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Foreword

The OECD Global Science Forum (GSF) and the Science and Technology Policy Institute of Korea (STEPI) activity on Open Research Agenda Setting was part of the OECD-STEPI project on Open and Inclusive Collaboration in Science. It is also a contribution to a larger portfolio of work by the OECD Committee for Scientific and Technological Policy (CSTP) and GSF on digitalisation and open science.

This project is based on an analysis of seven case studies of initiatives to co-design research agendas with citizen engagement. The main focus is on the challenges and lessons learned from these case studies. Whilst it was originally designed as a scoping study, the analysis revealed a number of consistent messages that it was considered were worthy of reporting in their own right.

The report aims to be useful to policy makers and to project managers and administrators who are contemplating whether and how to engage citizens in setting research agendas. It should promote a broader understanding of how such process are currently working in very different contexts. The conclusions and suggestions in this report are not meant to be prescriptive. Nevertheless there are a number of common issues and lessons learned that are broadly applicable.

The literature analysis and interviews for this study were carried out by Dai Qian from the OECD-GSF Secretariat (on secondment from MOST, People's Republic of China) and Eunjung Shin (STEPI, Korea). The preliminary results were discussed at an international workshop on Open and Inclusive Science in Seoul on 29-30 June 2017 that was hosted by STEPI. The final report was drafted by Dai Qian and Giulia Ajmone Marsan, with input from Eunjung Shin, Byong-Sam Choi and Lars Kluver and final editing by Carthage Smith.

This publication is a contribution to the OECD Going Digital project, which aims to provide policymakers with the tools they need to help their economies and societies prosper in an increasingly digital and data-driven world.

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Table of contents

Foreword	3
Abstract	5
Executive summary	6
The ten main observations	6
Rationale and justification [when and why?].....	6
Doing it well [how?]	7
Resources and impact [was it cost effective?].....	7
1. General context: open science and digitalisation	8
1.1. Open science and citizen involvement.....	8
1.2. Methods	9
2. Case study summaries	12
2.1. Case study 1: CIMULACT	12
2.1.1. Objectives and methodologies.....	12
2.1.2. Takeaway messages	12
2.2. Case study 2: Great New Zealand Science Project.....	13
2.2.1. Objectives and methodologies.....	13
2.2.2. Takeaway messages	14
2.3. Case study 3: Ideas for Change.....	14
2.3.1. Objectives and methodologies.....	14
2.3.2. Takeaway messages	15
2.4. Case study 4: James Lind Alliance	15
2.4.1. Objectives and methodologies.....	15
2.4.2. Takeaway messages	16
2.5. Case study 5: RISTEX.....	16
2.5.1. Objectives and methodologies.....	16
2.5.2. Takeaway messages	17
2.6. Case study 6: the X-Project.....	17
2.6.1. Objectives and methodologies.....	18
2.6.2. Takeaway messages	18
3. Overall analysis	19
3.1. Rationale	19
3.2. Methodologies	19
3.3. Main lessons learned.....	20
For further reading	22
Appendix 1. Individuals interviewed for case studies	23

Abstract

Citizen engagement is being promoted in many countries as a mechanism to improve the efficiency, quality and relevance of research and improve transparency and trust in science. At the same time, digitalisation is opening up new opportunities for consultation and exchange with citizens. This report includes an analysis of 7 different initiatives to engage citizens in the co-design of research agendas. These cases varied considerably in their scientific focus, geographic scale and overall aims and methodology. Nevertheless, a number of consistent messages came through in relation to: 1. the rationale for engaging citizens in setting research agendas; 2. how to do so effectively; 3. the resource implications and potential impact. The report includes 10 key observations or lessons learned to help guide policy-makers, research funders and researchers who are interested in citizen engagement in science.

Key words: science policy, research agenda, citizen engagement, co-design, digital tools.

Executive summary

Within the broader context of Open Science and also frameworks such as Responsible Research and Innovation in Europe or the Ethical Social and Legal Implications (ELSI) programme in the United States, there is increasing policy interest in citizen involvement in different stages of the scientific process. This begins with the establishment of research agendas and priorities and continues through into citizen science and public engagement. This report focuses on this first step: the co-design of research agendas.

Research agendas are generated at many different scales from regional to national to local and by many different bodies, including governments, research agencies and institutions. These agendas might cover all fields of science or specific areas and might be focussed on defining broad priorities or directions for specific programmes or projects. There is a potential role for citizen consultation for all of these different agendas but the potential added value and usefulness of such consultation varies considerably. In some areas, such as health research, such consultation is fairly routine and is understood to be beneficial and in some situations essential. In other areas, such as theoretical physics or metrology, the added value is less obvious.

This report is based on an analysis of seven case studies (six *de novo* and one recently reported in the literature) that represent very different types of open research agenda setting exercises. Detailed information was collected on each of these cases using structured interviews, with the overall aim of identifying key challenges and lessons learned that might inform overall policy thinking in this area. Each case was very different and interesting in its own right and so the report includes a summary of each case study and the key messages (section 2) as well as an overall analysis (section 3). The main observations emerging from this latter analysis are summarised below in response to the key policy questions: when, why, and how should open research agenda setting happen? and, is it cost-effective? These ten observations do not provide a complete response to any of these questions, which are very context dependent, but together with the 'take away messages' from the individual case studies they do hopefully provide some useful guidance.

The ten main observations

Rationale and justification [when and why?]

There are three main observations that emerge from the overall analysis of the case studies that address the questions of when and why citizen engagement in research agenda setting should be considered.

1. The involvement of citizens in open research agenda setting exercises can be a powerful and useful complement to traditional research agenda setting by governments and/or the academic community.
2. New and novel research ideas can definitely emerge from citizen engagement.
3. Managing expectations on both sides (researchers and citizens) is essential, and where there is strong discordance that cannot be resolved, success is unlikely.

Doing it well [how?]

Having made a decision that citizen engagement can be beneficial, how can this be done effectively and efficiently? Each situation is context specific but a number of overarching principles can be identified.

4. Being clear on aims and methods is key. Each of the seven cases considered in this project had different aims and the methods varied accordingly. There are a number of standard and tested methodologies available and these can be adapted to specific contexts.
5. On-line/digital tools and personal interactions are both important and should be used in a complementary way.
6. Logical design and clear definition of responsibilities and tasks are critical. Processes, including data collection and analysis, can be complex and raise new challenges relative to traditional agenda setting exercises. Clear designation of an overall co-ordinator is important.
7. Transparency and openness are critical for maintaining trust amongst different stakeholders. An effective engagement process needs to be iterative with regular communications and feedback.

Resources and impact [was it cost effective?]

8. Collaboration with funding organisations is essential to ensure that agendas are taken up and translated into research projects.
9. Doing it properly can be resource-intensive, although tapping into existing expertise and learning for others can save a lot of wasted effort.
10. Evaluation should ideally be built into the design of initiatives from the outset so that monitoring and impact assessment can be carried out, in order to improve methods and approaches over time.

1. General context: open science and digitalisation

The potential benefits of, and obstacles to, Open Science have been reviewed in number of recent reports (see for example, *Making Open Science a Reality* (OECD, 2015)). Many of the acknowledged benefits are associated with making the outputs of publicly funded research, principally data and publications, more widely accessible in digital format to scientists, the business sector and society more generally (OECD, 2015). This in turn is seen as opening up new research opportunities driving innovation. As such, open science was strongly advocated in the Daejeon Ministerial Declaration on Science, Technology, and Innovation (OECD, 2015) and is being mandated in many OECD countries. At the same time, many commentators and policy makers agree that open science is more than just open data and open access to publications and is more broadly about developing an open and inclusive scientific enterprise that involves multiple stakeholders throughout the various stages of the scientific process (OECD, forthcoming). These broader 'engagement' aspects of Open Science have, to date, attracted less policy attention but are an area of active experimentation in a variety of different settings - involving different areas of science and different stakeholder communities. Much of this work is focused on citizen engagement and, in Europe at least, is sometimes considered under the umbrella of Responsible Research and Innovation (Engage2020).

Open Science is enabled by digitalisation. Digital technologies offer new opportunities to organise and disseminate the outputs of research and they expand the opportunities to make science more inclusive. They can enable broader participation in scientific processes. Hence, citizens can now contribute via online platforms to the definition of research priorities. They can use mobile apps to collect data to be used by researchers and they can contribute via crowd-sourcing platforms to the analysis of complex mathematical problems. In some ways this makes the processes of science more complicated and threatens our traditional academic structures and norms, but it also opens up new opportunities to make science more effective, more pertinent and more innovative.

1.1. Open science and citizen involvement

When given the opportunity, the general public can actively participate in many aspects of science (Engage2020). With reference to a framework for Open Science (OECD, forthcoming), the principal areas for participation include:

- **Citizen science.** Citizen science is a broad term that encompasses many actors and spans a range of levels of engagement: from being better informed about science, to participating in the scientific process itself by observing, gathering or analysing data. At the heart of the scientific process, it can be more narrowly understood as people, who are not professional scientists, taking part in research, i.e. co-producing scientific knowledge. This involves collaborations between the public and researchers/institutes but also engages governments and funding agencies. Digitalisation has led to the emergence of online collaborative platforms and analytical tools that are central to many successful examples of citizen science.

- **Public engagement.** At the downstream end of the scientific process, digitalisation has provided new possibilities for researchers to communicate about their research in a more interactive manner, as well as for citizens to stay informed with respect to scientific discoveries. Studies have demonstrated the ability of blogs to improve science communication and involve unconventional actors. Researchers are increasingly active in the sphere of social media, e.g. Science journal produces a list of top 50 science stars based on Twitter followers. Fenda, a mobile app run by the Chinese popular science website Guokr.com, enables the public to ask questions to leading researchers, with the questioner paying a price that he/she considers worthy for a one-minute response.

And last but not least, the focus of this paper:

- **Open research agenda setting.** Returning to the beginning of the scientific process, institutions and governing bodies at various scales are recognising the benefits in consulting multiple actors and engaging them in setting agendas. Initiatives to strengthen the engagement of citizens in the selection of research priorities are beginning to appear in many countries. Public consultation exercises have been enabled by digitalisation and there is an increasing use of e-platforms for engaging a variety of actors. These are being used to complement more traditional multi-stakeholder consultation activities, such as workshops and forums. Why, when and how to co-design scientific research agendas are becoming important policy issues.

Having introduced the broader context of Open Science and citizen involvement in science, the rest of this report focuses on the engagement of citizens in agenda setting for science. However, it should be recognised at the outset that, although the main focus is on learning from case-studies to improve co-design processes, such processes are an overall complement and not a replacement for more traditional priority setting exercises. In this respect one of the main observations from this study is that co-design can have benefits but can be challenging to achieve effectively and also has costs. Balancing benefits, feasibility and costs is not something that is explicitly addressed in the current work but is obviously an important consideration.

The aim of this project was to explore in detail a small number of diverse cases of research agenda setting exercises that have from the outset been designed to engage citizens and accommodate their perspectives and suggestions. The objective at the outset was to analyse these cases with respect to identifying common challenges and lessons learned that might have broader policy implications and this is addressed in section 3. However, each of the case studies was of interest in its own right and generated specific take-way messages that may also be of interest in particular contexts. Hence section 2 of this report includes a description and analysis of each of the six individual cases, which feed into the subsequent more normative assessment in section 3.

1.2. Methods

This study collected detailed information on six initiatives by means of desk-top research and in-depth interviews. These initiatives were proposed by GSF member countries and covered different research domains and geographic areas. The selected initiatives were:

- CIMULACT, a European initiative led by the Danish Board of Technology Foundation;

- The Great New Zealand Science Project (GNZSP);
- Ideas for Change, Colombia;
- The James Lind Alliance, United Kingdom;
- RISTEX, Japan;
- X-Project, Korea.

The structured in-depth interviews were carried out, via webEx, by the OECD-Secretariat with individuals who had direct experience working with the initiatives - mainly programme managers or scientific leaders (see appendix 1). These interviews covered the following main areas:

- Historical background and context;
- Overall aims, key actors and governance arrangements;
- The project design - methodological approach and use of digital technologies;
- Implementation - challenges and lessons learned;
- Follow up and assessment.

Box 1 below provides an overview of an additional consultative agenda setting exercise that was carried out in the framework of the development of the Dutch National Research Agenda (De Graaf et al, 2017). This unique national initiative was presented at an OECD/CSTP workshop on the digitalisation of science and innovation in 2016 and has been the subject of a published detailed analysis, which is not repeated here. This exercise complements the six other case studies that are described in section 2 and it has been included in the overall analysis presented in section 3.

Box 1. The Dutch National Research Agenda in Perspective

In November 2014, the Dutch government started the development of a new strategy for science: the National Research Agenda. One of the pillars for the development of this agenda was public consultation in order to make the process more inclusive and maximise support from different groups of society. Public consultations were conducted thanks to digital tools, via which the public was invited to “ask a scientist a question”. All residents of the Netherlands could submit questions on this website along with explanations and key words. In total, almost 12 000 questions were submitted.

Using word processing software, the questions were analysed and clustered into 248 groups. Each group had an overarching main question and a brief explanation. To develop the clusters, the following criteria were used:

- Could the research related to the question provide some results in a 10 year time?
- The question had to be challenging and ground-breaking;
- There had to be a prominent research group in the Netherlands capable of working on the issue raised in the question or, if not, convincing arguments to invest in building the capabilities to work around the issue.

Subsequently, three conferences were organised to work further on the 248 groups of questions to add relevant information and aggregate further some of the questions. The conferences were based on three themes: “science4science”, “science4competitiveness”, “science4society”. A total of 900 people participated in the conferences that were organised in disciplinary and multi-disciplinary discussion groups in several rounds. This resulted in 195 clustered questions to the previous 248. A panel of experts further reduced the questions to 140.

The 140 questions were then linked to different national research organisations' priorities. The 140 questions were also divided into chapters of the final National Research Agenda: i) man, the environment and the economy; ii) the individual and society; iii) sickness and health; iv) technology and society; v) fundamentals of existence. The final research agenda described the linkages between the 140 clustered questions and themes from the EU Horizon 2020 programme.

The National Research Agenda secretariat developed a digital tool to put research organisations in contact with the persons who had submitted a question concerning a theme relevant for the organisation. This tool gave the opportunity to those who participated in the exercise to communicate directly with researchers and other parties that showed interest.

By the time the National Research Agenda was released, more than half of those who had submitted a question had received invitations to lectures, public meetings and online forums from a range of different organisations. Some of these events were also covered by the press. Also, a documentary about this public engagement process was realised and premiered at the EUREKA! Festival in Amsterdam, a science and innovation festival.

Source: De Graaf et al (2017), The Dutch National Research Agenda in Perspective: A Reflection on Research and Science Policy in Practice.

2. Case study summaries

2.1. Case study 1: CIMULACT

CIMULACT stands for ‘Citizen and Multi-Actor Consultation on Horizon 2020’. The project engaged more than 1000 citizens in 30 countries in Europe, along with a wide variety of other societal actors. In a highly participatory process, the project has provided a unique contribution to European research and innovation policies and topics, created dialogue and shared understanding among the actors, and built strong capacities in citizen engagement on scientific issues, thereby enhancing responsible research and innovation (RRI) in the EU. CIMULACT is led by the Danish Board of Technology Foundation, with a consortium of organisations from 27 EU member states, Switzerland and Norway.

2.1.1. Objectives and methodologies

CIMULACT went through several phases, utilising techniques and experience from previous EU projects:

- Vision phase – Workshops in 30 countries with 36 citizens participating in each workshop to produce visions for the future. Measures were taken to ensure consistent formats and diversity in participants.
- Social needs – A workshop in which the whole consortium worked together with scientists, journalists, artists, and public opinion leaders to extract societal needs from the visions.
- Research programme scenarios –co-creation of research programme scenarios made by the consortium, invited experts, stakeholders and one citizen from each country;
- Enriching the scenarios – citizens and multi-actors came in again through workshops and online consultation to enrich and detail the scenarios;
- Research topic – a conference was held with the project consortium and EC officials, which defined 23 research topics, based on the enriched research scenarios, that will feed into the EU research and innovation agendas;

A work package of methodological learning was also developed for summarising lessons learnt.

2.1.2. Takeaway messages

- **Involving citizens in setting research and innovation agendas is not only feasible, but also helpful.** Citizens are capable of producing concrete and unique contributions, and their visions, needs and concerns can be collected and processed with a standardised methodology that enables this information to be transformed into research and policy recommendations.
- **A well-designed methodology enables effective collection of citizens' visions, needs and concerns,** and translation of them into meaningful research topics for policy makers, funders and scientists, while remaining true reflections of the citizens' inputs;

- **Close collaboration with relevant funders and policy-makers is crucial**, if the outputs of such initiatives are to be implemented and have impact.
- Broader impacts are also seen, such as: **enhancement of mutual** understanding among policy makers, researchers and citizens, **capacity building** for both consortium partners and citizens, and promotion of responsible research and innovation.

2.2. Case study 2: Great New Zealand Science Project

The Great New Zealand Science Project (GNZSP) was a campaign that aimed to foster public engagement in research agenda-setting especially for the new national science programme (2013-22), the National Science Challenges. The project facilitated a nationwide communication and discussion on what are the biggest science issues facing the country. It was led by the Ministry of Business Innovation and Employment, but multiple actors, including the science and innovation sector, government and its advisory groups, and the general public, got involved in identifying science challenges in New Zealand. GNZSP eventually contributed to developing the National Science Challenges. GNZSP focused on challenges in the following thematic areas: marine resources; biodiversity; natural hazards; fighting diseases; land and water; climate change; advance materials and manufacturing; foods and health.

2.2.1. Objectives and methodologies

The project was led mainly by the Ministry of Business Innovation and Employment.

- The Ministry invited proposals from public relations organisations for public campaigns to identify topics linked to science challenges.
- The project was managed by the Ministry with a Governance Group and a cross-government Reference Group.
- The Minister appointed a 10 person “peak panel” of top researchers and budding young scientists to identify National Science Challenges from the submissions

Process:

The project was run for a short time, from October 2012 to January 2013. A major aim was public outreach and communication.

- A public relations firm was engaged to develop and run the campaign
- The campaign used TV advertising, with young people talking to scientists. The advertisements directed people to a website (the Ministry’s website).
- The public could use the website to “like” the illustrative challenges or build their own science project around what they thought were the biggest science challenges facing New Zealand.
- A separate channel was established for submissions from the science and innovation sector.

After the campaign, all the submissions were reviewed and assessed by the ‘peak panel’. The final panel report was published in March 2013 via the website of the Prime Minister’s Chief Science Advisor.

2.2.2. Takeaway messages

- **The main value of the project was in the social process rather than the ideas collected themselves.** It was really about socialising ideas, communicating with each other regarding what the science challenges were. For example, the project team got to know that, in response to the national science challenge on ageing people wanted more social science perspectives rather than medical approaches.
- **The timeframe of the campaign was a challenge,** especially the timing at the end of the school year, which limited access to school administrators, so that school children were individually invited to the campaign via TV commercials and websites rather than any formal channels in schools. Having schools involved in helping children to identify potential challenges would have increased awareness, participation and response rates.

2.3. Case study 3: Ideas for Change

Ideas for Change (IFC) is an ongoing project developed by the Colombian science and innovation agency, Colciencias. It aims to create the participatory and collaborative dynamics needed for knowledge sharing among vulnerable communities and actors of the scientific community in order to develop innovative solutions from science and technology. The solutions must address social problems and the unmet basic needs in specific social sectors.

IFC primarily engages two major stakeholders, the first being the vulnerable communities that may be in different areas of the Colombian territory, and the second the members of the scientific community. Other stakeholders are also involved to develop the project. This included alliances with other government agencies and multilateral agencies, in the role of technical or financial sponsors.

IFC is co-ordinated by the Administrative Department of Science, Technology and Innovation (Colciencias) and is funded by the national budget that leverages resources from international organisations or the business sector. IFC was initially funded by the Inter-American Development Bank and began its implementation in 2012. Thus far, three calls for proposals have been developed respectively in areas of water, energy and biodiversity.

2.3.1. Objectives and methodologies

Social challenges are defined at the government level (step 1) and this requires co-ordination and alliance building with other state departments, research institutions, financial and technological sponsors. Vulnerable communities are involved in all the remaining steps, i.e. they are asked to input concrete needs to formulate specific challenges (step 2), and are involved in the selection of solution proposals (step 3) and development of solutions (step 4).

2.3.2. Takeaway messages

- It is important, yet challenging, to bring together local communities, the scientific community and government actors as equal partners, when the historical relationships are hierarchical. **A level playing field is essential** to ensure effective communication and exchange.
- Co-ordination is **time and resource intensive**. It is necessary at multiple levels: alliance building for identifying social challenges, engaging local communities, prioritisation and expectation management, and building dialogue in developing and applying the solutions.
- **Digitalisation**, in this case the accessibility to internet and the online virtual platforms for submitting needs and solution proposals can facilitate considerably participation and management of the initiative.
- Besides providing solutions to concrete community needs, such initiatives, especially if successful in building relations among the involved actors, can add value in terms of **promoting trust, social cohesion and inclusiveness** around science, technology and innovation.

2.4. Case study4: James Lind Alliance

The James Lind Alliance (JLA) is a non-profit making initiative established in 2004. JLA is based at the National Institute for Health Research Evaluation at the University of Southampton in the UK. Over time, JLA has expanded its activities to Canada, the Netherlands and Germany. JLA has been working to identify research priorities in more than 40 areas including emergency medicine, palliative and end of life care, kidney transplantation and autism. JLA has the goal to bring patients, carers and clinicians together for the development of Priority Setting Partnerships (PSPs) to identify and prioritise unanswered questions about the effect of medical treatment. The aim of JLA's activities is to make sure that health research funders are aware of the issues that matter most to patients and clinicians.

2.4.1. Objectives and methodologies

JLA establishes PSPs on specific medical topics that generally last about 1/1.5 years. The methodology generally follows the following steps:

- Forming a multi-stakeholder steering group, who define the scope of PSP and develop a protocol to set out tasks;
- Gathering questions from all stakeholders, including patients, clinicians, health professionals, which is usually done through online survey of open-end questions to allow accessibility. This step can take several months;
- Processing the questions for prioritisation: the questions and uncertainties are checked against evidence, which can be significant work depending on the area;
- Further narrowing down the questions by interim prioritisation – the questions are again sent to the stakeholders for prioritisation which, in the end, generates a list of 20-30 questions;

- A final one-day workshop, where the questions are discussed and ranked by a balance of patients, carers and professionals, after which a top 10 list of questions is produced— one of the key outputs of a JLA PSP.

2.4.2. *Takeaway messages*

For the success of PSPs the following factors are of key importance:

- **Identifying the right stakeholders.** In most cases, the stakeholders are identified via the contacts of the steering group. PSPs need to be practical and do their best given the resources and contacts available. In this, the role of the steering group is crucial. For example, to engage the patients, it is important to have a representative in the steering group from primary care.
- **Preparing the stakeholders for participation.** An important JLA advisor’s job is to make sure that all the stakeholders from different communities are able to contribute equally. This means the patients and carers are being heard as much as the clinicians.
- **The PSP research questions do not need to be fully defining research questions.** Research funders and researchers have the task of finalise the definition and possible implementation. However research questions need to be in a state that the research community will also find valuable and useful.
- **Transparency is a key element in the process.** All the decisions made need to be reported. And the steering group needs to make sure that people can see what decisions are made.
- **Managing the expectations appropriately.** It is often necessary to make people understand the time it takes to have the selected priorities addressed. It takes time to fund research projects for the priorities, and the projects themselves may take years to complete.

2.5. Case study 5: RISTEX

RISTEX is a funding institution affiliated to the Japan Science and Technology Agency. It was established in 2001, following the adoption of the Budapest declaration at the UNESCO/ICSU world conference on science in 1999. This conference recognised the importance of “science for peace”, “science for development” and “science in society and science for society”, in addition to the more widely embraced “science for knowledge”. RISTEX conducts R&D programmes with the aim to produce and promote innovative solutions to address social challenges such as global warming, the ageing population and improvement of safety and security. RISTEX values transdisciplinary research carried out together by researchers from various fields, practitioners and other stakeholders. RISTEX runs programmes to support implementation and outspread of the R&D results into society. RISTEX funds at an average of USD 180 000 per year per project and each project has a duration of three years.

2.5.1. *Objectives and methodologies*

RISTEX projects generally follow these five steps:

- **Identify a social issue:** Every two years, a survey, using online questionnaires, of ongoing social issues is carried out. Text-mining of government white papers, magazines and newspapers is also used as additional input to the priority-setting process.
- **Identify R&D focus areas:** RISTEX establishes R&D focus areas through workshops and interviews with experts and stakeholders who are acquainted with the social problem under consideration. Interviews are conducted with stakeholders related to the social issue. For each social issue, around 70-80 interviews are made. This takes around one year and involves 2-3 people.
- **R&D projects:** The projects feature a solution oriented R&D, trans-disciplinary approach: proposals must have stakeholder involvement in agenda setting and implementation of the research. Proposals are also required to adopt multidisciplinary approaches, and hands-on R&D management involving RISTEX area directors and area advisors.
- **Development of prototypes:** The outcomes of R&D projects should not only be applied in the region or community where a social experiment takes place, but also should be extended to other organisations, communities, and regions.
- **Application and dissemination of the R&D programmes' outcomes into society:** RISTEX also exercises an Implementation Support Programme. This provides support to promote the usage of results from R&D projects and encourage widespread adoption.

2.5.2. Takeaway messages

- RISTEX is unique in Japan and tries to influence the way researchers engage with the public but so far the **impact has been limited**.
- **There is a relative lack of incentives** for researchers to participate in RISTEX projects
- There **are challenges to measure the impact** of RISTEX projects and the methodology is still being developed.
- **It can be difficult to scale up solutions** developed for specific communities and adapt them to broader contexts.

2.6. Case study 6: the X-Project

The X-Project is a new type of national research and development programme that has recently been implemented in Korea. Research problems are suggested by the general public and solved through science and technology solutions developed by researchers. The goal of the X-Project is to expand the type of participants who suggest and address research problems to include broader groups than the research community alone. The X-Project engages three main groups: the public, the scientific community and the X-Project organizations. Governance involves the X-Project Steering Committee composed of experts from various fields, the Executive Office made up of STEPI researchers, and the Ministry for Science and Innovation Policy (MSIP), which initiated X-Project and provided funding.

The X-Project was developed around the following principles: all ideas should be respected; all participants should be properly rewarded; research should target problem-solving; all the content created in a project should be open to the public; the objective, structure and operating method of the project should be as simple as possible; scalability should be considered in project design.

2.6.1. Objectives and methodologies

The X-Project was divided into five stages:

- Establishment of the X-Project with the organising X-Project Steering Committee (November 2014).
- Proposal of problems by the public (June 2015 ~).
- Selection of 50 problems (August 2015).
- Contest to select research teams (September ~ November 2015).
- Selection of research teams (first round November 2015, second round March 2016).

In 2015, 50 questions were selected as research topics, and 54 academic groups as research teams.

2.6.2. Takeaway messages

- **Digitalisation**, in this case web pages (proposal of questions, sharing of views, selection of top questions), social media (project promotion, proposal of questions, disclosure of the progress), and text mining (grouping and automatic production of questions) has facilitated the participation, proposal collection, maturation, and curation of inputs. In order to enhance the quantity and quality of questions, it is important to design online platforms, via which questions can be raised and ideas incubated.
- Initially, there were low expectations and some concerns about the planning and execution of a national research and development project which was led by not experts but the general public. However, the expanded participation of the public can lead to not only the **development of novel and realistic research topics but also increased public interest** and trust in science and technology.
- All content and information developed by the X Project was made **accessible and open to the public** to encourage all participants to provide input and develop a common understanding of the research problems.

3. Overall analysis

3.1. Rationale

There are multiple reasons to involve citizens in research agenda setting exercises – as reported by case study interviewees. These include the following:

- Getting feedback and opinions from the non-expert community;
- Making research agenda setting more inclusive and participatory;
- Getting a better understanding of citizens' concerns and needs, especially vis-à-vis research on grand challenges;
- Getting a different point of view on what is needed to address social challenges through science;
- Getting ideas about future demands and needs that can be met by the development of new services and products – a way to stimulate innovation;
- Enhancing mutual understanding among policy makers, citizens, researchers and strengthening social consensus in science policy;
- Promoting capacity building both among researchers and citizens. Researchers may learn how to interact with the non-expert community and citizens learn about research processes;
- Modifying citizens public perception of science.

For example, in the case of CIMULACT, the involvement of citizens was seen as a way to provide legitimacy to EU research projects and also strengthen responsible research and innovation approaches. In the case of RISTEX, citizens' involvement represented a unique opportunity to get feedback on the needs of people with respect to social challenges affecting Japanese society: climate change, ageing population, safety and security issues.

In Colombia, Ideas for Change specifically focuses on vulnerable communities that may have little awareness of research and do not always have the chance to voice their needs. This initiative benefited also from the participation of citizens with regard to the development of applications arising from research.

The James Lind Alliance brings patients, clinicians and carers together to make sure that health research funders are aware of the issues that matter most to patients and clinicians, recognising that research priorities are often set by the industry of the academia.

The X-Project in Korea has a strong focus on problem solving and it aims to involve citizens to develop useful applications and also strengthen the relationship between the general public and science and technology.

3.2. Methodologies

Generally the initiatives covered by the case studies follow standard and systematic methodologies to maximise the participation of citizens. All used digital technologies to a greater or lesser degree and in some cases, such as the national agenda setting exercise in the Netherlands, the initiative would not otherwise have been feasible. However, these technologies alone are not sufficient for effective consultation. The organisation of interactive workshops is typically an important step to involve citizens together with

researchers and in some cases government officials. In the case of the New Zealand Science Project there was an active engagement with television media and the press.

In all cases, the role of facilitators, in the form of steering groups or project managers, was essential. Steering Groups can also play an important role in the selection of the final priorities out of the large number of initial ones. This was done, for instance, in the X-Project and by the James Lind Alliance.

3.3. Main lessons learned

Despite the diversity of the cases considered there are some common issues that give an initial indication as to where policy intervention might be appropriate. Recurrent and strong messages emerging from the case studies include the following:

- **The involvement of citizens in open research agenda setting exercises can be a powerful and useful complement to traditional research agenda setting.** These exercises are not a substitute for traditional methodologies but can provide useful and different contributions by making the process more inclusive.
- **Being clear on aims and methods is key.** Policy makers may have different aims for involving citizens in research agenda setting (see the list of rationales above). For example, they may want to identify new research ideas or simply to engage citizens in prioritisation of pre-defined areas. It is important to clarify and articulate the main aim at the outset of an initiative so that appropriate methodologies can be developed accordingly.
- **Logical design and clear task descriptions are required.** The importance of designing the process of involving citizens in a logical way with clear questions emerged as an important feature across the cases. This was considered as being crucial to motivate people to participate into projects and encourage lively discussions. It is also a way to make sure that everybody participates on an equal footing in the process by eliminating barriers between “more and less expert citizens”. The composition and the role of steering groups can be crucial to ensuring good communications between experts and non-experts.
- **Transparency and trust promote participation.** To encourage active bottom-up participation it is necessary to involve citizens at different stages and clearly and openly communicate and show the results of the different stages as well as the overall conclusions. This is very important for promoting a positive public perception of science as citizens are generally curious to understand how the selection process works in practice and how their ideas were integrated or contributed to the definition of the selected priorities or research questions. A transparent and open process is also a way to reward citizens for their contribution.
- **New ideas can definitely emerge.** Several of the cases demonstrated that it is not only feasible to open up research agenda setting to citizens, but that citizens are capable of adding concrete and unique contributions to the agenda. Their ideas, needs and concerns can be collected and processed to provide concrete added value to priority setting exercises. Moreover, in some cases, citizens are not only providing new ideas and contributions but also bring in point of views that are quite different from the ones of traditional experts. For example, the CIMULACT project found that experts tend to prioritise activities that are already familiar to them and suggest incremental improvements while citizens suggested completely new ideas. The Great New Zealand Science Project similarly showed that, at least

with respect to questions around ageing population, citizens expressed the need to develop more the social science perspective than the medical/clinical solutions on which research tends to concentrate.

- **Managing expectations on both sides is required.** On one hand, it is important to explain to citizens how research projects work. They need to be aware that it takes time to fund research and it takes even more time to obtain results. It is important to explain to citizens how these processes work to avoid their disappointment if identified priorities or research questions are not immediately selected, funded and produce the desired outputs. On the other hand, it is also important to manage the expectations of policy makers and research funders vis-à-vis the involvement of non-experts in the research priority setting exercise. As highlighted by the X-Project, it takes time to achieve a virtuous cycle of public awareness and active public participation in research priority setting. Even in this case, results may not immediately arise. As a consequence, it may be premature to decide whether to continue such engagement activities on the basis of initial, short-term evaluations.
- **Funding organisations need to be involved.** Open research agenda setting exercises may be carried out by research funding agencies or by independent bodies with the necessary expertise. In the former situation it is important to have access to the required methodological expertise. In the latter case, it is advisable to closely engage relevant research funding agencies from the outset to make sure that the identified priorities are taken up in future research funding programmes.
- **On-line/digital tools and personal interactions are both important.** As already discussed, open science is enabled by digitalisation and on-line digital tools are certainly helpful, if not essential, to engage the general public in research agenda setting initiatives. Many of the cases under consideration would have not have been possible without online platforms. However, personal interactions are equally important to engage the general public and help stakeholders understand the practicalities of the different initiatives. Not surprisingly, several case studies highlight the importance of having the “right” steering group and identify the organisation of workshops as an essential step in the consultation process.
- **Doing it properly can be resource intensive.** Engaging citizens in research agenda setting exercises has a number of advantages as already detailed above. However, these exercises tend to be resource-intensive as they generally involve multiple steps, from the management of digital tools, to the organisations of workshops, to dissemination schemes for the general public. It is difficult to compare the real costs of these activities with more traditional agenda setting, since many aspects of the latter (horizon scans, foresight, committees, lobbyism, etc) are subsumed by interested stakeholders.
- **More consideration needs to be given to impact assessment.** Most of the cases in this study were subject to evaluations of different types (see Box 2 for example). However, rigorous impact assessment is not routine. Methodologies to assess the impact of this kind of activity, taking into account the different aims that specific projects want to achieve, need to be developed.

The initiatives that were included in this initial scoping work are relatively recent and, at least in some cases, in an experimental phase. For these reasons, the impact of citizen engagement in research agenda setting has not yet been fully analysed for each case. An initial, and intriguing, finding from a simple survey that was conducted to assess the impact of the X project, was that both citizens and researchers considered that the main

impact would be in increasing public interest in science rather than by providing life-changing solutions (X-Project interview). As time goes by, in depth evaluations will shed further light on the successful (and also less successful) aspects of these practices.

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Appendix 1. Individuals interviewed for case studies

CIMULACT: Lars Klüver, Danish Board of Technology Foundation (TNK) Denmark.

Great NZ Science Project: Veronica Jacobsen, Ministry for Business and Innovation, New Zealand.

Ideas for Change: Ricardo Andrés Triana González and Maria Isabel Velez Agudelo, Department of Science, Technology and Innovation (Colciencias), Colombia.

James Lind Alliance: Caroline Whiting, University of Southampton.

RISTEX: Hiroshi Tsuda, Japan Science and Technology Agency.

X Project: Byong-Sam Choi and Seong Won Park, Science and Technology Policy Institute, Korea.