throughout society. This aligns with the survey findings where a lack of formal guidelines and support was a major concern. By advocating for incentives and structures that respect and recognise researchers using citizen science methods, the policy aims to address the absence of organisational support and training highlighted by 70% of researcher and research organisation respondents.

The policy provides principles and guidelines for research organisations, funders, and other community-facing entities to promote citizen science. For example, the policy recommends that "organisations should have a policy on citizen science as its own policy or as part of another policy on open science". This directly responds to the 85% of researchers and research organisations who noted the lack of formal guidance in their organisations. Additionally, the policy seeks to answer how citizen science projects can be made more appealing to researchers, addressing the 71% of researchers respondents who have neither conducted nor planned to conduct research based on citizen science.

By suggesting methods for citizen science to bring recognition and merit to researchers, the policy attempts to integrate citizen science as an equal scientific method, responding to the infrequent visibility in funding opportunities noted by 86% of research funder respondents. The policy aims to clarify the role of organisations as enablers of citizen science, fostering its development and participatory nature as part of Finnish organisational culture. This is a direct response to the lack of awareness and support structures reported by the respondents.

The policy also aims to improve interaction with citizen scientists. In the survey results 87% of citizen scientists that participated in the survey responded that the only stage of the research process they had taken part in in citizen science projects was data collection. 15% of researchers that participated in the survey responded that they had not shared the results of a citizen science project to participating citizen scientists. The policy recommends organisational support for communication and interaction during and after citizen science projects. This approach seeks to empower researchers to sustain and enhance their engagement with citizens both during the project and for a significant period after its completion.

The final policy emphasises the need to strengthen organisational capacity for citizen science by improving training, providing legal and administrative support, enhancing recognition for CS methodologies, and promoting transparent communication practices.

The policy objectives highlight the need for citizen science training and support for legal issues and platforms. The policy advises organisations to provide researchers and staff with opportunities to engage in both practical and methodological training in citizen science as part of their overall professional development. It also recommends that organizations guarantee legal support for citizen science projects, ensuring it is available on the same terms as for other projects.

The policy promotes the possibility for sharing resources among organisations. In this way, the policy aims to address the 70% of researcher and research organisation respondents indicating their organisations lacked available support or training on citizen science, while ease of participation was identified as one of the top three concerns related to citizen science in the survey. Direct questions of legal support were not present in the survey. However, the working group identified legal support as a necessary policy feature.

Prior to the publication of the final policy document, an additional consultation was conducted in March 2022 with the national OS coordination steering group to ensure stakeholder commitment and consensus. The review did not result in further content revisions but served as a measure for policy validation.

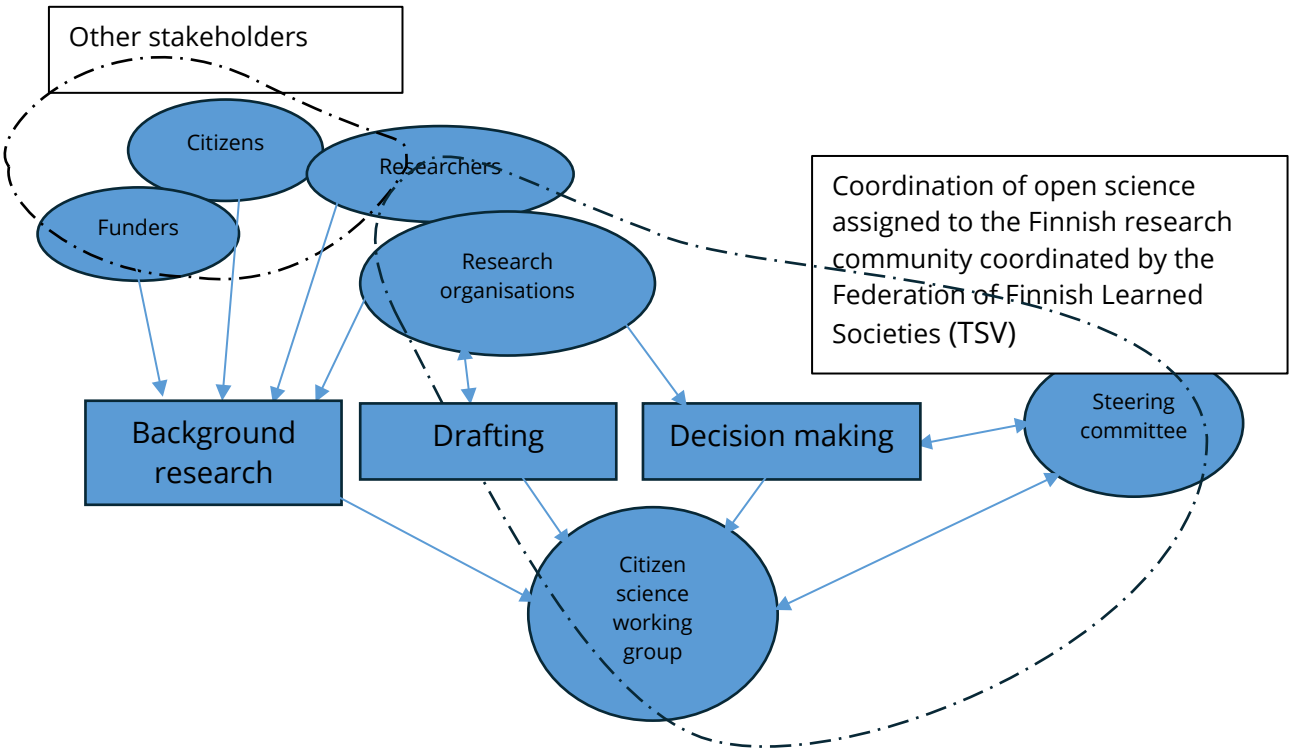

Fig 1. Role of stakeholder engagement in citizen science policy development process in Finland

The interactions between the policy, evidence from the documentary data and the survey responses are evident in the deliberate alignment of policy recommendations with stakeholder feedback, as depicted in Figure 1. The stakeholder feedback and participation played a key role in shaping the policy document, which seeks to bridge the identified gaps by providing a comprehensive framework that encourages the integration of citizen science into mainstream research practices. By addressing the concerns and barriers highlighted by stakeholders, the policy aims to cultivate a more supportive and structured environment for citizen science, ultimately enhancing its visibility, attractiveness, and efficacy as a scientific method. This alignment underscores the importance of stakeholder-informed policy development in creating responsive and effective governance frameworks. Analysis shows most volume in terms of feedback resulting in policy content was received from the stakeholder survey while public feedback and steering group review provided validation and minor revisions. The overall volume of participation suggests possible gaps in representation that did however effectively inform the policy content.

Discussion

Focus of this study was on the relationship between participatory policy-making processes and the resulting policy outcomes, using Finland's first citizen science policy as a case example.

The policy development process included several participatory elements such as public commentary and steering group review, which allowed stakeholders to share views and respond to draft versions of the policy, also identified in Buckland-Merrett et al. (2017).

Participation in the working group was active, suggesting that participation had a meaningful role in the policymaking process. This is in line with earlier research indicating that inclusiveness can strengthen trust and accountability in policymaking (Marks et al., 2022; Ansell & Gash, 2008). The policy process comment rounds reflected the principles of systemic design (Blomkamp 2021), seeking to create enabling conditions for researchers to engage with the process.

Practical gaps in institutional support for citizen science, particularly regarding formal guidelines, training, and visibility in funding mechanisms could be identified through the survey. Identification of these gaps made possible a deeper understanding of the everyday challenges researchers face when using citizen science methods. This demonstrates how participatory approaches can help to identify concrete barriers and translate stakeholder concerns into specific policy actions.

The participatory methods employed in developing the policy appear to have translated stakeholder concerns into actionable recommendations that indicate increased likelihood for policy support an adaption following Wehn et al (2017).

However, the findings also reveal limitations in the reach of the participatory process. The overall number of survey participants (N=152) limits the scope of national level collaboration. A substantial share of survey respondents (40%) reported being unfamiliar with citizen science. This suggests that participation involved a larger proportion of individuals who already had some awareness or interest in citizen science. For this segment, the process may have functioned more as consultation, rather than providing a broader learning or capacity-building exercise. This may limit the policy's potential to foster widespread engagement and shared ownership across the research community and reflects concerns raised in participation frameworks such as the IAP2 Spectrum (International Association for Public Participation, 2018), which emphasise the need for participation to extend beyond consultation.

The Finnish research community consists of researchers and candidates affiliated with research organisations, research funders, service providers that develop the infrastructure of open science as well as several other actors including learned societies, scholarly publishers, academies and national scientific boards and committees, research libraries and archives (Avoimen tieteen ja tutkimuksen koordinaatio 2021). Open participation enables the involvement of broad engagement, but as the Finnish case illustrates, stakeholder representation during policy development – even with multi-faceted participatory structures – most likely did not engage the whole research community. It is also noteworthy that various research performing organisations were already represented in the Citizen Science Working Group and this could partly explain the lower levels of participation alongside limited resources and engagement visibility. This highlights a critical tension between inclusivity and the need for sustained long-term engagement as found in Collaborative Governance models (Ansell & Gash, 2008).

The documentary and survey findings suggest that while the participatory approach captured specific concerns, it may not have been sufficiently inclusive or iterative to address the deeper cultural and structural challenges facing citizen science. This limitation points to the need for participatory processes that are not only consultative

but also transformative, enabling long-term shifts in institutional practices and community ownership of policies resulting in stakeholder trust.

The case study findings align with broader theoretical discussions on participatory policymaking (Riduan, 2024; Calyx, 2022; Liu, 2021; Batory & Svensson, 2019 Visser & Kreemers, 2019; Filipiak & Dylewski, 2018) suggesting that challenges can undermine the effectiveness of participation without inclusive, resourceful and participatory design.

Successful international examples of participatory policymaking, such as Scotland's Community Empowerment Act and Colombia's Planning Councils (McHugh et al., 2023; Mayka, 2019), illustrate the importance of sustained stakeholder engagement throughout the policy cycle with iterative feedback loops and robust communication strategies to ensure comprehensive participation. These real-world examples emphasize how effective participatory processes can generate decisions that better reflect community needs, thus aligning with stakeholder theory and the results from this study. Evidence from these cases along with this study highlight the need for more robust communication and capacity building to support deeper participation through the policy development cycle as well as reaching broader participation with underrepresented stakeholder groups in the research community.

Moving forward, citizen science and other science policy frameworks must balance immediate stakeholder feedback with strategies for long-term capacity-building and systemic change, leading to more inclusive and legitimate policy outcomes following Jumadi et al. (2024). This requires integrating participatory approaches with broader institutional reforms, such as enhanced communication channels, and sustained funding mechanisms. Another driver of open science practices alongside national policies suggested by de Castro (2022) was Horizon Europe funding that requires open access to publications and research data for funded projects. The sporadic visibility of citizen science with funding projects indicates low funding incentives for conducting citizen science research that could be assessed further in future research.

To generalise these findings, future research should replicate participatory experiments across different science policy contexts and topics. A follow-up study examining policy adoption and conducting comparative analyses with participatory policy-making models in other European countries could provide valuable insights into best practices for fostering inclusivity and impact. Future research should also investigate mechanisms for making stakeholder engagement more inclusive, iterative, and impactful, ensuring that participatory approaches function as catalysts for systemic change in science policy. Research questions might explore how participatory processes influence various aspects of science policy development, such as peer learning, consensus building, and preference transformation. As participatory policymaking potentially scales to involve larger populations, innovative technologies and data analysis tools could play a vital role in enhancing both the inclusivity and the impact of such processes. A question rises whether the inclusion of all relevant actors fosters legitimacy and increases policy acceptance (Freeman et al., 2010).

Conclusion

The driving question of this case study was how participatory approaches shape the development of policy documents, particularly Finland's citizen science policy. Our findings suggest that the participatory approach improved responsiveness to stakeholder needs despite limitations in awareness and inclusivity, addressing gaps such as missing guidelines and training while enhancing the visibility of citizen science in funding structures. By incorporating stakeholder input, the policy promotes integration into mainstream research practices and offers recognition to researchers adopting these methodologies. Although challenges remain, the Finnish model demonstrates the potential of participatory policymaking to create inclusive and effective frameworks and stands out in the Nordic context for national-level engagement. Overall, the case highlights the need for processes that are transformative rather than merely consultative, integrating feedback, communication strategies, and capacity-building to ensure systemic change and broader engagement.

References

Aitamurto, T. (2016). Crowdsourced deliberation: the case of the law on off-road traffic in Finland. Policy & Internet, 8(2), 174-196. https://doi.org/10.1002/poi3.115

Ansell, C., & Gash, A. (2008). Collaborative Governance in Theory and Practice. Journal of Public Administration Research and Theory, 18(4), 543–571. https://doi.org/10.1093/jopart/mum032

Ansell, C., Sørensen, E., & Torfing, J. (2017). Improving policy implementation through collaborative policymaking. Policy & Politics, 45(3), 467–486. https://doi.org/10.1332/030557317X14972799760260

Arnstein, S. R. (1969). A Ladder of Citizen Participation. Journal of the American Institute of Planners, 35(4), 216–224. https://doi.org/10.1080/01944366908977225

Avoimen tieteen ja tutkimuksen koordinaatio (2021) Avoimen tieteen ja tutkimuksen koordinaatio. Itsearviointi. Responsible Research Series 11:2021. https://doi.org/10.23847/tsv.149

Bhangale, A. (2024). Citizen science at the university of amsterdam: findings from interviews and a university-wide survey. https://doi.org/10.31219/osf.io/z5b63

Blomkamp, E. (2021). Systemic design practice for participatory policymaking. Policy Design and Practice, 5(1), 12-31. https://doi.org/10.1080/25741292.2021.1887576

Boon, W., Haan, J., Duisterwinkel, C., Gould, L., Janssen, W., Jongsma, K., ... & Yerkes, M. (2022). Meaningful public engagement in the context of open science: reflections from early and mid-career academics. Research for All, 6(1). https://doi.org/10.14324/rfa.06.1.23

Brenya, E. (2024). Do the people matter in policymaking in ghana? a reflection on the e-levy and debt exchange programs. Panafrican Journal of Governance and Development (Pjgd), 5(1), 56-77. https://doi.org/10.46404/panjogov.v5i1.5361

Brussel, S. and Huyse, H. (2018). Citizen science on speed? realising the triple objective of scientific rigour, policy influence and deep citizen engagement in a large-scale citizen science project on ambient air quality in antwerp. Journal of Environmental Planning and Management, 62(3), 534-551. https://doi.org/10.1080/09640568.2018.1428183

Buckland-Merrett, G., Kilkenny, C., & Reed, T. (2017). Civil society engagement in multi-stakeholder dialogue: a qualitative study exploring the opinions and perceptions of meta members. Journal of Pharmaceutical Policy and Practice, 10(1). https://doi.org/10.1186/s40545-016-0096-0

Calyx, C. (2022). Participatory budgeting for research funding decisions. Evidence & Policy, 18(1), 163-176. https://doi.org/10.1332/20x160178165248 92

de Castro, P. (2022). Successful implementation of Open Access strategies at Universities of Science & Technology. CESAER Task Force Open Science 2020-2021. https://doi.org/10.5281/zenodo.6410867

Cheng, W. and Ahmad, J. (2010). Incorporating stakeholder approach in corporate social responsibility (csr): a case study at multinational corporations (mncs) in penang. Social Responsibility Journal, 6(4), 593-610. https://doi.org/10.1108/17471111011083464

Dickinson, J., Shirk, J., Bonter, D., Bonney, R., Crain, R., Martin, J., ... & Purcell, K. (2012). The current state of citizen science as a tool for ecological research and public engagement. Frontiers in Ecology and the Environment, 10(6), 291-297. https://doi.org/10.1890/110236

Driesche, C. and Kerklaan, S. (2022). The value of visual co-analysis models for an inclusive citizen science approach. inspired by co-creation methods from design thinking. Fteval Journal for Research and Technology Policy Evaluation, (54), 51-60. https://doi.org/10.22163/fteval.2022.571

Freeman, R. E, Strategic management: A stakeholder approach. (1984) Pitman Boston. 1984.

Freeman, R. E., Harrison, J. S., Wicks, A. C., Parmar, B. L., & de Colle, S. (2010). *Stakeholder Theory: The State of the Art*. Cambridge: Cambridge University Press.

Gibbs, N., Angus, C., Dixon, S., Parry, C., & Meier, P. (2023). Stakeholder engagement in the development of public health economic models: an application to modelling of minimum unit pricing of alcohol in south africa. Applied Health Economics and Health Policy, 21(3), 395-403. https://doi.org/10.1007/s40258-023-00789-6

Häkli, J., Kallio, K., & Ruokolainen, O. (2019). A missing citizen? issue based citizenship in city-regional planning. International Journal of Urban and Regional Research, 44(5), 876-893. https://doi.org/10.1111/1468-2427.12841

Hansson, E.-L., Bukauskas, L., Garavelli, S., Gunnarsdóttir, B., Hammargren, P.-O., Rosti, T., Hienola, A., Iozzi, M. F., Morthorst-Jensen, D. A. M., Christiansen, E., Rauste, P., Slaidins, I., & Vellemaa, T. (2022). D2.8: Open Science policies and resource

provisioning in the Nordic and Baltic countries (final report). Zenodo. https://doi.org/10.5281/zenodo.6503709

Harrison, J. and Wicks, A. (2013). Stakeholder theory, value, and firm performance. Business Ethics Quarterly, 23(1), 97-124. https://doi.org/10.5840/beq20132314

Hicks, A., Barclay, J., Chilvers, J., Armijos, M., Oven, K., Simmons, P., ... & Haklay, M. (2019). Global mapping of citizen science projects for disaster risk reduction. Frontiers in Earth Science, 7. https://doi.org/10.3389/feart.2019.00226

Hinckson, E., Schneider, M., Winter, S., Stone, E., Puhan, M., Stathi, A., ... & King, A. (2017). Citizen science applied to building healthier community environments: advancing the field through shared construct and measurement development. International Journal of Behavioral Nutrition and Physical Activity, 14(1). https://doi.org/10.1186/s12966-017-0588-6

Hu, R. (2024). Learners, not just data contributors: self-regulated learning in citizen science. https://doi.org/10.20944/preprints202404.0926.v1

International Association for Public Participation (2018). IAP2 Spectrum of Public Participation Accessed at https://engagementinstitute.org.au/resources/iap2-public-participation-spectrum/ on June 13, 2025.

Joss, S., & Bellucci, S. (2002, January 1). Participatory Technology Assessment: European Perspectives. https://www.researchgate.net/publication/37415082_Participatory_Technology_Assessment_European_Perspectives

Jumadi, Adhifa, M. N. H. N, Amelia, A., & Ashiva, D. S. (2024). Stakeholder engagement, government policy, and tourist satisfaction. Entrepreneurship Bisnis Manajemen Akuntansi (E-Bisma), 161-175. https://doi.org/10.37631/ebisma.v5i1.1431

Kansalaistieteen työryhmä. (2022). Kansalaistieteen suositus. Responsible Research Series. 5:2022. https://doi.org/10.23847/tsv.230

Laird, Y. (2023). Harnessing citizen science in health promotion: perspectives of policy and practice stakeholders in Australia. Health Promotion International, 38(5). https://doi.org/10.1093/heapro/daad101

Laird, Y., Manner, J., Baldwin, L., Hunter, R., McAteer, J., Rodgers, S., ... & Jepson, R. (2020). Stakeholders' experiences of the public health research process: time to change the system?. Health Research Policy and Systems, 18(1). https://doi.org/10.1186/s12961-020-00599-5

Langhof, H., Lander, J., & Strech, D. (2016). Input analysis for two public consultations on the eu clinical trials regulation. Health Research Policy and Systems, 14(1). https://doi.org/10.1186/s12961-016-0141-0

Lankoski, L. and Smith, N. (2017). Alternative objective functions for firms. Organization & Environment, 31(3), 242-262. https://doi.org/10.1177/1086026617722883

Lee, L. and Lu, J. (2020). Using a citizen science approach in early childhood education: a call for strengthening evidence. Cogent Education, 7(1). https://doi.org/10.1080/2331186x.2020.1823141

Lemke, A. and Harris-Wai, J. (2015). Stakeholder engagement in policy development: challenges and opportunities for human genomics. Genetics in Medicine, 17(12), 949-957. https://doi.org/10.1038/gim.2015.8

Lynch, D., Kupper, F., & Broerse, J. (2018). Toward a socially desirable eu research and innovation agenda on urban waste: a transnational eu citizen consultation. Sustainability, 10(5), 1641. https://doi.org/10.3390/su10051641

Mardiyanta, A. (2013). Restore public trust through deliberative public policy formulation. Bisnis & Birokrasi Jurnal Ilmu Administrasi Dan Organisasi, 20(1). https://doi.org/10.20476/jbb.v20i1.1861

Marks, L., Laird, Y., Trevena, H., Smith, B., & Rowbotham, S. (2022). A scoping review of citizen science approaches in chronic disease prevention. Frontiers in Public Health, 10. https://doi.org/10.3389/fpubh.2022.743348

Mayka, L. (2019). Society-driven participatory institutions: lessons from colombia's planning councils. Latin American Politics and Society, 61(2), 93-114. https://doi.org/10.1017/lap.2018.79

McHugh, N., Baker, R., & Bambra, C. (2023). Policy actors' perceptions of public participation to tackle health inequalities in scotland: a paradox?. International Journal for Equity in Health, 22(1). https://doi.org/10.1186/s12939-023-01869-8

McKinley, D., Miller-Rushing, A., Ballard, H., Bonney, R., Brown, H., Cook-Patton, S., ... & Soukup, M. (2017). Citizen science can improve conservation science, natural resource management, and environmental protection. Biological Conservation, 208, 15-28. https://doi.org/10.1016/j.biocon.2016.05.015

Mehari, Y., Pekkola, E., Hjelt, J., Cai, Y., Stenvall, J., & Javier, O. (2022). Defining 'responsible' in responsible research and innovation: the case of quadruple helix innovation in the energy sector in the tampere region., 199-225. https://doi.org/10.1007/978-3-030-84044-0_10

Moore, S. (2017). Towards a sociology of institutional transparency: openness, deception and the problem of public trust. Sociology, 52(2), 416-430. https://doi.org/10.1177/0038038516686530

Mumelaš, D., & Martek, A. (2024). Benefits of Citizen Science for Libraries. Publications, 12(1), 8–8. https://doi.org/10.3390/publications12010008

National Open Science Coordination. (2022). Policy for open scholarship. *Responsible Research Series*. 2:2022. https://doi.org/10.23847/tsv.227

Niyibizi, J., Nganabashaka, J., Ntawuyirushintege, S., Tumusiime, D., Umwali, G., Rulisa, S., ... & Munganyinka, C. (2021). Using citizen science within an integrated knowledge translation (ikt) approach to explore cardiovascular disease risk perception in rwanda. Frontiers in Tropical Diseases, 2. https://doi.org/10.3389/fitd.2021.752357

Open Science Coordination in Finland (2022). Recommendation for citizen science. In *Responsible Research series* 13. https://doi.org/10.23847/tsv.445

O'Sullivan, J., Pollino, C., Taylor, P., Sengupta, A., & Parashar, A. (2020). An integrative framework for stakeholder engagement using the basin futures platform. Water, 12(9), 2398. https://doi.org/10.3390/w12092398

Pernaa, H. (2020). Participative policymaking in complex welfare system: a delphi study., 109-132. https://doi.org/10.1007/978-981-15-0069-5_6

Poger, J., Mayer, V., Duru, O., Nauman, B., Holderness, H., Warren, N., ... & Kraschnewski, J. (2020). Network engagement in action. Medical Care, 58, S66-S74. https://doi.org/10.1097/mlr.0000000000001264

Rowbotham, S., Laird, Y., Marks, L., Walker, P., Pontifex, K., Sobhan, A., ... & Smith, B. (2022). Building capacity to apply citizen science approaches in policy and practice for public health: protocol for a developmental evaluation of four stakeholder-led projects. Citizen Science Theory and Practice, 7(1). https://doi.org/10.5334/cstp.488

Riyadh, D. H., Supriati, B. C. & Lopez, T. C. (2023). Transparency and policy implementation in the public sector in Singapore. Journal of Public Policy & Governance, 7(3), 1-12. https://doi.org/10.53819/81018102t5223

Saarela, S. (2018). From pure science to participatory knowledge production? researchers' perceptions on science–policy interface in bioenergy policy. Science and Public Policy, 46(1), 81-90. https://doi.org/10.1093/scipol/scy039

Schött, S., Amin, R., & Butz, A. (2023). A literature survey of how to convey transparency in co-located human–robot interaction. Multimodal Technologies and Interaction, 7(3), 25. https://doi.org/10.3390/mti7030025

Shackleton, R., Adriaens, T., Brundu, G., Dehnen-Schmutz, K., Estévez, R., Fried, J., ... & Richardson, D. (2019). Stakeholder engagement in the study and management of invasive alien species. Journal of Environmental Management, 229, 88-101. https://doi.org/10.1016/j.jenvman.2018.04.044

Sulkowski, A., Edwards, M., & Freeman, R. (2017). Shake your stakeholder: firms leading engagement to cocreate sustainable value. Organization & Environment, 31(3), 223-241. https://doi.org/10.1177/1086026617722129

Svahn, E., Kallio, M., Helariutta, A., Koivisto, E., Mäntylä, E., Enwald, H., Ylönen, I., Karlsson, J., Clarot, K., Rauhala, M., Roininen, M., Tiainen, N., Nokelainen, O., Nissilä, P., Laihonen, P., Leinonen, P., Salminiitty, R., Peltonen, T., & Rabb, V. (2024). How to Become a Citizen Scientist: A Beginner's Guide. *Jyväskylä University Digital Archive (University of Jyväskylä)*. https://doi.org/10.5281/zenodo.14025248

Syberg, K., Hansen, S., Christensen, T., & Khan, F. (2017). Risk perception of plastic pollution: importance of stakeholder involvement and citizen science., 203-221. https://doi.org/10.1007/978-3-319-61615-5_10

The EOSC Open Science Observatory (2023). Citizen science Accessed at https://www.eoscobservatory.eu/explore/open-science-by-area/citizen-science on November 12, 2025.

Tomkiv, Y., Liland, A., Oughton, D., & Wynne, B. (2017). Assessing quality of stakeholder engagement: from bureaucracy to democracy. Bulletin of Science Technology & Society, 37(3), 167-178. https://doi.org/10.1177/0270467618824027

Wehn, U., Collins, K., Anema, K., Basco-Carrera, L., & Lerebours, A. (2017). Stakeholder engagement in water governance as social learning: lessons from practice. Water International, 43(1), 34-59. https://doi.org/10.1080/02508060.2018.1403083

White, M., & Langenheim, N. (2021). A ladder-truss of citizen participation: re-imagining Arnstein's ladder to bridge between the community and sustainable urban design outcomes. J. Of Design Research, 19(1/2/3), 155. https://doi.org/10.1504/jdr.2021.121067