



# Citizen Science and Citizen Engagement

Achievements in Horizon 2020  
and recommendations on the way forward



Research and  
Innovation

**Citizen Science and Citizen Engagement - Achievements in Horizon 2020 and recommendations on the way forward**

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# **Citizen Science and Citizen Engagement**

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and recommendations on the way forward

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## EXECUTIVE SUMMARY

**Mariya Gabriel**, Commissioner for Innovation, Research, Culture, Education and Youth

*“Interaction between citizens, scientists and policy makers is essential to enrich research and innovation, and reinforce trust of society in science. I am proud of the hundreds of thousands empowered citizens that already contributed to research and innovation in recent years and look forward to continue opening up research towards society and the world.”*

Research and innovation are essential to finding solutions to the pressing challenges we face. It requires opening up the research and innovation system to the participation and collective intelligence of society, embedding high integrity and ethics standards, raising interest in science, and supporting Europe’s brightest minds engage in scientific careers. Put simply, Europe cannot thrive without ensuring the best possible match between the immense potential achievements science has to offer and the needs, values and aspirations of citizens.

The objective of this report is to convey the achievements of the citizen science and citizen engagement projects funded under the Science with and for Society (hereinafter referred to as SwafS) part of Horizon 2020. Its purpose is to serve as input for the preparation of the Horizon Europe programme implementation.

### **Overview of SwafS Implementation in Horizon 2020**

A budget of EUR 462 million was earmarked for SwafS in Horizon 2020. Close to 2,000 proposals submitted in response to the annual calls for proposals, conveys strong interest in SwafS matters.

The annual evaluations are deemed to be highly robust. So far, they resulted in 150 funded projects and close to 50 more projects are expected to stem from the final calls under Horizon 2020. Since the start of this Framework Programme, REA Unit B.5 manages the projects. SwafS projects are typically composed of large consortia with an average of 11 partners and tend to run for around 3 years.

### **Citizen science and citizen engagement**

In 2015, former Commissioner Moedas identified three strategic priorities, described in [Open innovation, Open science, Open to the world](#) (the three O’s strategy). One important dimension of open science is citizen science and in 2016, the Council<sup>1</sup> recognised citizen science as an open science priority. Citizen science can make science more socially relevant, accelerate and enable production of new scientific knowledge, increase public awareness about science and ownership of policy making, as well as increase the prevalence of evidence-based policy making.<sup>2</sup>

The 22 projects funded under this part of the SwafS portfolio are categorised as ‘deepening the evidence base, practice and training on co-design and co-creation’ (6 projects) and ‘doing citizen science’ (16 projects). In terms of the former, projects produced a range of resources including practical guidance on running co-design and co-creation activities, representing the state-of-the-art in the field. Moreover, several projects developed sustainable networks. Notably, the EU-Citizen.Science Platform will serve as a repository for citizen science resources and become a pan-European hub. The ‘doing citizen science’ project portfolio reached an impressive number of citizens, often

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<sup>1</sup> [Council conclusions on the transition towards an Open Science system, adopted by the Council at its 3470th meeting held on 27 May 2016](#)

<sup>2</sup> [SwafS work programme 2018-2020](#)

in innovative ways and engaging groups typically excluded from R&I processes. Importantly, the diverse projects highlight the fact that citizen science approaches and methodologies can apply across all areas of science from physics and technology development to health and the social sciences and humanities.

Citizen science and science engagement more generally, is an ideal means to democratise science, build trust in science, and leverage the vast societal intelligence and capabilities to conduct excellent research and innovation. To fully reap these benefits, important challenges need to be tackled: design and adoption of indicators to measure outcomes; development of infrastructures and platforms to support cross-European activities; training and capacity building; international mutual learning activities; and finally, promotion of career and incentive systems embedding these approaches within institutions so that they become a complementary part of the EU's R&I landscape.

## INTRODUCTION

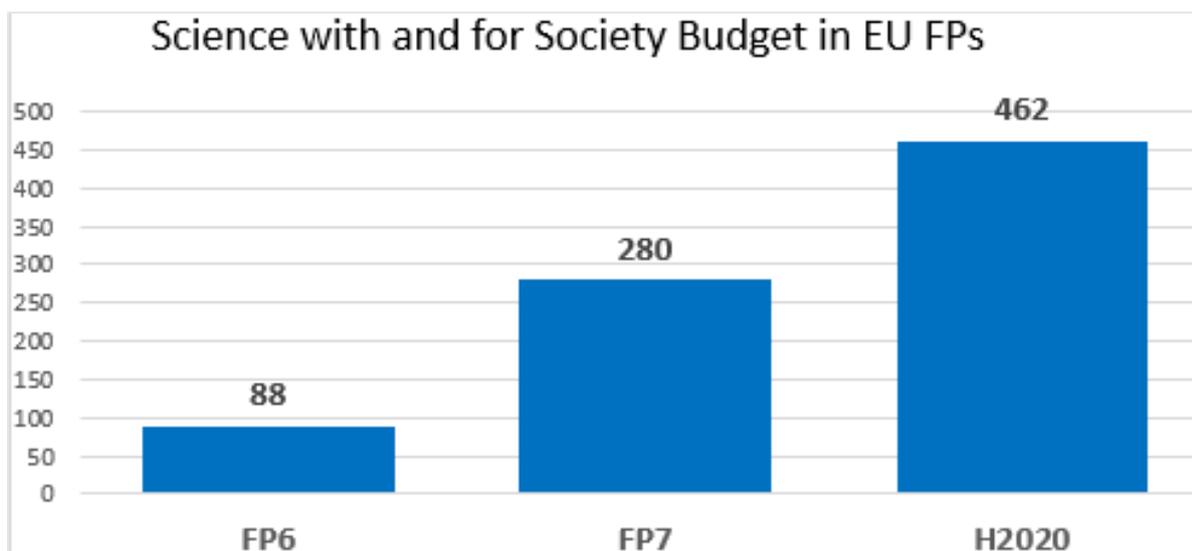
The Commission working paper in November 2000 '[Science, Society and the Citizen in Europe](#)' established the basis for the debate on the relationship of science and technology with society. On 26 June 2001, European research ministers adopted a [resolution on 'science and society and on women in science'](#) inviting both EU Member States and the European Commission to become more active in bringing science and society closer. As a response to the June 2001 invitation, in December 2001 the '[Science and Society](#)' Action Plan was launched to set out a common strategy to make a better connection between science and European citizens.

The '[Science and Society](#)' theme under 'Structuring the ERA' in the Sixth Framework Programme (FP6) became the first ever initiative of its kind on a European scale. With a budget of EUR 88 million, its goal was to increase society's acceptance of and engagement with science and to rectify gender imbalances in research. The Science and Society projects supported a wide range of studies and participatory events in areas including gender, ethics, young people and scientific participation.<sup>3</sup>

In 2007, under the 7<sup>th</sup> Framework Programme for Research and Technological Development (FP7), 'Science and Society' became 'Science in Society (SiS)' with the main objective to foster public engagement and a sustained two-way dialogue between science and civil society. Its budget almost tripled to 280 million euros. 183 projects were funded with an average EC contribution of 1.6 million euros. SiS demonstrated a clear European added value addressing science and society-relevant issues such as governance, ethics, public participation, awareness raising, gender equality, science education, open access to data, as well as dissemination of research and innovation.<sup>4</sup>

In 2012, the Communication on a reinforced ERA, included gender equality and gender mainstreaming in R&I as one of its five core priorities<sup>5</sup>.

Fig. 1: Evolution of budget allocated to 'Science with and for Society' in EU FPs



<sup>3</sup> [Report of the Expert Group](#): Evaluation of the Sixth Framework Programmes for research and technological development 2002-2006

<sup>4</sup> [Study 'Commitment and coherence: Ex-post-evaluation of the 7<sup>th</sup> EU Framework Programme \(2007-2013\)'](#)

<sup>5</sup> [COM\(2012\) 392 final](#) 'A Reinforced European Research Area Partnership for Excellence and Growth'

In parallel, SiS led to the development of a concept reconciling the aspirations and ambitions of European citizens and other Research and Innovation actors and towards the end of FP7, lessons learnt gave birth to an approach known as Responsible Research and Innovation (RRI), which was, on 21 November 2014, enshrined in the [Rome Declaration](#).

Under such a framework, all societal actors (researchers, citizens, policy makers, businesses, civil society organisations, etc.) work together during the whole Research and Innovation process in order to better align both the process and its outcomes, with the values, needs and expectations of European society<sup>6</sup>. In practice, RRI<sup>7</sup> is implemented as a package, aiming to better engage society in Research and Innovation activities, enabling easier access to scientific results, favouring a better uptake of the gender and ethics dimensions in Research and Innovation content, and spreading good practices in formal and informal education in science.

This concept of Responsible Research and Innovation (RRI) was tested and promoted during the last years of FP7. While RRI activities are concentrated in the 'Science and/in Society' parts, the intention was for the principles of RRI to be integrated into the overall research strategy across the Framework Programme.

The ex-post evaluation of FP7 found that future Framework Programmes should involve citizens and civil society organisations more substantially. They should engage citizens and stakeholders in a dialogue about the purpose and benefits of research and the way it is conducted, create incentives for science communication and support more strategic measures of communication addressing different audiences, foster the linkages between researchers, citizens and policy makers.

It recognised that citizen involvement in European research projects aims at increasing trust, acceptance, and ownership of research, a positive perception of science, better adoption of new knowledge and innovations, and improving relevance and creativity of research outcomes.<sup>8</sup>

Following on from this, Horizon 2020 includes a dedicated part on 'Science with and for Society'. Its overall aim is to build effective cooperation between science and society, to recruit new talent for science and to pair scientific excellence with social awareness and responsibility.<sup>9</sup> SwafS has grown substantially to reach EUR 462 million (see [Fig. 1](#): Evolution of budget allocated to 'Science with and for Society' in EU FPs), giving leverage to put RRI and all its dimensions into practice in Europe, notably through 'institutional changes' (a concept which was first piloted with Gender Equality Plans under FP7) in research and innovation organisations. In parallel, gender, RRI, and social sciences and humanities became cross-cutting issues promoted throughout the Horizon 2020 programme.<sup>10</sup>

New innovations are essential to Europe's international competitiveness. Europe cannot thrive without including citizens in the process of ensuring the best match possible between the immense potential achievements of science, and the needs and aspirations of society.

It is essential to realise societally robust science and innovation policy in the context of the European Research Area (ERA) and Innovation Union. The interim evaluation of Horizon 2020 conveys that 'Science with and for Society' is highly relevant to the

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<sup>6</sup> Brochure '[Responsible Research and Innovation: Europe's ability to respond to societal challenges](#)'

<sup>7</sup> The five dimensions of Responsible Research and Innovation are gender equality, science education, open access/open data, public engagement, and ethics.

<sup>8</sup> Study '[Commitment and coherence: Ex-post-evaluation of the 7th EU Framework Programme \(2007-2013\)](#)'

<sup>9</sup> [Regulation \(EU\) No 1291/2013 of the European Parliament and of the Council establishing Horizon 2020](#)

<sup>10</sup> [European Commission website for SwafS](#)

overarching challenges facing Europe and calls for greater support for citizen science and user-led innovation.<sup>11</sup>

In response to this, Horizon Europe places citizens at its core. Like for FP6, where the programme was embedded in 'Structuring the ERA', 'Science with and for Society' will be embedded in the 'Strengthening the European Research Area - Reforming and Enhancing the European R&I system'. According to the legal basis establishing the framework for Horizon Europe, *'this part will also include activities on: [...] modernising European universities; supporting enhanced international cooperation; and science, society and citizens'*.<sup>12</sup>

The [Horizon Europe Impact Assessment report](#) states that the SwafS part on 'Accelerating and catalysing processes of institutional change' contributes to implementing the RRI keys (public engagement, science education, ethics including research integrity, gender equality, and open access) through institutional governance changes in Research Funding and Performing Organisations (RFPOs) in an integrated way.

Results contribute to the implementation of ERA priorities, a greater involvement of all stakeholders in R&I, and a better and more sustainable engagement with society. Under Horizon 2020, the key performance indicator for SwafS is the number of institutional change actions which are analysed notably under the RRI chapter. This will be a key bridge for SwafS as it moves into Horizon Europe.

The Horizon Europe legal basis sets out the aim of deepening the relationship between science and society, maximising benefits of their interactions through gender equality plans, diversity and inclusion strategies, and comprehensive approaches to institutional changes. It calls on the future Framework Programme to engage and involve citizens and civil society organisations in co-designing and co-creating responsible research and innovation agendas and content, promoting science education, making scientific knowledge publicly accessible, facilitating participation by citizens and civil society organisations in its activities and promoting gender equality and strengthening the gender dimension. It should do so both across the programme and through dedicated activities under the 'Strengthening the European Research Area' part.

The engagement of citizens and civil society in research and innovation should be coupled with public outreach activities to generate and sustain public support for Horizon Europe. The programme should also seek to remove barriers and boost synergies between science, technology, culture and the arts to obtain a new quality of sustainable innovation, as well as support an inclusive approach to gender equality in research and innovation<sup>13</sup>.

Further enriching the debate in the run-up to the start of Horizon Europe are two reports on mission-oriented R&I, authored by Mariana Mazzucato, which provide directions for how co-design, co-creation, and citizen involvement in implementation can play key roles in responding to the challenges of our times<sup>14,15</sup>.

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<sup>11</sup> [Interim evaluation of H2020](#)

<sup>12</sup> [COM/2018/435 final 'Proposal for a regulation of the European Parliament and of the Council establishing Horizon Europe'](#)

<sup>13</sup> See supra note 12

<sup>14</sup> ['Mission-oriented Research & Innovation in the European Union'](#), by Mariana Mazzucato

<sup>15</sup> [Governing Missions in the European Union](#), by Mariana Mazzucato

The ERA cannot grow in a sound manner without citizens at its core embracing science education for all, promoting gender equality in our organisations, integrating ethical aspects in the research design phase and further developing a coherent EU ethics and integrity framework, opening up research and innovation to collective intelligence and capabilities, building trust in science through targeted communication and ultimately ensuring citizens are an integral part of the process to ensure better R&I.

The objective of this report is to convey the achievements of citizen science and citizen engagement projects funded under SwafS in Horizon 2020. Its underlying aim is to serve as input for DG Research and Innovation to integrate citizens in science under Horizon Europe, both across the future Framework Programme and in the first work programmes falling under the 'Strengthening the European Research Area' part.

The report commences with an outline of the methodological aspects of the analysis (the frame for the analysis, data sources, the analytical approach and its limitations). The first chapter presents an overview of SwafS implementation in Horizon 2020 in terms of both the evaluation process and project implementation. The core of the report presents the citizen science and citizen engagement policy objectives, analyses the projects' achievements and puts forward recommendations for the future Framework Programme. The final chapter presents concluding remarks as a complement to the highlights outlined in the executive summary.

At the time of writing this report, the COVID-19 pandemic, came to the fore with Member States going into lockdown, resulting in citizens across the EU being obliged to stay at home. There was an imminent need for effective online tools and many SwafS projects adopted contingency measures notably moving from physical to an online format for project activities in order to sustain the bridge between science and society.

## 0. METHODOLOGICAL NOTE

### Data sources

**Calls for proposal:** From the start of Horizon 2020 in 2014 until 2019, projects funded under the calls foreseen in the respective SwafS work programmes are included in the analysis (note that the calls dedicated to National Contact Points and those managed by DG R&I, featuring under the 'other actions' section of the work programmes are excluded):

Year	Call
2014	ISSI (2 topics): ISSI-1-2014, ISSI-2-2014
2015	ISSI (1 topic): ISSI-1-2015
2016	Single call (1 topic): SwafS-01-2016
2017	Single call (3 topics): SwafS-10-2017, SwafS-13-2017, SwafS-23-2017
2018	Single call (2 topics): SwafS-15-2018-2019, SwafS-18-2018
2019	Single call (2 topics): SwafS-15-2018-2019, SwafS-17-2019
2020	Single call (2 topics) <sup>16</sup> : SwafS-23-2020, SwafS-27-2020

**Projects:** The projects included are those funded under the calls listed in [Table 1](#): Number of citizen science and citizen engagement projects in Horizon 2020, as of 15/07/2020. In terms of data sources, the Grant Agreement notably the Description of Action, project deliverables, review reports, project web sites, project policy briefs as well as input from REA Project Officers over-seeing the implementation of the projects have been the basis of the analysis.

**Cluster events:** REA-led events organised in collaboration with DG R&I, bringing together projects funded under the same theme, pointed to some recommendations which are taken up in this report. In 2019, such an event was held for citizen science and citizen engagement projects.

**Reports:** Horizon 2020 legal basis, annual work programmes, Interim evaluation of Horizon 2020, Impact Assessment for Horizon Europe are the primary references. Other relevant documents are referenced directly in the report.

**Feedback from the evaluation:** Some recommendations made by experts during the panel meetings and the independent observers in their reports are also included.

**DG R&I Policy Officers** provided input in terms of key reference documents as well as the objectives of the respective themes and gave feedback on the draft chapters.

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<sup>16</sup> Evaluation still to be carried out at the time of writing this report.

Table 1: Number of citizen science and citizen engagement projects in Horizon 2020, as of 15/07/2020

# of projects	SwafS theme	Citizen science & citizen engagement
Finished		5
Running (at least 1 review held)		5
Running (1st review to be completed)		5
Just started (Q4 2019 / Q1 2020)		7
<b>TOTAL</b> GAs signed, as of 15/05/2020		22
Forecast of 2020 call		7
<b>TOTAL H2020</b>		<b>29</b>

### Analytical approach

The approach to the analysis is qualitative. Whenever possible, quantitative data has been included.

The analysis is primarily based on first-hand data on the currently running or completed projects under the Horizon 2020 Framework Programme. Each project was systematically assessed including the website, review reports and key deliverables. Deliverables singled out in the report are those deemed to be particularly pertinent by the project consortia (highlighted in project website) and/or by the independent expert involved in the project review and responsible REA Project Officer (highlighted in the review report). Policy and other pertinent reports have been consulted in order to integrate this analysis in a broader perspective.

In the project portfolio table and maps, a distinction is made between the coordinator (i.e. the entity coordinating the project consortium) and other partners. Note that 'other partners' includes project beneficiaries that are signatory to the grant agreement and does not include other entities e.g. third parties, that may be involved in project activities.

Finally, note that the project budget corresponds to the requested EU contribution.

### Limits of the analysis

The main limitation of this study lies in the lack of complete data as many projects have not yet concluded. The analysis was carried out prior to the 2020 evaluation, projects resulting from the 2019 call commenced close to the time of drafting this report and those funded following the 2018 call had not yet been subject to their first review.

# 1. OVERVIEW OF SWAFS IMPLEMENTATION IN HORIZON 2020

## 1.1. Evaluation process

Since the start of Horizon 2020, SwafS has organised calls for proposal on an annual basis.

As indicated in the introduction, the underlying objective of all these calls is to build effective co-operation between science and society; Foster the recruitment of new talent for science; Pair scientific excellence with social awareness and responsibility<sup>17</sup>.

The Horizon 2020 specific programme<sup>18</sup> outlines eight activity lines for SwafS:

- Attractiveness of scientific careers;
- Gender equality;
- Integration of citizens' interests and values in research and innovation (R&I);
- Formal and informal science education;
- Accessibility and use of research results;
- Governance for the advancement of responsible research and innovation and promotion of an ethics framework for research and innovation;
- Anticipation of potential environmental, health and safety impacts;
- Improved knowledge on science communication

For the SwafS WP [2014-2015](#), four separate calls for proposal were organised each year, with a common call deadline, and focused on:

- Making science education and careers attractive for young people (SEAC);
- Promoting gender equality in research and innovation (GERI);
- Integrating society in science and innovation (ISSI);
- Developing governance for the advancement of responsible research and innovation (GARRI)

As of 2016, the structure of the SwafS work programme moved from four distinct calls to individual topics under a single call. Under this new approach, the [SwafS WP 2016-2017](#), focused on the following main orientations:

- Institutional Change to Support Responsible Research and Innovation in Research Performing and Funding Organisations
- Embedding Responsible Research and Innovation in Horizon 2020 Research & Innovation
- Strengthening the Science with and for Society Knowledge-Base
- Developing Inclusive, Anticipatory Governance for Research & Innovation

The [SwafS WP 2018-2020](#) focused on the following five strategic orientations: Accelerating and catalysing processes of institutional change;

- Accelerating and catalysing processes of institutional change;
- Stepping up the support to Gender Equality in Research & Innovation policy;
- Building the territorial dimension of SwafS partnerships;
- Exploring and supporting citizen science, and
- Building the knowledge base for SwafS.

**Table 2: SwafS proposals data in Horizon 2020** shows the number of proposals submitted, evaluated and funded as well as the corresponding EC grant amount and the

<sup>17</sup> [Regulation \(EU\) No 1291/2013 of the European Parliament and of the Council establishing Horizon 2020](#)

<sup>18</sup> See supra note 17

volume of evaluation review requests. From the outset, it is clear that there is a strong interest in the SwafS fields peaking in the final year of Horizon 2020 with 407 proposals submitted.

Over the course of Horizon 2020, the pattern tends to be lower submission rates in the first year of the work programme compared to the following year. Furthermore,

Table 2: SwafS proposals data in Horizon 2020

Year	Title of Call	Number of proposals			EC grant amount for retained proposals	Success rate	Evaluation review	
		Submitted	Evaluated	Retained for funding			Requests	Upheld but not re-evaluated
<b>2014</b>	SEAC-2014-1	140	140	8	14.719.360 €	5,7%	1	0
	GERI-2014-1	47	44	5	10.275.490 €	11,4%	1	0
	GARRI-2014-1	28	28	5	8.710.636 €	17,9%	0	0
	ISSI-2014-1	35	33	3	10.792.173 €	9,1%	0	0
<b>2014 TOTAL</b>		<b>250</b>	<b>245</b>	<b>21</b>	<b>44.497.659 €</b>	<b>8,6%</b>	<b>2</b>	<b>0</b>
<b>2015</b>	SEAC-2015-1	207	204	6	11.934.183 €	2,9%	1	0
	GERI-2015-1	46	46	4	8.359.319 €	8,7%	1	0
	GARRI-2015-1	31	31	6	9.174.322 €	19,4%	0	0
	ISSI-2015-1	109	99	7	23.315.000 €	7,1%	2	1
<b>2015 TOTAL</b>		<b>393</b>	<b>380</b>	<b>23</b>	<b>52.782.823 €</b>	<b>6,1%</b>	<b>4</b>	<b>1</b>
<b>2016</b>	SwafS-25-2016	9	8	1	497.626 €	12,5%	0	0
	SwafS-2016-1	132	129	22	44.285.828 €	17,1%	1	0
<b>2016 TOTAL</b>		<b>141</b>	<b>137</b>	<b>23</b>	<b>44.783.454 €</b>	<b>16,8%</b>	<b>1</b>	<b>0</b>
<b>2017 TOTAL</b>	SwafS-2017-1	<b>221</b>	<b>216</b>	<b>24</b>	<b>61.167.321 €</b>	<b>11,1%</b>	<b>2</b>	<b>0</b>
<b>2018</b>	SwafS-2018-1	121	114	26	55.674.892 €	22,8%	2	1
	SwafS-2018-2-stage-1	76	76	16	-	21,1%	0	0
	SwafS-2018-2-stage-2	16	16	5	7.049.141 €	31,3%	0	0
<b>2018 TOTAL</b>		<b>197</b>	<b>190</b>	<b>31</b>	<b>62.724.033 €</b>	<b>16,3%</b>	<b>2</b>	<b>1</b>
<b>2019</b>	SwafS-2019-1	194	193	27	52.272.299 €	14,0%	0	0
	SwafS-2019-2-stage-1	114	113	22	-	19,5%	1	0
	SwafS-2019-2-stage-2	22	21	8	10.804.446 €	38,1%	0	0
<b>2019 TOTAL</b>		<b>308</b>	<b>306</b>	<b>35</b>	<b>63.076.746 €</b>	<b>11,4%</b>	<b>1</b>	<b>0</b>
<b>2020</b>	SwafS-2020-1	262	-	-	-	-	-	-
	SwafS-2020-2-stage-1	145	-	-	-	-	-	-
<b>2020 TOTAL</b>		<b>407</b>						
<b>GRAND TOTAL</b>		<b>1917</b>	<b>1474</b>	<b>157</b>	<b>329.032.036 €</b>	<b>10,7%</b>	<b>12</b>	<b>2</b>

submission rates were lower overall for the 2016-2017 work programme topics compared to the first (2014-2015) and final (2018-2020) work programmes in Horizon 2020. In 2020, the number of proposals submitted peaked with over 400 consortia putting forward proposals and bringing the total number of proposals submitted under Horizon 2020 up to almost 2,000.

Looking more closely at the 2019 call, for which the evaluation is completed, compared to the previous year, the number of proposals increased by 56%. This call includes 13 topics, two of which are subject to a two-stage evaluation.

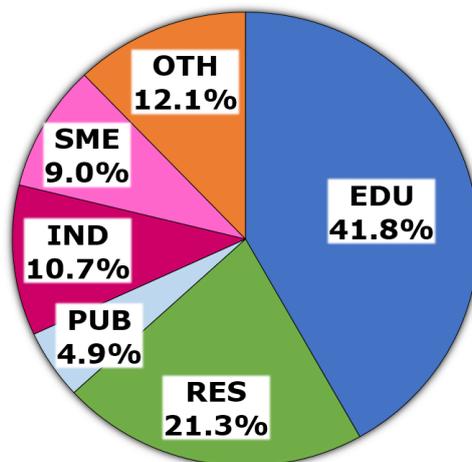
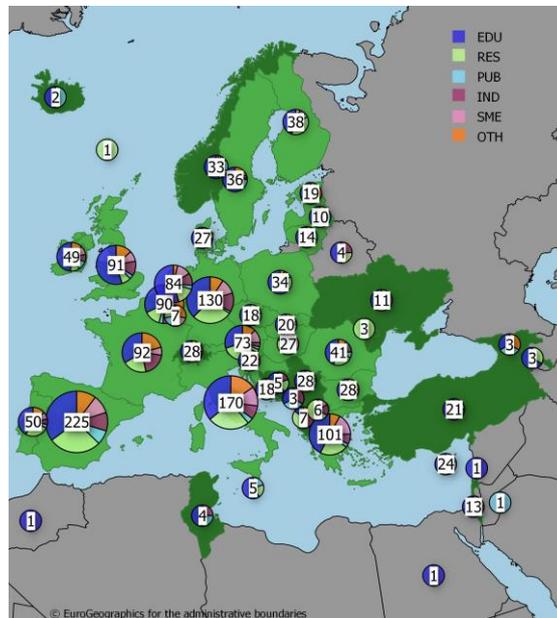
Science Education remains the most popular topic with the highest number of proposals (93). Meanwhile, Citizen Science is the topic with the biggest growth in terms of proposals (78), which more than doubled compared to 2018 (33).

In the 2019 call, approximately one third of the topics identified international cooperation as particularly pertinent including one of the gender topics, dedicated to dialogue with third countries. With applicants from 85 different countries from continents across the globe including Asia, Australia, Africa, South and North America, Science with

and for Society follows the spirit of 'open to the world'. Looking at Europe in particular, the map below shows, applicants come from right across the continent.

Applicants represent stakeholders from all parts of the quadruple helix model<sup>19</sup>, including Civil Society Organisations (falling under the 'other' category in pie chart above) with the relative majority being educational institutes.

Fig. 2: Applicants for SwafS-2019 single call for proposals



- **EDU** Higher or Secondary Education
- **RES** Research Organisations
- **PUB** Public Bodies
- **IND** Industry
- **SME** Small and Medium Enterprise
- **OTH** All other entries

<sup>19</sup> The quadruple helix model considers particular services, products and solutions as being co-identified, co-developed and co-created through co-operation between industry, government (e.g. policy makers and institutions), universities and society (e.g. citizens and Civil Society Organisations (CSOs)).

After the 2014 evaluation, DG R&I delegated the management of SwafS to REA Unit B5. Since 2015, REA Unit B5 manages the evaluation and implementation of SwafS projects and to this end, continues to work in close cooperation with DG R&I responsible for the policy making and drafting of the work programmes.

In line with Horizon 2020 practices, three independent evaluators evaluate each proposal, selected for their expertise while the overall panel is well-balanced in terms of gender (i.e. at least 40% of males and females), geography and sector of activity.

With regard to the quality of the evaluation process, independent observers examine the fairness of the evaluation procedure. In the 2019 SwafS evaluation, the observer reported, 'that the design, planning and execution of the evaluation process was very robust and entirely consistent with peer review principles of transparency, equality of treatment and absence of conflicts of interest.' The evaluators themselves echoed this observation in the panel meetings in their invitation to EC services to better publicise the robustness of the evaluation procedure.

A quantitative indicator of the quality of the evaluation is the number of evaluation review requests filed. Applicants may file a complaint on the evaluation of their proposal from a procedural point-of-view. Over the course of the last 5 years, 0.8% of applicants (12) filed such a complaint.

An independent Evaluation Review Committee, consisting of REA staff (not involved in the evaluation) and DG R&I staff, assesses each evaluation review request.

The outcome shows that for 10 out of the 12 evaluation review requests, the respective Evaluation Review Committees found no grounds for the complaint. For the remaining two (0.1%), the Committees found some grounds for the complaint. However, this did not have an impact in terms of the proposal's possibility for funding and hence a re-evaluation of the proposal was not required.

## **1.2. Project implementation**

SwafS counts a total budget of EUR 462 million in Horizon 2020. Since the start of Horizon 2020, 150 projects have been funded amounting to a total budget of EUR 319 million, all are managed by REA Unit B.5 except for three which are managed by DG R&I.

SwafS projects are typically composed of large consortia with an average of approximately 11 partners per project. The duration tends to vary with the shortest project duration being 2 years and the longest project extending to 5 years while the average project duration is 3 years.

In terms of their nature, 30% are Research and Innovation Actions (RIA) focused on generating new knowledge while approximately 70% of funded projects are Coordination and Support Actions (CSA) tending to focus on 'accompanying measures' including for example networking, mutual learning exercises and awareness-raising type activities. The exception is [GENDER-NET Plus](#), an ERA-NET COFUND action, managed by DG Research and Innovation, which aims at funding research projects promoting the integration of sex and gender analysis into research at an international level.

The REA Unit B.5 signs grants with consortia within the legal deadline of 8 months from the call deadline. Project Officers partake in kick-off meetings and closely follow the project during the lifetime. Each project has defined reporting periods that conclude with a review meeting, the formal approval of the deliverables and the payment for the activities carried out. The REA calls upon the support of an independent expert to review

the deliverables and reports. The quality of deliverables is closely monitored notably those that are public and are automatically published once approved.

The REA works closely with DG Research and Innovation to ensure policy makers are kept abreast of any feedback from the project relevant for their policy monitoring or future policy making activities.

DG R&I and the REA promote networking between projects to encourage sharing of best practices and to encourage projects to build on the available know-how. The REA and DG R&I have developed this practice by organising thematic one-day cluster events in Brussels. These cluster events are organised in co-creation mode with the projects and since 2018 five such events were organised including for ethics, gender, science education and citizen science projects.

Liaising with other SwafS projects was formally encouraged in the 2018-2020 work programme which foresees the inclusion of 'additional dissemination obligations' in Article 29.1 of the grant agreement for certain topics. This provision requires consortia to share their strategies and methodologies from the outset with a view to reaping the full benefits of synergies. Project co-ordinators have demonstrated strong willingness to work together in organising joint communication channels, events, meetings, and co-ordinating content-related activities. This grant condition was a key element in terms of aiming to build a knowledge and collaboration ecosystem. The results have been positive in the territorial and citizen portfolios for example where projects are pro-actively liaising with each other. The Super\_MoRRI project gathered 14 other SwafS projects together at its annual event in Leiden in January 2020.<sup>20</sup> This 'additional dissemination obligation' condition should be used more extensively in the future.

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<sup>20</sup> [Super MoRRI annual event, January 2020](#)

## 2. CITIZEN SCIENCE AND CITIZEN ENGAGEMENT

### 2.1. Policy objectives

The 'Integrating Society in Science and Innovation' call of the initial [SwafS 2014-2015 work programme](#) included topics on public outreach and multi-actor engagement for scenario building. The [2016-2017 work programme](#) saw three topics focus specifically on the involvement of citizens (alongside other actors) in co-producing research content.

In parallel, wider policy developments intensified efforts in this domain. In 2015, former Commissioner Moedas identified three strategic priorities, described in [Open innovation, Open science, Open to the world](#) (the three O's strategy), which proposed *inter alia* that 'many more actors will take part (in the research process) in different ways and the traditional methods of organising and rewarding research will also see many changes'<sup>21</sup>. One important dimension of open science is citizen science, envisioned as being 'linked with outreach activities, science education or various forms of public engagement with science as a way to promote Responsible Research and Innovation'. In 2016, the Council<sup>22</sup> recognised citizen science as an open science priority and in April 2018, the [Open Science Policy Platform \(OSPP\)](#) included citizen science as one of eight Open Science ambitions.

Furthermore, partly in response to the interim evaluation of Horizon 2020, the SwafS [work programme 2018-2020](#) included a strategic orientation on 'exploring and supporting citizen science', and developed a portfolio approach to work towards this orientation.

The SwafS work programme 2018-2020 focuses on the meanings, mechanisms and challenges facing citizen science from local to European and global levels, learning from on-going experiences and innovative grassroots initiatives. In addition, the aim is to explore how citizen science can act as a catalyst to develop scientific skills and competences, act as a tool for informal and formal science education of young people and adults, counteract perceived anti-intellectual attitudes in society, raise the scientific literacy of European citizens, as well as promote social inclusion and employability.

Citizen science is blooming across scientific disciplines. It has the potential to bring a wide variety of benefits to researchers, citizens, policy makers and society and across the research and innovation cycle. It can make science more socially relevant, accelerate and enable production of new scientific knowledge, help policy makers monitor regulatory implementation and compliance, increase public awareness about science and ownership of policy making, and increase prevalence of evidence-based policy making<sup>23</sup>. To this end, the European Commission aimed to support and showcase excellent examples of citizen science across scientific disciplines (presented in section 2.3.2).

At the same time, there are difficulties setting up citizen science initiatives in terms of choosing the optimum methodologies; quality assurance and validation of the outcomes; managing large numbers of volunteers for many months or even years and keeping them motivated and responding to their questions. To this end, the

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<sup>21</sup> [Commissioner Moedas' speech at the conference 'A new start for Europe: Opening up to an ERA of Innovation'](#)

<sup>22</sup> [Council conclusions on the transition towards an Open Science system](#)

<sup>23</sup> [SwafS Work programme 2018-2020](#)

European Commission supported a mutual learning space where citizen science projects and participants can exchange experiences and successful strategies, resulting in the Coordination and Support Action 'Exploring and supporting citizen science' in the [2018-2020 work programme](#). Furthermore, the growth of citizen science brings with it a need to understand its breadth and consequences. This led to a topic in 2019 dedicated to consolidating and expanding the knowledge base on citizen science in terms of understanding how it is conducted, the actors including incentives and disincentives for their involvement, good practices, the enablers and barriers for citizen science as well as its effects on R&I systems.

## 2.2. Project portfolio

Citizen Science is addressed across topics in various SwafS work programmes, resulting in 22 funded projects (2020 call not included) which for the purposes of this analysis are categorised as 'deepening the evidence as well as practice and training on co-design and co-creation' (6 projects) and 'doing citizen science' (16 projects). Their combined budget is approximately EUR 58.3 million with EUR 17.6 million for the first group and EUR 40.7 million for the 'doing citizen science' projects.

Fig. 3: Number of coordinators in Member States (MS) and Associated Countries (AC)

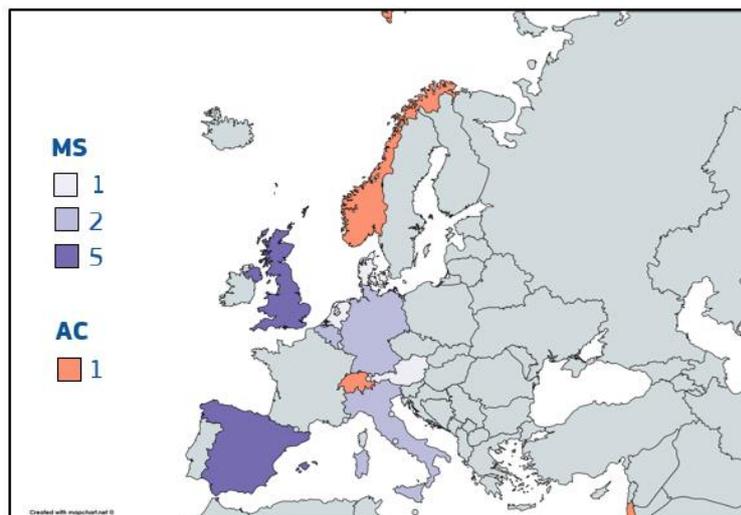


Fig. 4: Number of other partners in Member States (MS) and Associated Countries (AC)

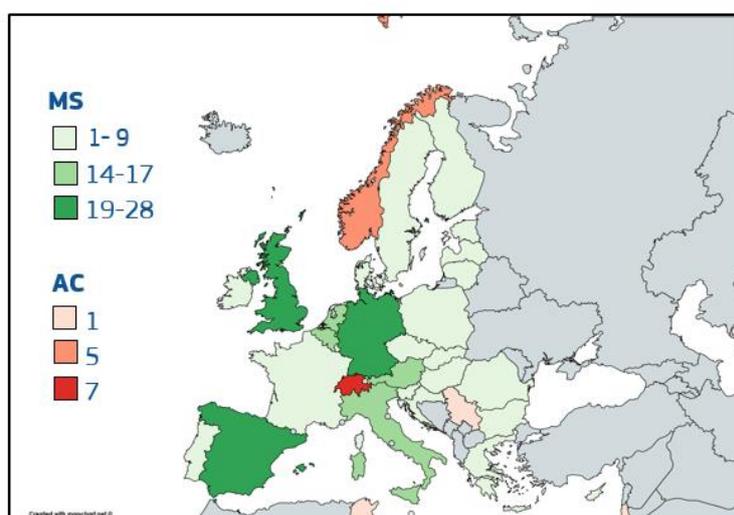


Fig. 5: Number of partners in Third Countries (TC)



Table 3: Co-creation project portfolio

Project	Budget €	Dates	Coordinator	Country Coord.	Countries Other partners	Website
<b>ISSI-2-2014</b> Citizens and multi-actor engagement for scenario building (CSA)						
CIMULACT	3.3 M	01-06-2015 31-03-2018	FONDEN TEKNOLOGIRADET	DK	<b>EU:</b> AT, BE(2), BG, CY, CZ, DE, EL, ES, FI, FR, HR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, RO, SE, SK, UK <b>AC:</b> CH, NO	<a href="http://cimulact.eu">cimulact.eu</a>
<b>Swafs-13-2017</b> Integrating society in science and innovation – An approach to co-creation (RIA)						
SCALINGS	4.0 M	01-05-2018 31-07-2021	TECHNISCHE UNIVERSITÄT MÜNCHEN	DE	<b>EU:</b> AT (2), DK, ES, FR, NL, PL, UK(2) <b>AC:</b> CH	<a href="http://scalings.eu">scalings.eu</a>
SISCODE	4.0 M	01-05-2018 30-04-2021	POLITECNICO DI MILANO	IT	<b>EU:</b> BE(2), DE(2), DK(2), EL, ES, FR, IE, IT, NL, PL, PT(2), UK <b>AC:</b> RS	<a href="http://siscodeproject.eu">siscodeproject.eu</a>
<b>Swafs-15-2018-2019</b> Exploring and supporting citizen science (CSA)						
EU- Citizen.Sci ence	2.0 M	01-01-2019 31-12-2021	MUSEUM FÜR NATURKUNDE - LEIBNIZ- INSTITUT FÜR EVOLUTIONS- UND BIODIVERSITÄTSFORSCH UNG AN DER HUMBOLDT- UNIVERSITÄT ZU BERLIN	DE	<b>EU:</b> AT(2), BE, DE, ES, IE, LT, NL, PT, SE, UK(3)	<a href="http://eu-citizen.science">eu-citizen.science</a>
<b>Swafs-18-2018</b> Taking stock of the application of the precautionary principle in R&I (RIA)						
RECIPES	2.0 M	01-01-2019 31-12-2021	UNIVERSITEIT MAASTRICHT	NL	<b>EU:</b> AT, BG, DE(4), DK, IT, NL <b>AC:</b> NO	<a href="http://recipes-project.eu/">recipes-project.eu/</a>
<b>Swafs-17-2019</b> Consolidating and expanding the knowledge base on citizen science (RIA)						
CS-Track	2.3 M	01-12-2019 30-11-2022	THE MOFET INSTITUTE	IL	<b>EU:</b> AT, BE, DE(2), EL, ES(2), FI	<a href="http://cordis.europa.eu/project/id/872522">cordis.europa.eu/ project/id/872522</a>

Table 4: Citizen science project portfolio

Project	Budget €	Dates	Coordinator	Country Coord.	Countries Other partners	Website
<b>ISSI-1-2014-2015</b> Pan-European public outreach: exhibitions and science cafés engaging citizens in science (CSA)						
DITOs	3.5 M	01-06-2016 31-05-2019	UNIVERSITY COLLEGE LONDON	UK	<b>EU:</b> AT, BE, DE, ES, FR, NL, PL, SI, UK <b>AC:</b> CH	<a href="http://togetherscience.eu">togetherscience.eu</a>
SPARKS	3.5 M	01-07-2015 30-06-2018	ASSOCIATION EUROPEENNE DES EXPOSITIONS SCIENTIFIQUES TECHNIQUES ET INDUSTRIELLES	BE	<b>EU:</b> AT, BE(2), CY, DE, FR, HU, IT, LT, LU, , NL, PL, PT, RO, SK, UK <b>AC:</b> CH	<a href="http://cordis.europa.eu/project/id/665825">cordis.europa.eu/project/id/665825</a>
Big Picnic	3.4 M	01-05-2016 30-04-2019	BOTANIC GARDENS CONSERVATION INTERNATIONAL LBG	UK	<b>EU:</b> AT, BE, BG, DE(3), EL, ES(2), IT, NL(2), PL, PT, UK(2) <b>AC:</b> NO <b>TC:</b> UG	<a href="http://bigpicnic.net">bigpicnic.net</a>
<b>Swafs-01-2016</b> Participatory research and innovation via Science Shops (RIA)						
SciShops.eu	3.0 M	01-09-2017 29-02-2020	SYNYO GmbH	AT	<b>EU:</b> BE(2), CY(2), DE(3), ES(2), HU, IT, LT, NL, RO, SE, SI, UK	<a href="http://scishops.eu">scishops.eu</a>
InSPIRES	3.0 M	01-04-2017 31-03-2021	FUNDACION PRIVADA INSTITUTO DE SALUD GLOBAL BARCELONA	ES	<b>EU:</b> ES, FR, HU, IT, NL <b>AC:</b> TN <b>TC:</b> BO	<a href="http://inspiresproject.com">inspiresproject.com</a>
<b>Swafs-23-2017</b> Responsible Research and Innovation in support of sustainability and governance, taking into account the international context (CSA)						
D-NOSES	3.2 M	01-04-2018 31-03-2021	FUNDACION IBERCIVIS	ES	<b>EU:</b> AT, BG, DE(2), EL(2), ES(2), IT, PT(3), UK <b>TC:</b> CL	<a href="http://dnoses.eu">dnoses.eu</a>
<b>Swafs-10-2017</b> Putting Open Science into action (RIA)						
GRECO	2.9 M	01-06-2018 31-05-2021	UNIVERSIDAD POLITECNICA DE MADRID	ES	<b>EU:</b> ES (3), PT, DE (3), BG <b>AC:</b> CH <b>TC:</b> BR	<a href="http://greco-project.eu/">greco-project.eu/</a>
<b>Swafs-15-2018-2019</b> Exploring and supporting citizen science (RIA)						
Cities-Health	2.0 M	01-01-2019 31-12-2021	FUNDACION PRIVADA INSTITUTO DE SALUD GLOBAL BARCELONA	ES	<b>EU:</b> ES, IT, LT, NL, SI	<a href="http://citieshealth.eu">citieshealth.eu</a>
MICS	1.9 M	01-01-2019 31-12-2021	CONSERVATION EDUCATION AND RESEARCH TRUST	UK	<b>EU:</b> HU, IT, NL, RO, UK	<a href="http://mics.tools">mics.tools</a>
ACTION	2.0 M	01-02-2019 31-01-2022	KING'S COLLEGE LONDON	UK	<b>EU:</b> DE, ES(2), IT(2), NL(2), UK <b>AC:</b> NO(2)	<a href="http://actionproject.eu">actionproject.eu</a>
REINFORCE	2.0 M	01-12-2019 30-11-2022	EUROPEAN GRAVITATIONAL OBSERVATORY	IT	<b>EU:</b> AT, BE, EL(2), FR, IT(2), UK(2) <b>TC:</b> AR	<a href="http://reinforceeu.eu">reinforceeu.eu</a>
WeCount	2.0 M	01-12-2019 30-11-2021	TRANSPORT & MOBILITY LEUVEN NV	BE	<b>EU:</b> BE(2), ES, IE, SI, UK	<a href="http://tmleuven.be/en/project/wecount">tmleuven.be/en/project/wecount</a>
CoAct	2.0 M	01-01-2020 31-12-2022	UNIVERSITAT DE BARCELONA	ES	<b>EU:</b> AT(2), DE(2), ES, UK <b>TC:</b> AR(2)	<a href="http://cordis.europa.eu/project/id/873048">cordis.europa.eu/project/id/873048</a>
CSI-COP	2.0 M	01-01-2020 30-06-2022	COVENTRY UNIVERSITY	UK	<b>EU:</b> BE, CZ, DE(2), EL, ES, FI, HU, NL <b>AC:</b> IL	<a href="http://cordis.europa.eu/project/id/873169">cordis.europa.eu/project/id/873169</a>
EnviroCitizen	2.3 M	01-04-2020 30-09-2023	UNIVERSITETET I STAVANGER	NO	<b>EU:</b> CY, EE, ES, NL, RO, SE	<a href="http://envirocitizen.eu">envirocitizen.eu</a>
Crowd4SDGs	2.0 M	01-05-2020 30-04-2023	UNIVERSITE DE GENEVE	CH	<b>EU:</b> ES, FR, IT <b>AC:</b> CH(2)	<a href="http://cordis.europa.eu/project/id/872944">cordis.europa.eu/project/id/872944</a>

## 2.3. Achievements

### 2.3.1. Citizen engagement: co-creation

[CIMULACT](#)'s main objective was to engage citizens and stakeholders in the co-creation of research agendas based on real and validated societal visions, needs and demands. CIMULACT built on the principle that the collective intelligence of society gives Europe a competitive advantage and strengthens the relevance of the European science and technology system.

CIMULACT established genuine dialogue between thousands of citizens, stakeholders, scientists and policy makers visions and scenarios and produced valuable suggestions for research and innovation policies and topics. In addition, CIMULACT produced a [guide](#) presenting methods for conducting work with citizens and stakeholders.

Finally, the [report](#) on comparison of research topics from CIMULACT with those from expert-oriented foresight studies showed that there are marked differences between the research agenda envisioned by citizens compared to those envisaged by experts and policy makers, suggesting that there is room and need for both approaches to complement each other.

The project's outputs include a [booklet](#) documenting 23 citizens-based research topics and compiled in a [report](#) including recommendations for research and innovation policy.

These were delivered on time to feed into the last work programmes of the Horizon 2020 calls as well as discussions on Horizon Europe. They also proved to be of interest to policy makers at a national level.

For [SISCODE](#), 'co-creation is a non-linear process that involves multiple actors and stakeholders in the ideation, implementation and assessment of products, services, policies and systems with the aim of improving their efficiency and effectiveness, and the satisfaction of those who take part in the process'. SISCODE aims to stimulate the use of co-creation methods in policy design.<sup>24</sup>

In the [RRI research landscape](#) report, SISCODE examined how co-creation has manifested in EU-funded projects and policies. It found that many projects tend to fall towards the consultation end of the spectrum rather than towards genuine co-creation. Methods and objectives of co-creation need to be explicit, appropriate to the subject, context and people, inclusive of all stakeholder groups and led by a skilled moderator.

The [SISCODE toolbox](#) guides the project's ten co-creation labs in their efforts to figure out new solutions for societal challenges.

[SCALINGS](#) works to bring together diverse actors in a joint innovation activity for mutual benefit. SCALINGS aims to identify under which conditions co-creation practices can be scaled-up from one city or country to another. Businesses as well as EU research rely on scaling up co-creation processes to wider markets. The project illustrates this by way of an example: when engineers develop a healthcare robot together with patients and doctors in a hospital in Barcelona, the robot might be optimally suited for one hospital environment but it will unlikely fit to the social, cultural, or organisational context of another hospital, city, or country. SCALINGS

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<sup>24</sup> [SISCODE: Co-creation in RRI practices and STI policies](#)

questions one-size-fits-all solutions to societal challenges and fosters innovation practices that value the social, cultural and regulatory context. SCALINGS is testing three key co-creation instruments: Living Labs<sup>25</sup>, Public Procurement of Innovation<sup>26</sup> and Co-Creation Facilities<sup>27</sup>.

[EU-Citizen.Science](#) is building a central platform for citizen science in Europe to share useful resources about citizen science, including tools and guidelines, good practices and training modules. Many citizen science projects develop mobile apps or web platforms and only a minority are developed further in follow-on projects; the [EU-Citizen.Science Platform](#) will serve as a repository for such citizen science resources and will include lists of hardware and software tools and thereby ensure the sustainability of projects and a common vision among the research community. Furthermore, EU-Citizen.Science will provide criteria for 'good' citizen science.

[RECIPES](#) (REconciling sCience, Innovation and Precaution through the Engagement of Stakeholders) aims to reconcile innovation and precaution by developing tools and guidelines to ensure the precautionary principle is applied while still encouraging innovation and to this end, seeks to introduce mechanisms for public involvement in scientific and technological decision making. In May and June 2019, RECIPES hosted citizen meetings in Denmark, Norway, the Netherlands, Italy and Bulgaria. Citizens who took part in the meetings had the chance to reflect on issues related to precaution and innovation in relation to research and to provide their ideas and opinions on the matter.<sup>28</sup>

[CS-Track](#) aims to deepen knowledge on citizen science and its implications for science and society, by investigating a diverse set of citizen science activities using web-based analytics and multi-perspective analysis to understand the complex processes that are at the heart of citizen science activities.

### 2.3.2. *Doing citizen science*

While the [2018-2020 work programme](#) did not adopt an official definition of citizen science, it did frame it as covering a range of different levels of participation: from raising public knowledge about science, encouraging citizens to participate in the scientific process by observing, gathering and processing data, right up to setting scientific agendas and co-designing and implementing science-related policies.

In the [2014-2015 work programme](#), a number of public engagement projects were pioneers in the field of citizen science and science cafés. [BigPicnic](#) focused on a key priority for EU citizens, namely food security. An international network, mainly consisting of botanical gardens, pooled their research expertise in food and food plants, building, through the co-creation approach and public debate, a number of low-cost, outreach exhibitions on food security, using the metaphor of a picnic basket. The project, which has now ended, reached approximately 60,000 people through Science Cafes, and its legacy includes a [report documenting public views and recommendations for RRI on food security](#), as well as a [toolkit](#) on how to organise Science Cafes.

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<sup>25</sup> Living labs take the development of new technologies into the real world. They are sites of collective invention, testing, and demonstration of technologies and sociotechnical futures.

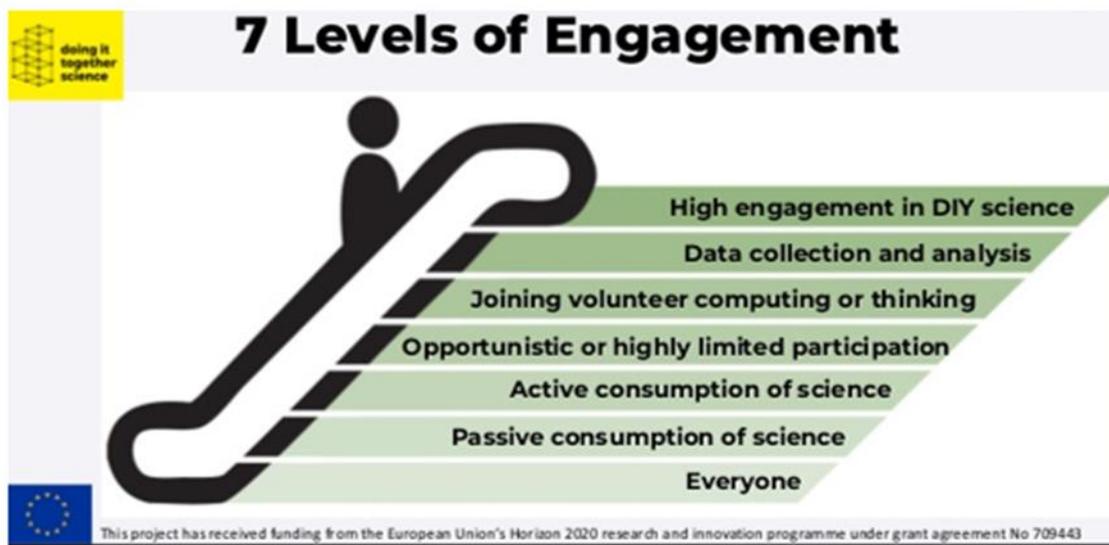
<sup>26</sup> In public procurement of innovation, the public sector uses its purchasing power to act as an early adopter of innovative solutions. It acts as a co-creator by defining public challenges that could be solved through innovation, choosing preferred solution providers, and steering the process towards public benefits.

<sup>27</sup> Co-creation facilities are open, physical or virtual infrastructures for collaborative innovation. They provide lab space, expertise, equipment for staff & external clients or they act as platforms for 'triple helix' interactions between academia, companies and policy makers.

<sup>28</sup> [RECIPES event: European citizens on the Precautionary Principle and innovation](#)

Under the same call in 2014, [Doing it Together Science \(DITOs\)](#) stands out for its extensive and impressive outreach efforts (over 730 events, engaging over 550,000 people across Europe), and innovative activities. It was designed as a 'leverage' project, inviting partners to carry out citizen science and adding an element of Do-It-Yourself (DIY) science. The escalator framework ([Fig. 6](#): The citizen engagement 'escalator') evolved through the project and became more grounded and clear, positioning the DIY science and citizen science activities within a wider context of public engagement in science and showing the potential for continuity and since the project's completion continues to be used.

Fig. 6: The citizen engagement 'escalator'



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The escalator framework embraces the notion that there are different degrees of engagement and that individuals can move up or down the escalator over their life-course, and that there is no 'optimum' or 'best' level of participation for all people at all times. Participation can be minimal, for example, volunteers sharing computing resources or social media habits without actively engaging in the research itself, or downloading an app that automatically collects data for scientific purposes, yet could still be considered as citizen science.

DiTOs, and its Do-It-Together science bus, was itself an example of an innovative and successful citizen science approach. Several 'science captains' drove the bus across Europe, making a total of 17 stops at a variety of community centres, small towns, public festivals and museums to run participatory workshops and report on their journey on social media. The goal was to involve all kinds of local citizens in [ready-made activities](#) and encourage participants to contribute with their own folk remedies and recipes for sharing with new people in new places. This is an excellent way to bring science to young children while at the same time brings citizens closer to the EU.

The project has been mentioned in the Rand report, '[Emerging developments of Citizen Science](#)', as part as a wider strategy to increase citizen engagement in science and policy making. It showed also how citizen science and crowdsourcing can be incorporated into research and innovation within the European Union, in order to help reduce asymmetries between citizens and researchers in their ability to interact with and access science and the innovations that arise from scientific research. According to the Rand report, Horizon 2020 has been instrumental in driving the

growth of citizen science within Europe through explicit and formal backing for the approach by the European Commission.

Science shops are another example of a type of interface between researchers and society, aiming to increase access to science, knowledge and technology for social groups that would or could not ordinarily have had access to them. [InSPIRES](#) brings together practitioners and experts to jointly pilot, implement and roll out innovative models for science shops. Concentrating most of its efforts on Research & Innovation in the health sector, with particular attention to ensuring gender balance and inclusion of vulnerable groups (the elderly, adolescents, migrants and refugees), InSPIRES organises science cafés and other public engagement initiatives following a 'glocal' approach. Under the cascade funding mechanism foreseen in the work programme for this topic, InSPIRES organised grants that have supported a number of activities, such as some in Africa (Uganda), engaging with local quadruple helix stakeholders.

The sister project, [SciShops.eu](#), aims to further build on the capacity of the science shops ecosystem in Europe and beyond. The SciShops project seeks to demonstrate the benefits of starting a science shop for every type of organisation as well as the advantages civil society gain from collaborating with science shops in community-based participatory research. The participatory events organised during the project lifetime raise awareness of this win-win concept.

[SPARKS](#) was a public engagement project dedicated to creating and implementing innovative ways to engage citizens in science, notably "technology shifts in health and medicine". SPARKS<sup>29</sup> successfully organised an interactive touring exhibition and 200 innovative participatory activities (science cafés, pop-up Science Shops, incubation activities and scenario workshops) across Europe. SPARKS produced a [toolkit](#) to prepare Science Espressos, Reverse Science Cafés, Pop-up Science Shops and Scenario Workshops together with a [handbook](#) outlining practical guidelines on how to implement the SPARKS methodology by means of concrete activities and tools. These have provided useful input to the emerging concept of missions in Horizon Europe.

[D-NOSES](#), aims to launch a collaborative journey to tackle the problem of odours at a global scale by developing coordinated local case studies in seven European and three non-European countries, with the ultimate objective of placing odour pollution on the global policy agenda. The [International Odour Observatory platform](#), currently under development, will become the one-stop-shop for all stakeholders involved in participatory odour management activities in their own area using the [Odour Collect app](#).

[GRECO](#) aims to put open science into action in the photovoltaic (PV) sector. GRECO will develop six cutting-edge photovoltaic products and involve citizens as amateur scientists. Citizens will actively participate in the process of research, development and innovation both in the design of new PV solutions and in the provision of data. The material data generated by citizen scientists will be taken up in the research and innovation process. In return, society will increase awareness and understanding and help shape the direction of the spread of solar energy, thus leading to an overall deeper understanding of photovoltaic research<sup>30</sup>.

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<sup>29</sup> [Horizon Magazine article "Hacker culture' and citizen scientists taking research beyond the lab", 6 June 2017](#)

<sup>30</sup> [Greco website](#)

The [2018-2020 work programme](#) was the first work programme that had a strategic orientation and several topics dedicated to citizen science. A topic on exploring and supporting citizen science in its broad sense gave space to applicants to come up with new ways to tackle research and innovation challenges across all disciplines, through 'hands-on citizen science activities'. It made possible the use of the cascading grant mechanism and encouraged the portfolio of projects to work together with the 'additional dissemination obligations'<sup>31</sup>. Interest in this topic has grown significantly with the number of proposal submissions more than doubling to 69 in the 2019 call compared to the previous year. In 2020, the topic is repeated with slightly amended text, and with the addition of a sub-topic focused on frugal innovation to broaden even further the portfolio of actions in terms of disciplines and sectors represented.

[CitieS-Health](#) aims to put citizens' concerns at the heart of research agendas on environmental epidemiology by tackling health issues that concern them. Groups of citizens in five cities in Europe will design and run experiments to explore how pollution in their living environment is affecting their health. To date, it has produced an interactive step-by-step [toolkit](#) customised to different stakeholders and domains, with a particular focus on air pollution, noise pollution and health factors.

[MICS](#) (Measuring Impact of Citizen Science) is developing knowledge on metrics and instruments to evaluate citizen science impacts. The testing and validation of these tools focus on river restoration as an aspect of nature-based solutions.

[ACTION](#) has set up an accelerator to support hands-on citizen science activities to combat and prevent major forms of pollution in the EU. By considering the needs of multiple stakeholders throughout the entire lifecycle of citizen science, ACTION creates methodologies, tools and guidelines to democratise the scientific process, allowing anyone to design and realise a citizen science project, from the early stages of project ideation to validating and publishing the results and beyond. To further pursue this aim the project published a call in August 2019 for new and ongoing citizen science initiatives related to any form of pollution in Europe and worldwide, and with a focus on the involvement of marginalised groups, using the cascading grant mechanism. There was an overwhelming response to this call (116 submissions), out of which six successful applicants received EUR 20,000 to deliver a six-month pilot with the support of the ACTION team. In February 2020, the grantees worked together with the ACTION team on the tools already under development, to co-design other resources aiming at supporting their activities and enhancing their sustainability.

Citizen science's strategy for social media: citizen science projects use co-creation for all tools developed by the project. For example, each partner takes turns in managing the project's Twitter account. This coordinated effort led to the social media accounts being highly successful, and as a result, at the end of DITOs, a new citizen science project, EU-Citizen.Science, inherited the project's social media accounts.

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<sup>31</sup> The 2018-2020 work programme foresees additional dissemination obligations: consortia must make active efforts to freely share, in a timely manner and as appropriate, the research strategies, methodologies, and raw and analysed data deriving from their activities (including any evaluation activities), with the other projects funded by SwafS subject to these same additional dissemination obligations. Applicants must acknowledge and incorporate these obligations in their proposal, outlining the efforts they will make towards this in Annex 1 of the proposal. The respective option of Article 29.1 of the Model Grant Agreement applies.

A number of new projects, funded from the 2019 call, started in 2020:

- [REINFORCE](#) aims to minimise the gap between society and large research infrastructures in the field of physics through the implementation of four cutting-edge citizen science projects in the fields of gravitational waves, neutrino astronomy, particle physics and cosmic ray interplay with geoscience and archaeology with citizens. The project aims to involve 100,000 citizens in its activities.
- [WeCount](#) aims to empower citizens to take a leading role in the production of data, evidence and knowledge around transport and mobility in their local communities and was the subject of a dedicated [BBC news article](#).
- [CoAct](#) proposes a radically new approach called 'Citizen Social Science' to face four social global issues (mental health care, youth employment, environmental justice and gender equality), by engaging vulnerable citizens acting as in-the field competent co-researchers.
- [CSI-COP](#) investigates GDPR compliance to analyse how far we are being tracked by default as we visit websites and apps on our mobile devices. The findings uncovered by citizen scientists will be used to produce a new taxonomy and an online and open repository of trackers useful to a variety of end-users.
- [EnviroCitizen](#) aims to uncover the processes by which citizen scientists working in voluntary environmental-based activities can strengthen their environmental citizenship. The project will study birding activities as a means of developing environmental citizenship.
- [Crowd4SDG](#) researches the extent to which citizen science can provide an essential source of non-traditional data for tracking progress towards the Sustainable Development Goals (SDGs) as well as the ability to generate social innovations that enable such progress.

## 2.4. Recommendations

### 2.4.1. Policy recommendations

**Scientific domains:** Citizen science involves a wide range of actors from different sectors (academy, NGOs, public authorities, museums, etc.). While citizen science is applicable across all scientific disciplines, it will differ in terms of the research approach, problem formulation and methods of data gathering depending on the research questions, the disciplines, and the citizens involved.

**Measuring citizen science:** One of the main challenges for citizen science is to measure the impact and devise indicators that are meaningful for stakeholders. The MICS project, aiming to develop metrics and instruments to evaluate citizen science impacts is a first step in this direction. Efforts to this end should continue in Horizon Europe to emphasize its value in the research and innovation process and for citizen science to be widely acknowledged as a research method producing excellent scientific outcomes.

**European platform for citizen science:** EU-Citizen.Science will become the one-stop-shop for citizen science resources, ensuring consistency across projects. To complement this effort, an interactive step-by-step toolkit, customised to different research contexts would be a highly useful resource to guide projects new to citizen science. The [EU-Citizen.Science platform](#) and its resources should be referenced in the respective work programme topic descriptions.

**Inclusiveness:** The Horizon 2020 interim evaluation pointed to the need for greater outreach to civil society. In this respect, citizen science is an ideal mode of R&I to

democratise science, build trust in science, and leverage societal intelligence and capabilities in R&I.

**Ethical standards:** The specific context, the research aims and the disciplinary practices of a project will determine where the activities fall on the spectrum of opportunistic to systematic data collection. In the medical and social sciences, the boundaries of citizen science and data-collection practices can be challenging. Sharing personal and medical data can be part of citizen science, but this depends on the framing and intention of the project, and consideration of whether those taking part are subjects of research or participants who are shaping and carrying out different stages of the project. Some projects, such as SwafS' [Pro-Ethics](#), are elaborating ethical guidelines for projects conducting citizen science activities. Such guidelines should be linked with the European Commission's on-going developments in ethics and integrity in relation to research and innovation.

**Environment focus:** Many citizen science projects focus on environmental or sustainable development issues, showing citizens' strong concern about these matters. This is an area of high interest for the European Commission, as shown by the recently adopted [Green Deal](#). Synergies will be explored with DG Environment and other relevant DGs, so that citizen science is able to play a role in working towards environmental objectives.

**Policy dissemination:** The European Parliament's Green/European Free Alliance (EFA) group conveyed their support for citizen science projects focusing on the environment, such as DITOs, which organised several policy events with the support of Members of European Parliament (MEPs). Efforts to raise the European Parliament's awareness about citizen science activities should be coordinated in order to promote the value of DIY science and citizen science.

**Terminology:** Involving citizens in shaping technology and innovation is a key way of bringing science and society closer together. However, the use of terminology for activities involving stakeholders and the lack of a formal definition of citizen science may lead to some misinterpretations in the research community and among the public at large. It is important to distinguish between the concepts of public engagement, co-creation, citizen science, open science and science communication to clarify the purposes of each in the context of Horizon Europe. For example, the term 'public engagement' has tended to be used in RRI when referring to participatory activities. Furthermore, it would be useful to link these terms with Responsible Research and Innovation.

**Declaration on citizen science:** DG R&I will organise a [Citizen Science conference](#), under the German Presidency, on 14-15 October 2020, 'Knowledge for Change: 'A decade of citizen science (2020-2030) in support of the Sustainable Development Goals'. It will address this challenge by focusing on citizen science as a relevant approach to contribute to global challenges and industrial competitiveness in Horizon Europe. The aim is to gather policy makers and citizen science projects from all parts of the world, from local to global scales, and both community-led and academic-led activities, to build the future of citizen science policy making. Financed under the SwafS work programme, this conference will be an opportunity to highlight the diversity of citizen science projects from SwafS and beyond, serve as a forum for reflection on the latest developments, and to define together the impacts, benefits and challenges of citizen science. Most importantly, collaborative sessions will draw recommendations to feed into strategic policy recommendations for the decade 2020-2030. One of the main outcomes will be a Declaration, formulated in an open

and participatory process, to chart the path for citizen science to play a full role in helping achieve the Sustainable Development Goals by 2030.

#### *2.4.2. Recommendations for Horizon Europe*

**Reinforcing Citizen Science:** Mainstreaming citizen science, building on the investments made to date in Horizon 2020, is a natural way to reinforce citizen science as a whole. However, while topic texts may be one avenue to approach this, another is to mention citizen science explicitly in the proposal template and the evaluation criterion of Excellence 'Appropriate consideration of interdisciplinary approaches and, where relevant, citizen science activities and the gender dimension'.

Another way to mainstream citizen science could be to develop Massive Open Online Courses (MOOC) on citizen science on the lines of that of [University College London](#) and for projects to sign-up for such courses to guide them in the integration of citizen science in their activities.

Furthermore, it is necessary to continue to fund dedicated citizen science actions to pursue efforts in strengthening networks, co-ordinating as well as communication among citizen science projects (particularly, but not limited, to those funded by SwafS and SwafS-type activities in Horizon Europe and supporting newcomers to citizen science activities notably as a result of mainstreaming citizen science in Horizon Europe. This can be done through raising public awareness of citizen science, and the delivery of training to citizen scientists (or potential science practitioners).

**Horizon Europe missions & citizen science:** Missions, constituted under Horizon Europe, provide a unique opportunity to test and refine mechanisms for consulting and engaging with citizens. Use of citizens' engagement for the definition and implementation of missions under Horizon Europe is crucial. Effective citizen engagement involves three stages of intervention: communication and awareness raising; co-design and co-creation; and co-implementation. Awareness raising on the missions concept is key for the other stages to be successfully deployed. Toolkits highlighted in the achievements sections may be useful resources to develop these missions.

Going local by making the most of cascading grants: Horizon 2020 introduced cascading grants and these are particularly well suited to the 'doing citizen science' topic in order to identify citizen science actors at a more local level.

## CONCLUDING REMARKS

Since 2014, the projects funded under 'Science *with and for* Society' contributed to its primary aims set out in the [EU Regulation establishing Horizon 2020](#), notably to effectively build cooperation between science and society, recruit new talent for science and pair scientific excellence with social awareness and responsibility.<sup>32</sup>

**Engaging citizens** is a priority across the European Commission and a key component of Horizon Europe. Missions, constituted under Horizon Europe, provide a unique opportunity to test and refine mechanisms for consulting and engaging with citizens. Use of citizens' engagement for the definition and implementation of missions under Horizon Europe is crucial. Effective citizen engagement involves three stages of intervention: communication and awareness raising; co-design and co-creation; and co-implementation.

Toolkits and guidelines produced by SwafS funded projects will be useful resources to effectively implement these missions. In the near future, the [EU-Citizen.Science platform](#) will serve as the reference point for tools and guidelines, promising practices and training modules on citizen science. The COVID-19 pandemic, which came to the fore in March 2020 with Member States going into lockdown, resulting in citizens across the EU being obliged to stay at home, there was an imminent need for effective online tools. Many SwafS projects adopted contingency measures including moving from physical to virtual events and online activities.

**Networking** is key to ensure that projects learn from each other and build on existing know-how. DG Research and Innovation and the REA organise thematic cluster events to promote networking between projects and encourage sharing of best practices. Liaising with other SwafS projects was formally encouraged in the 2018-2020 work programme which foresees the inclusion of 'additional dissemination obligations' requiring consortia to share their strategies and methodologies from the outset with a view to reaping the full benefits of synergies. This grant condition was a key element in efforts to build a knowledge and collaboration ecosystem. Project co-ordinators demonstrated strong willingness to work together.

**International cooperation** is one of the priorities of Commissioner Gabriel. SwafS projects have embraced international cooperation and involve partners from around the world.

**Inclusiveness** on all levels underpins SwafS. We need science education for all, gender equality in our organisations, ethics and integrity embedded in research, communication we can trust, open science and ultimately place citizens at the core to ensure excellent Research and Innovation to tackle the challenges of today for a better future.

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<sup>32</sup> [Regulation \(EU\) No 1291/2013 of the European Parliament and of the Council establishing Horizon 2020](#)

## **GLOSSARY**

CSA: Coordination and Support Action  
CSO: Civil Society Organisation  
DIY: Do-It-Yourself  
DG: Directorate-General  
DG R&I: DG Research and Innovation  
EFA: European Free Alliance  
ERA: European Research Area  
FP: Framework Programme  
GA: Grant Agreement  
GDPR: General Data Protection Regulation  
H2020: Horizon 2020  
MEP: Members of European Parliament  
MOOC: Massive Open Online Course  
NGO: Non-Governmental Organisation  
PV: Photovoltaic  
R&I: Research and Innovation  
REA: Research Executive Agency  
RIA: Research and Innovation Action  
RRI: Responsible Research and Innovation  
SDG: Sustainable Development Goal  
SiS: Science in Society  
SoP: Standard Operating Procedures  
SSH: Social Sciences and Humanities  
SwafS: Science with and for Society  
WP: Work Programme

## LIST OF COUNTRY CODES

<b>AR</b>	Argentina	<b>IE</b>	Ireland
<b>AT</b>	Austria	<b>IL</b>	Israel
<b>BE</b>	Belgium	<b>IT</b>	Italy
<b>BG</b>	Bulgaria	<b>LT</b>	Lithuania
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Inclusiveness on all levels underpins SwafS. We need science education for all, gender equality in our organisations, ethics and integrity embedded in research, communication we can trust, open science and ultimately place citizens at the core to ensure excellent Research and Innovation to tackle the challenges of today for a better future.

Europe can only thrive by matching the immense potential of science with the values, needs, and aspirations of society.

Horizon Europe must strengthen efforts to tap into the vast potential citizens have to offer and ensure effective cooperation between science and society.

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