RI4C2
Research & Innovation
For Cities & Citizens

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101035803

Measuring civic engagement of R&I activities

DELIVERABLE 6.3
MONTH 18

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Research & Innovation
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D6.3 – Measuring civic engagement of R&I activities

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The main objective of this deliverable is to elaborate instrument(s) for measuring public civic engagement in R&I activities

RI4C2's WP6 („EC2U Knowledge ecosystems") aims to gain a deep understanding of how the seven local Knowledge ecosystems (existing or under creation at the level of the EC2U local communities) are functioning and to establish a framework for them.

A formal framework for EC2U local Knowledge ecosystem was developed at each EC2U partner by identifying actors and capacities involved in promoting and implementing R&I outputs at local level. These are Citizen Science champions, models for successful engagement of citizens, civil society, local/regional communities and public/municipal authorities in different stages of R&I process.

They helped us in the design of instrument(s) providing a measure of civic engagement in a given project. Such instrument(s) will be promoted to foster the creation (and submission) of R&I project with significant Citizen Science components, when relevant.

The current deliverable follows the previous one of:

D 6.1: Citizen Science Champions (M12)

Is consequently to other 2:

D 6.2: Vivid EC2U local Knowledge Ecosystem (M24, February, 2023)

D 6.4: Selection of relevant R&I topics for Citizen Science (M24, February, 2023)

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1. The context of the deliverable

1.1 Challenging the diversity of the "civic engagement" concept

A formal framework for EC2U local Knowledge ecosystem was developed at each EC2U partner by identifying actors and capacities involved in promoting and implementing R&I outputs at local level (Deliverable D 6.1. „Citizen Science champions"). In the context of existing local cooperation instruments or networks it is important to explore the need for cooperation instruments at the level of knowledge ecosystems and to build an instrument for measuring public civic engagement in R&I activities. Thus, it is meaningful to define the context of the CS concept development and to position our desired instrument(s) as close to the real needs as possible.

Citizen engagement in scientific activities is getting more important as the valorization of research activities for the benefit of communities has a societal impact, and the democratization of science enhances the public's influence over science.

Digitalization and new IT technologies offer the environment for citizens to become real providers of data and knowledge and to gain an influential role for the design of public policies.

Defining the concept of citizen science can include a more theory-based approach and a practically grounded one. The terminology has the first appeared in three decades ago, according to the researchers of the Oxford English Dictionary (OED) (Haklay, M., Dörler, D., Heigl, F., Manzoni, M.,e Hecker, S., Vohland, K., 2021). An article from MIT Technology Review issue in January 1998 provides the content of the CS concept, that is referring to "generation of scientific data" „engages volunteers over a large area" and" addresses a politically relevant issue" (*idem*).

In this growing process of engaging citizens in research discoveries, we are witnessing an" exploding CS landscape" (Bonney, R., Cooper, C. and Ballard, H., 2016. The Theory and Practice of Citizen Science: Launching a New Journal. Citizen Science: Theory and Practice, 1(1), p.1. DOI: http://doi.org/10.5334/cstp.65).

A qualitative content analysis of international policy documents made by Hecker et al. (2019) (Hecker, S., Wicke, N., Haklay, M. and Bonn, A., 2019) shows various conceptualizing facets of the CS concept. Among them, we mention the following: "a tool for data collection and analysis mainly in the field of environmental research", "a tool for collaboration between the wider community and scientists working together in scientific projects" (idem). The same analysis presents another side related to the CS concept starting from the form of collaboration and level of engagement of citizens and embraces the collaboration between science and society, as followed: "crowdsourcing", "collaborative science" and "policy" (*idem*).

CS can also be considered as a "multifaceted phenomenon, consisting of collaborative data and knowledge generation among citizens, scientists and, in some case, decision makers, for a range of purposes, consisting of different dimensions (thematic, geographical, temporal, socio-political, scientific, technological and economic) which together influence the nature, remit, value and impact of any given citizen science initiative" (Wehn, U., Gharesifard, M., Ceccaroni, L., Joyce, H., Ajates, R., Woods, S., Bilbao,A., Parkinson, S., Gold, M., Wheatland, J., 2021).

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1.2. The public engagement in Citizen Science

The growing extent of including public participation in research projects has led to use of different models for understanding and assessing public engagement in CS.

There is no fit-for-all-projects model, but we can start our design process trying to understand what is common to all the CS projects and what some specific characteristics for different CS projects are.

Among the common features of the CS projects, we can mention:

- they have research objectives,
- they involve both research and public communities and,
- they aim to bring beneficial results for the community.

Different types of CS projects request different types of participation. Specific characteristics concern:

- different categories of researchers depending on the research domain of the project (environmental experts, social experts, physicist experts and so on),
- the profile of volunteers engaged in the project,
- the level of engagement during the project (co-design phase, data collection, research itself etc.)

Questions still remain why are volunteers interested in participating in CS projects? And how can we increase their contribution?

1.3.Participation patterns of citizens in citizen science projects

There are several theories used to explain the participation patterns of citizens in CS projects, some of the most used ones are:

- *Social capital theory*: This theory suggests that individuals participate in CS projects based on their social networks, relationships, and trust.
- *Motivation theory*: This theory suggests that individuals participate in CS projects based on their intrinsic and extrinsic motivations, such as personal interest, a desire to contribute to science, or a sense of community.
- *Technology acceptance theory*: This theory suggests that individuals participate in CS projects based on their attitudes towards the technology used, such as ease of use, perceived usefulness, and perceived enjoyment.
- *Innovation diffusion theory*: This theory suggests that the adoption of new technologies and practices, such as CS, spreads through social networks and that early adopters play an important role in the diffusion process.
- *Social identity theory*: This theory suggests that individuals participate in CS projects to reinforce their sense of identity as a member of a particular community or group.
- *Game theory*: This theory suggests that individuals participate in CS projects based on the incentives and rewards offered, such as recognition, feedback, or rewards.

These theories are not mutually exclusive and different combinations of them may apply in different contexts. Understanding the underlying motivations and drivers of participation in citizen science is important for improving the design and implementation of these projects.

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1.4. Citizen engagement in EU policies

The „Pact for Research and Innovation" in Europe establishes societal responsibility and engaging local communities and citizens in the design and implementation of R&I policies as one of its main principles (European Commission, 2022).

In this regard, bringing science closer to citizens is one of concrete European Research Area (ERA) actions for the period 2022-2024 to contribute to the priority areas defined in the Pact for Research and Innovation. The growing interest in engaging citizens in science and innovation at the level of EU policies is endorsed by the funding mechanisms developed within Horizon 2020 and Horizon Europe research programs:

- The 'Science with and for Society' (SwafS) program in Horizon 2020 appreciates that „co-design with citizens, stakeholders and end-users needs to be promoted in all policy instruments" and also states that citizen science is one important dimension of open science (European Commission, 2017);
- Presently, Horizon Europe program integrates citizen's engagement as a key element for the EU Missions (Horizon Europe Work Programme 2023-2024 12. Missions, 2023).

2. Methodology of elaboration of the instruments measuring civic engagement in R&I activities

2.1. Measuring civic engagement: a comparative analysis of EC2U countries

Analysis of people's civic engagement in the seven countries members of the EC2U Alliance can be done using the data available in Eurostat (2023) but also from the results obtained from surveys carried out by the European Parliament (Flash Eurobarometer FL4023, 2020) and the European Commission (2015).

The first attempts to measure people's civic engagement were realized in 2015. The European Commission used a series of indicators to express quantitatively people's civic engagement. One of the indicators used, "active citizenship", is referring to the participation in formal or informal voluntary activities by gender, age, educational attainment level and also by income, household type and degree of urbanization. The values obtained for the seven member countries of the EC2U alliance are presented in Figures 1 to 7.

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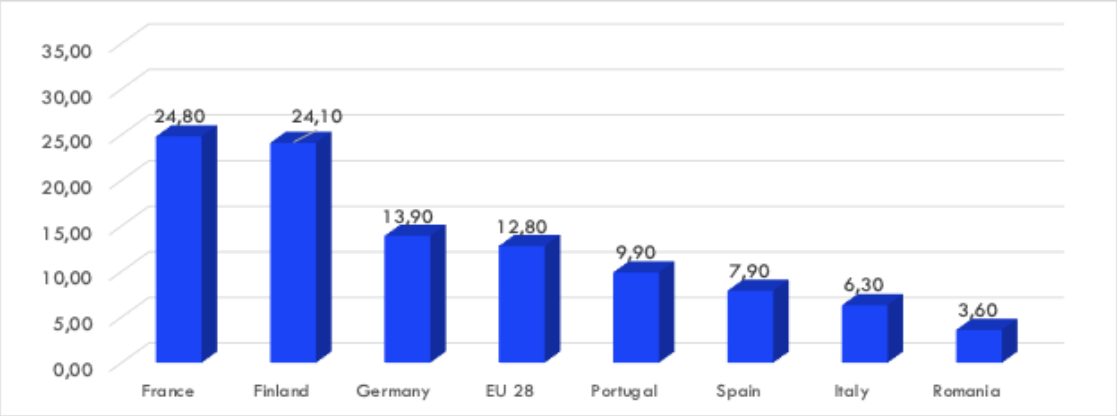
Figure 1. Active citizenship, 2015 (% of people aged 16 and over)



Source: processed according to data from Eurostat

From the seven (countries) members of the EC2U, three countries, namely France, Finland and Germany registered a percentage of active citizens higher than the EU average (12,80%), and four countries were situated below this average. France had the highest share (24,8%) of people being "active citizens" very close to Finland (24,1%) and Romania, with only 3,6%, exhibits the lowest share.

If we take gender into account when making comparisons for this indicator, we observe that in Finland and France, females are in a higher proportion "active citizens" compared to males, with differences of even 4% between the two groups in Finland. Germany has values situated above the EU average and registered a higher proportion of men compared to females as "active citizens". For the EU average, the proportion of males as "active citizens" is higher compared to females, the difference between the two categories is below 1%. The countries located below the EU average are Portugal, Spain, Italy and Romania. In these countries, men are in a higher proportion "active citizens" compared to females, with the difference between the two groups slightly higher than 2% in Portugal. With this comparison, taking into account gender, significant differences can be observed between countries. Thus, in Finland and France 1 out of 4 females are "active citizens", in Germany and Portugal around 1 out of 10, while in Italy and Romania only 1 out of 20 females are "active citizens". Similar proportions are also obtained for men (see Figure 2).

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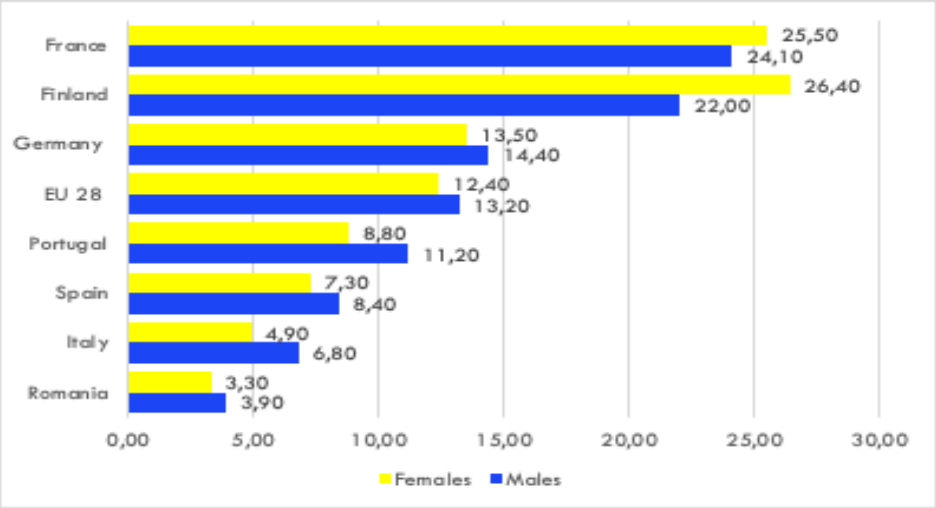
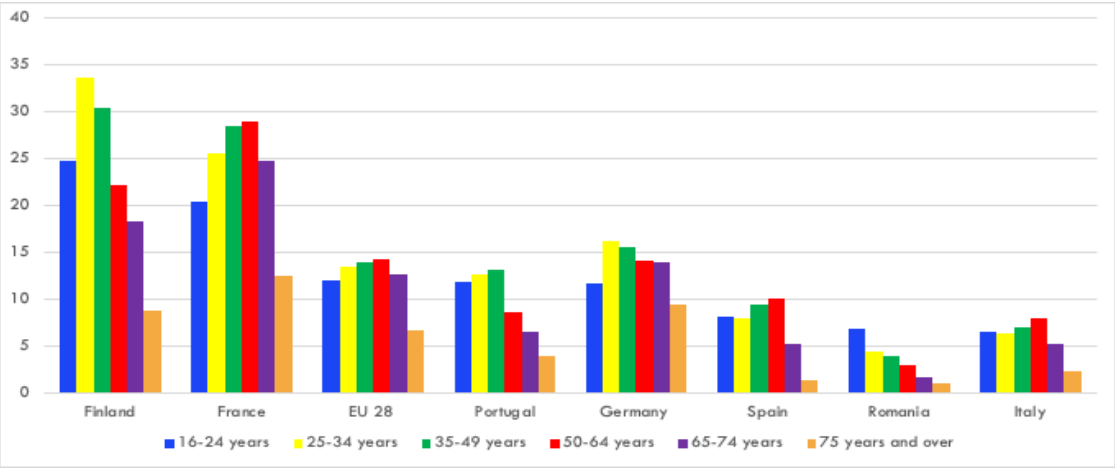
Figure 2. Active citizenship, by gender, 2015 (% of people aged 16 and over)



Source: processed according to data from Eurostat

The active participation in civil society is also analysed according to the age of people. Thus, six age groups were considered: 16-24 years, 25-34 years, 35-49 years, 50-64 years, 65-74 years and 75 years and over. Active citizenship by age for the seven EC2U countries is presented in figure 3. The results show that there are important differences between the countries. Thus, in Romania "active citizens" are younger people of 16-24 years old. In Portugal, "active citizens" come from the age group 35-49 years old, while in Spain, Italy and France most "active citizens" are elderly people coming from the age group 50-64 years old. In Finland and Germany, active citizenship is most pronounced among people between the ages of 25 and 34.

Figure 3. Active citizenship, by age, 2015 (%)



Source: processed according to data from Eurostat

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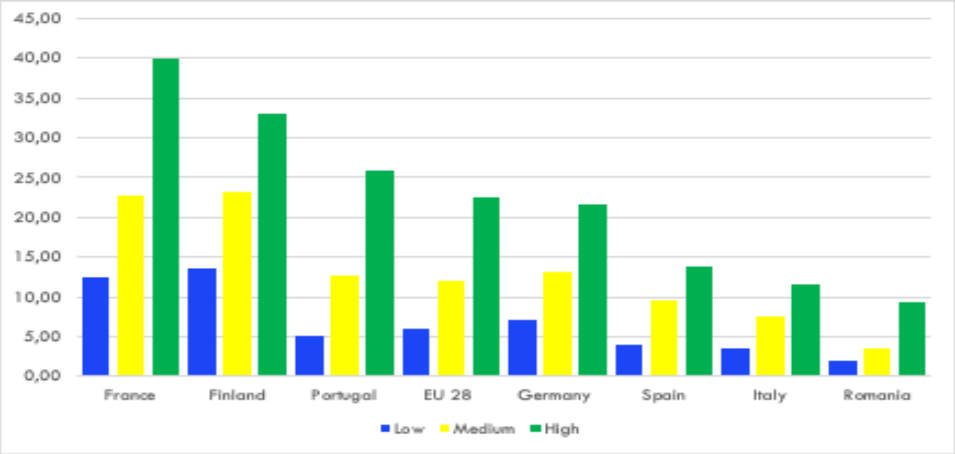
The analysis of civic engagement can also be done based on the educational attainment level. Figure 4 shows that the proportion of "active citizens" was generally higher for people who attended higher (tertiary) education than it was for those who attended medium (secondary and post-secondary non-tertiary) or lower (less then primary, primary and lower secondary) education. The highest values are registered in France, where almost 1 out of 2 people who attended higher education are "active citizens". In Finland 1 out of 3 people who attended higher education are "active citizens", in Portugal and Germany around 1 out of 4, while in Spain, Italy and Romania 1 out of 10 people with higher education were involved in active citizenship. The differences are important between the degrees of training in each country, so that higher education determines an important increase in the involvement of people as active citizenship. Thus, France had the widest education gap for active citizenship between higher and lower education (of 17 percent). On the other hand, Romania recorded the smallest gap between low and medium education (1.5 percent).

Figure 4. Active citizenship, by education level, 2015 (% of people aged 16 and over)



Source: processed according to data from Eurostat

Civic engagement reported to the income level also emphasizes significant differences between countries. Figure 5 points out that in 2015, the share of the population from the seven EC2U countries who were "active citizens" was significantly higher among the subgroup from the fifth income quintile (the top 20 % of highest earners) than it was for the first income quintile (the bottom 20 % of lowest earners). This means that the highest earners in the analysed countries were more likely than the lowest earners to be "active citizens". This pattern was common in each of the seven countries analysed. These findings emphasize that the highest earners in society usually have more interest or even lower barriers to participate actively in cultural and social life, while people with the lowest incomes tend to be less active.

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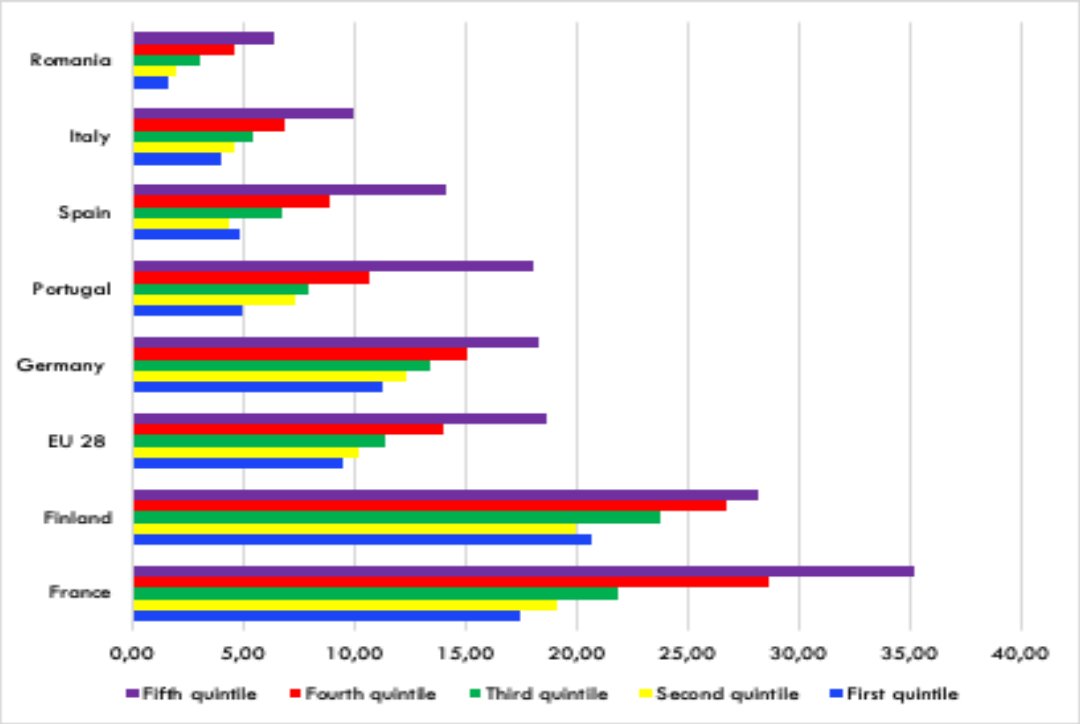
Figure 5. Active citizenship, by income level, 2015 (% of people aged 16 and over)



Source: processed according to data from Eurostat

Active citizenship by degree of urbanization shows that in general the population from large and important cities (refered to "Cities" in the following) have more interest to participate actively in cultural and social life compared to smaller cities ("towns and suburbs") and "rural areas". This trend is observed in Finland, France and Spain. In Portugal, the differences between towns and rural areas are very small, almost imperceptible. In Italy, the share of active citizens is almost equal in the three analysed areas, with very minor differences. In Germany, the highest proportion of "active citizens" is recorded in Cities, followed by Rural Areas, and after that, with a small difference, by Towns and Suburbs. Another peculiarity is observed in Romania, where the highest share of active citizens is observed in Towns and Suburbs, followed by Cities, and finally Rural Areas with an extremely low share (only 2.3%).

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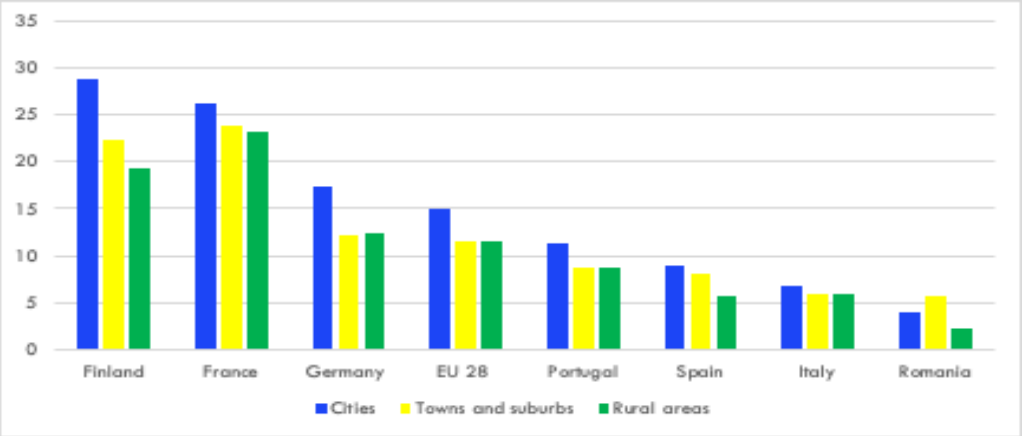
Figure 6. Active citizenship, by degree of urbanization, 2015 (% of people aged 16 and over)



Source: processed according to data from Eurostat

The European Commission also measured active citizenship by the type of household. For this part of the results, there was observed significant differences between the seven EC2U countries and also by the type of household. The share of most "active citizens" is the highest for households with two adults with dependent child in Finland, France, Germany, Portugal and Romania. In Spain and Italy, the largest share of "active citizens" comes from single persons. Finland, France and Germany registered higher shares than the EU average for all categories of households, while Spain, Romania and Italy had lower values. Portugal registered higher shares than the EU average for the active citizens coming from a household with two adults and a dependent child, but lower values for the other types of households.

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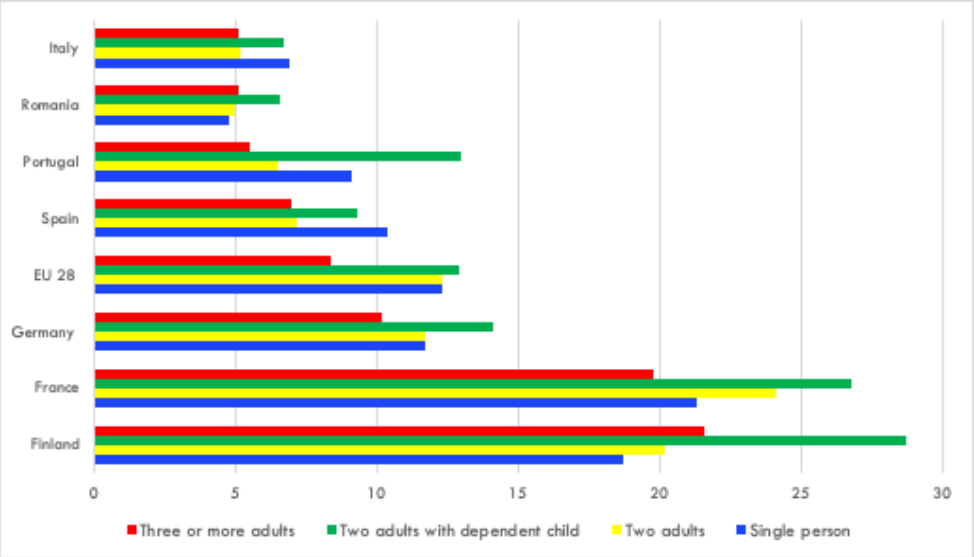
Figure 7. Active citizenship, by household type, 2015 (% of people aged 16 and over)



Source: processed according to data from Eurostat

In addition to the results obtained in 2015, the survey conducted by Flash Eurobarometer in 2020 also measured people's civic engagement. Their results show that in 2020, in all the seven EC2U countries, a large part of the respondents said that they were not engaged with Civil Society Organizations (CSO), but there is a considerable variation between countries. The proportion of people that are not engaged ranges from 40% in Spain to 69% in Romania. Also, three countries were situated below the EU average (51%), namely: Spain, France (46%) and Germany (47%), and four countries above, namely: Portugal (55%), Finland (58%), Italy (64%) and Romania (69%).

In average, 47% of the respondents from the EU declared their personal engagement with Civil Society Organizations in their country. The way they are involved differs from country to country (see table 1). In expressing their ways of engagement, the respondents could select multiple answers. Thus, the first most mentioned item was the donation of money to CSOs in Germany (34%), France (32%), Finland (26%), Portugal (23%), and Italy (19%). In Spain, donating money to CSOs was the second most mentioned item while in Romania this was the third mentioned item.

The fact that they actively encourage others to engage with CSOs was the second most mentioned item in Germany (23%), Portugal (21%), France (17%) and Finland (16%). For Spain and Italy this was the third mentioned item, and the first for Romania. The third most mentioned item was different according to the country. All these findings can be found in Table 1 below.

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Table 1. The engagement of citizens with Civil society organizations, by country, 2020

	Donate money to CSO	Actively encourage others to engage with a CSO	Taking part into demonstrations or similar activities organised by a CSO	Regularly volunteer to take part in activities for CSO	Engage with CSO mainly online or social networks	Do not know
EU average	27	16	15	15	14	2
Finland	26	16	9	13	13	1
France	32	17	15	17	15	4
Germany	34	23	17	19	10	1
Italy	19	6	6	15	4	0
Portugal	23	21	8	14	15	1
Romania	4	6	5	3	5	15
Spain	29	23	31	18	29	2

Source: processed from Flash Eurobarometer (2020)

Focusing on the motives that would stimulate active citizenship, significant differences are also observed between countries (Table 2). The most mentioned item that would stimulate active citizenship was the belief that personal engagement will have a real impact in almost all the seven.

Table 2. Factors that would stimulate active citizenship, by country, 2020

	The belief that personal engagement will have a real impact	Knowing how the financial engagement will be used	Being able to participate in concrete activities or projects organised by CSOs	Being regularly informed about the organization's ongoing activities or projects	Receiving feedback on what has been achieved	Being able to choose a flexible form of engagement	Don't know
EU average	33	25	19	18	16	16	29
Finland	46	30	14	15	14	26	29
France	31	32	24	23	15	18	26
Germany	45	29	23	22	19	14	30
Italy	23	19	12	8	7	13	22
Portugal	38	21	21	18	17	18	27
Romania	12	6	6	7	8	6	55
Spain	44	29	25	23	24	27	16

Source: processed from Flash Eurobarometer (2020)

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In all EC2U countries except for France, for which this was the first most mentioned item, the second most mentioned item was "knowing how the financial engagement will be used" as a factor that would stimulate active citizenship. As regards the third mentioned item, the results were heterogeneous among countries.

2.2. Beyond numbers: a motivation-based approach of civic engagement

The steps followed in this work to design instruments measuring citizen involvement in R&I activities are:

A) **Findings of experts**. Analyzing the determinant factors for citizens' involvement and the impact of public engagement for the knowledge ecosystem. The information achieved is the result of analysis of specific research literature in the field of CS.

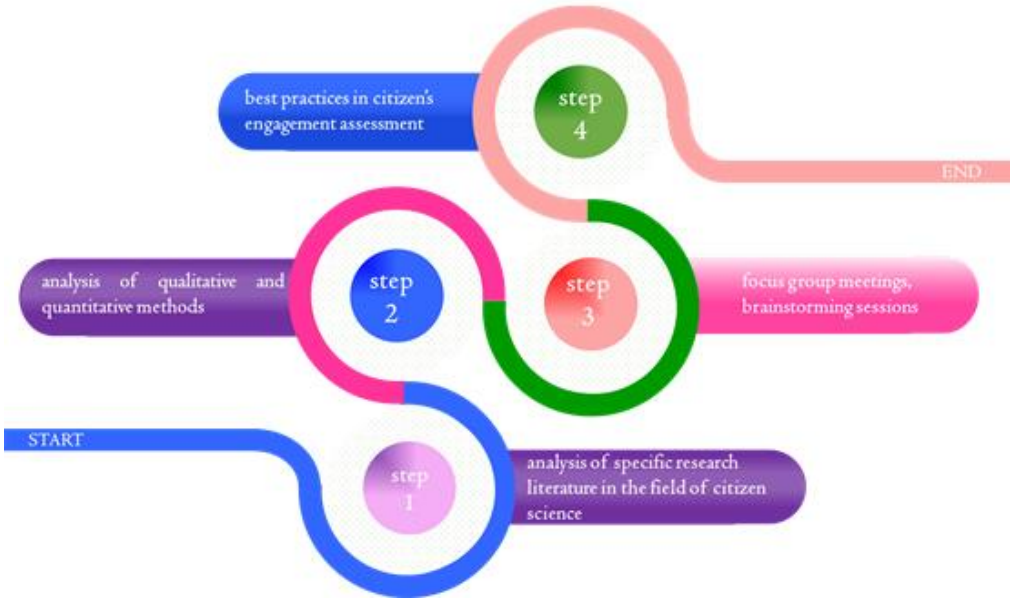
B) **Comprehensive perspective** using qualitative methods, but also quantitative measures.

C) **New and specific quantitative and qualitative perspective at the EC2U level**. Important sources of information are: the key findings from the European data, from the **focus groups and debates** performed within the consortium members.

Moreover, the **brainstorming** sessions organized to prepare the Deliverable D6.3 provided insightful ideas for the structure of the measuring instruments.

D) **Best practices** from other universities regarding citizen's engagement assessment

Figure 8. Steps in elaborating the measurement instruments



Considering the valuable expertise of the consortium members and the RI4C2 project' activities, the members of the Work Package 6 team have chosen a motivation-based approach: research studies enrich the diversity of motivations shown in civic engagement; it varies across individuals and the different

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types of projects (Levontin, L., Gilad, Z., Shuster, B., Chako, S., Land-Zandstra, A., Lavie-Alon, N., and Shwartz, A., 2022). In this context, the approach for the design of a special instrument measuring civic engagement in R&I activities is two-folded with qualitative and quantitative measures.

2.2.1. Qualitative measures of civic engagement in R&I activities. Engagement framework built on the citizen's motivational goals

The Schwartz theory of basic human values is a psychological theory developed by Shalom H. Schwartz (Schwartz, 1992), which outlines ten universal values that are shared across cultures. These values serve as broad, guiding principles that shape individual motivations, preferences, and behaviors. The ten basic human values identified by Schwartz are:

1. *Power*: A desire for control and influence over others and the environment.
2. *Achievement*: A desire for personal success and accomplishments.
3. *Hedonism*: A desire for pleasure and enjoyment.
4. *Stimulation*: A desire for variety, excitement, and new experiences.
5. *Self-direction*: A desire for independence, autonomy, and personal growth.
6. *Universalism*: A concern for the welfare of all people and the promotion of social justice and equality.
7. *Benevolence*: A desire to help others and promote their well-being.
8. *Tradition*: A respect for established cultural and religious beliefs and practices.
9. *Conformity*: A desire for social order, stability, and security, and a need to conform to the norms and expectations of society.
10. *Security*: A desire for safety, stability, and protection from harm.

The Schwartz theory suggests that these values are organized into a hierarchical structure, with some values being more central and dominant than others, and that different values may have different levels of importance for different individuals and cultures. This theory is widely used in the fields of psychology, sociology, and marketing to understand human motivations, preferences, and behaviors.

2.2.2. Engagement framework based on associations between community engagement and research outcomes (Community-engaged research CER)

Community-engaged research (CER) is a concept that brings together forms of research that have community engagement as a core principle (Goodman M.S., Sanders Thompson V.L., Johnson C.A., Gennarelli R., Drake B.F., Bajwa P., Witherspoon M., Bowen D., 2017). CER emerged as a research method focused on working with communities to find solutions to problems that affect their health. The origins of community-engaged research as a field can be traced back to a number of different sources, including community-based participatory research (CBPR), participatory action research (PAR), and engaged scholarship.

According to the same authors (Goodman M.S. et al., 2017) the most significant principles that guide the community-engaged attitude of the researchers involved in health services are:

1. Focus on local relevance and determinants of health
2. Acknowledge the community
3. Disseminate findings and knowledge gained to all partners
4. Seek and use the input of community partners
5. Involve a cyclical and iterative process in pursuit of objectives

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6. Foster co-learning, capacity building, and co-benefit for all partners
7. Build on strengths and resources within the community
8. Facilitate collaborative, equitable partnerships
9. Integrate and achieve a balance of all partners
10. Involve all partners in the dissemination process
11. Plan for a long-term process and commitments

Each of the 11 values have 4-5 associated sentences helping the assessment of the researchers personal driving forces in the relation with the community engagement. The patients or the health service beneficiaries are invited to express their view on "how often" they "think the academic team did" each of the listed actions (see the full list of instruments in Annex no 1).

2.3. Quantitative measures of civic engagement in R&I activities

From the literature review, the main indicators for quantitatively measuring civic engagement are referring to project appeal, activity ratio, level of activity, daily devoted time, public contribution, sustained engagement and participation ratio in communication and dissemination activities. The indicators, the appropriate formula and the literature having supported the indicator measured are detailed in the table below (Table no.3).

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Table no. 3 Measures for civic engagement

Adapted from Cox et al., 2015 as cited in De Moor, T, et al. 2019. Dynamics of Engagement in Citizen Science: Results from the "Yes, I do!"-Project. Citizen Science: Theory and Practice

Indicator	Definition	Formula	Source
Project appeal	"Total number of volunteers who have contributed to the project divided by project active period squared."	PA = people who have contributed /project active period	Cox et al., 2015 as cited in De Moor, T, et al. 2019. Dynamics of Engagement in Citizen Science: Results from the "Yes, I do!"-Project. Citizen Science: Theory and Practice
Activity ratio	"Ratio of days on which the member was active and executed at least one task in relation to the total days they remained linked to the project."	Ar=$\sum V's$ Active days/(date V leaves project)-(dates Vjoin project)	Aristeidо et al.2017 as cited in De Moor, T, et al. 2019. Dynamics of Engagement in Citizen Science: Results from the "Yes, I do!"-Project. Citizen Science: Theory and Practice
Level of activity	Number of submitted contributions made over time	LA=Number of total contributions in period t	De Moor, T, et al. 2019. Dynamics of Engagement in Citizen Science: Results from the "Yes, I do!"-Project. Citizen Science: Theory and Practice
Daily devoted time	"The averaged hours the volunteer remains executing tasks on each day he/she is active."	D= $\sum V's$Active hours/$\sum V's$active days	Ponciano and Brasileiro 2014 as cited in De Moor, T, et al. 2019. Dynamics of Engagement in Citizen Science: Results from the "Yes, I do!"-Project. Citizen Science: Theory and Practice
Public contribution	"Median number of classification per registered volunteer divided by project active period squared."	PC= median (contribution per volunteer)/(project active period)	Cox et al., 2015 as cited in De Moor, T, et al. 2019. Dynamics of Engagement in Citizen Science: Results from the "Yes, I do!"-Project. Citizen Science: Theory and Practice
Sustained engagement	"Mmedian time interval in weeks between a registered user's first and last recorded classification divided by project active period squared."	SE=median (date V last – date V first contribution)/ (project active period)	Cox et al., 2015 as cited in De Moor, T, et al. 2019. Dynamics of Engagement in Citizen Science: Results from the "Yes, I do!"-Project. Citizen Science: Theory and Practice
Participants in communication and dissemination activities	Number of individuals from different target groups (citizens is the broad category) participating in the Communication Activities	Pc=participants accoding to the project's specific reports	Project reporting

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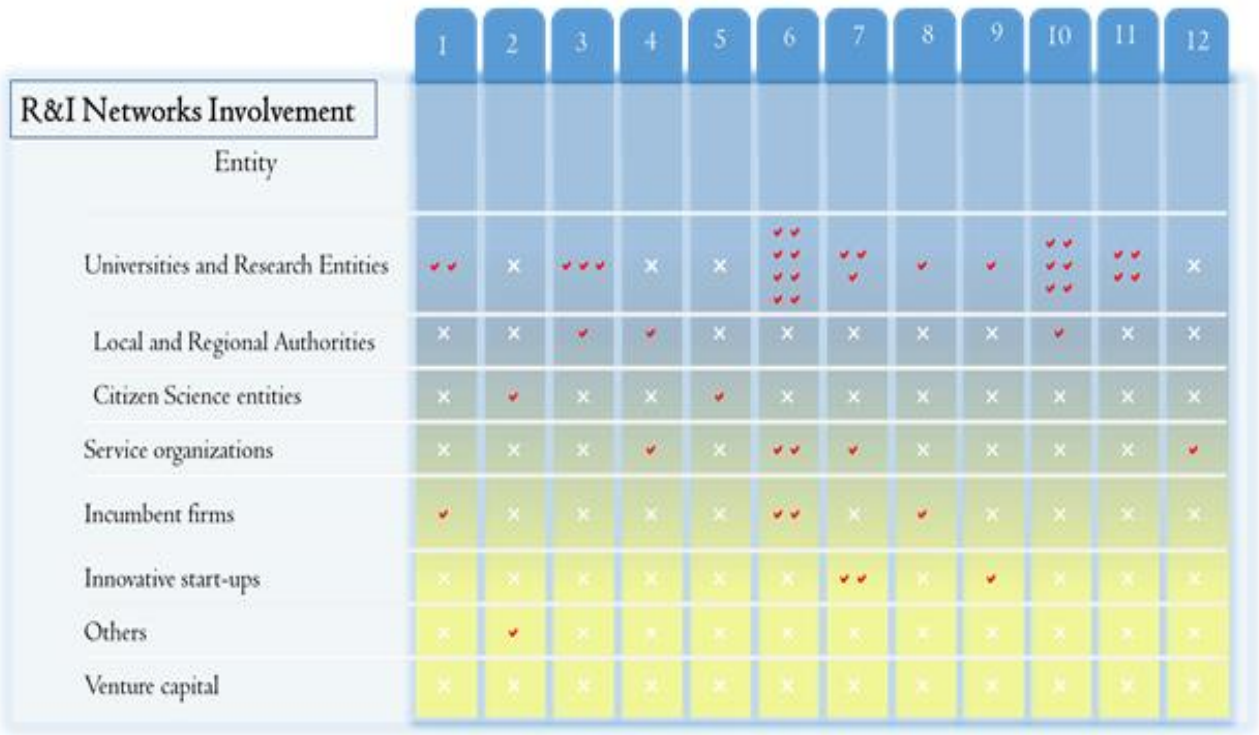
2.4.Key findings from Local Knowledge ecosystems of the EC2U Alliance

Previous data gathered at the level of the EC2U University Alliance through a questionnaire (July 2022-October 2022) have been focused on the characteristics of the local knowledge ecosystems and practices in the areas of CS. The main results from these surveys are detailed in deliverable D6.1 and some relevant indicators (like the research and Innovation *networks* at the local and regional level, the involvement in R&I activities etc.) are presented below.

There are various types of Research and Innovation networks considered by local stakeholders, usually related to their activity domain.

The answers from the questionnaire for identifying knowledge ecosystem components (D6.1) can be clustered into 12 network types as follows in the table below, showing also the involvement of each respondent category.

Figure 9. Involvement of entities in Research and Innovation networks



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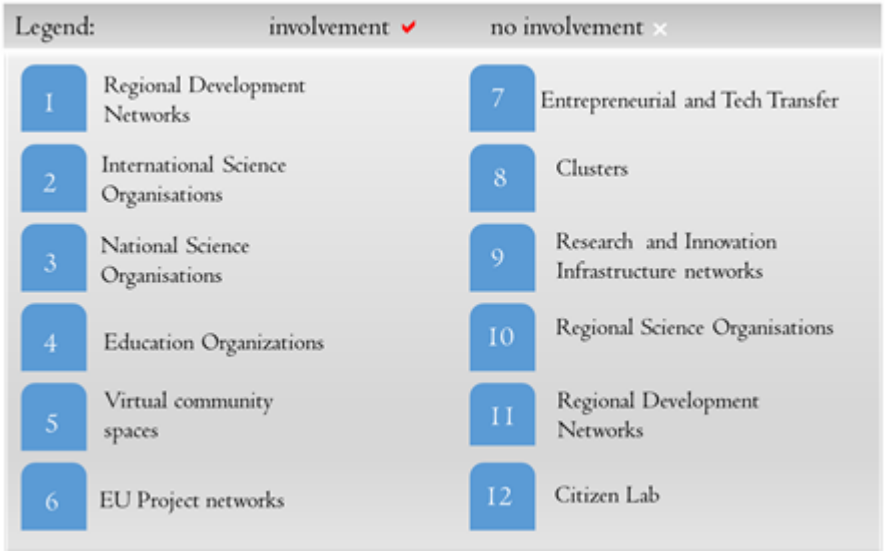

As expected, the Universities and Research Entities' category has the most intense involvement within R&I networks (Source: answers from the questionnaire for identifying knowledge ecosystem components (D6.1).

How do universities and other entities from Local Knowledge Ecosystems identify citizens willing to be involved?

Among the used strategies/instruments used by all the respondents are the following:

- "Volunteering, doctoral and postdoc programs";
- "Specialized personnel recruited from the external source";
- "We are looking for new volunteers for the various presentations / workshops at partner events (conferences, festivals) and online marketing";
- "Social networks";
- "Permanent innovation";
- "Performance evaluation, talent retention";
- "Work networks, assistance to events";
- "Personal and professional relationships";
- "Social Platforms and the Cultural System";
- "Ability to use research methodological tools";
- "Regional Strategy for Intelligent Specialization (identification, support and financing of innovation projects)";
- "Idea Competition, Corporate corners".

Regarding the *strategies for implementation of R&I*, responses indicated various paths for implementation of R&I results, such as: conferences, journals, participation, publication, collaboration, teaching, technology transfer.

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A visual representation (word cloud) of the received answers is presented in the figure 10.

Figure 10. Word cloud for R&I results implementation

How are the Universities and Research Entities implementing the R&I results? How many of these activities are targeting citizens and civic engagement?

Based on the responses to the survey realized in the seven cities and regions, the answers are the following:

- "Articles publication in international journals";
- "Publication of study results in specialized scientific journals and cooperation with international entities for biomolecular analysis";
- "Technology transfer to industry, micro-production activities, specialized services offered to those interested, "open science" publications";
- "Patenting (in the process of patenting innovative products and some horticultural genotypes";
- "The achievements of teaching staff are appreciated at the national, European and international level. Articles and artistic creation activities assimilated to articles published in international journals, rated ISI Web of Science, as well as other manifestations with international recognition are noted";
- "Development of cultural products for touristic agents in the city such as exhibitions, guided tours, workshops, open classes";
- "Teaching in higher education courses; publications in academic and non-academic books and journals; participation in tv shows and documentaries";
- "Organisation / participation in international conferences";
- "Evolution of the national innovation support ecosystem";
- "Through different types of research collaboration networks, together with industries and decision makers".

The answers indicate that citizens are indirectly envisaged by the universities and research institutes.

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2.5. Practices developed by the Local Knowledge Ecosystems and perceptions of the Citizen Science Champions

From October 2022 to January 2023, the Work Package 6' team has developed a qualitative approach to gather inputs from the active entities in the Local Knowledge Ecosystems, respectively, CS Champions. These Citizen Science Champions are successful local/regional stakeholders within knowledge ecosystems, including EC2U universities that can serve as models for successful engagement of citizens, civil society, local/regional communities and public/municipal authorities in different stages of R&I process. It implies that there was at least one focus group per involved university and further debates and discussions conducted in order to better understand the perception of the participants regarding local knowledge ecosystems.

The meetings were held in local languages, then transcribed and translated in English. The participants signed informed consents.

The main topics of the discussions regarded the following aspects:

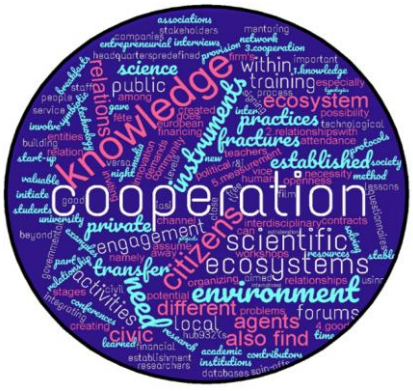
1. Knowledge ecosystems-how do participants perceive their belonging to K.E?
2. Relationship with local stakeholders
3. Cooperation instruments
4. Good practices and lessons learned
5. Measurement instruments of civic engagement in R&I projects

The focus groups were hosted by the University of Coimbra, the University of Jena, the University of Salamanca, the University of Poitiers, the "Alexandru Ioan Cuza" University of Iași and the University of Turku between December 16, 2022 and January 31, 2023. The participants were sampled from local knowledge ecosystem members and CS Champions.

The focus group data are qualitative in nature. As such they cannot necessarily be generalized to the entire local knowledge ecosystem components (from Consortium partners), because of the specific context.

These meetings were supporting the process of designing the instrument for measuring the civic engagement in a given Research and Innovation project. Extracts from the interventions of the participants are detailed in D 6.2 (Selected from the discussion's transcripts).

Figure 11. Word cloud representation for the Focus Groups topics



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3. The Toolkit of Instruments Measuring Civic Engagement in R&I activities

Following the methodology described in section 3, we have selected a qualitative measurement of citizen's engagement using **INNOVATE^{K}**, from a motivation-based approach and in accordance with RI4C2 consortium members expertise and strategy. The instrument description and justification are presented in Annex 1.

The instruments designed to provide a measure of citizens engagement in R&I projects includes the new developed (Instrument1 and Instrument3) and adapted instrument, as described in the table below. The four instruments form **The Toolkit of Measuring Instrument of Civic Engagement in R&I activities** (Annex no.1) and are aimed to:

3.1. **Instrument no 1**. Measure or assess the current stage of civic engagement (Developed by RI4C2 team)

3.2. **Instrument no.2.** Quantitatively assess volunteers' profile according to their engagement in a project.

3.3. **Instrument no 3.** INNOVATE^{K}. Qualitatively assess the motivations in civic engagement according to RIC4 expertise and strategy. (Newly developed by the RI4C2 team)

3.4. **Instrument no 4**. Quantitative and Qualitative measure based on the Engagement principles from the "Community-engaged research" concept.

Each instrument can be used independently for a certain stage of the project (for example, in the design phase and also for the measurement of the current stage of the civic engagement), or the instruments can be combined.

Table 4. The Toolkit of Instruments Measuring Civic Engagement in R&I activities

Instruments	Description	Observation
1. Measurement of the current stage of civic engagement	It offers a measurement of the citizen engagement readiness	The questionnaire is based on the section III. Citizen Science from the D6.1. The instrument is included in Annex 1
2. Quantitative measurement of civic engagement in R&I activities	It is based on the findings from citizen science literature and create volunteers' profile according to their engagement in the projects	The instrument is included in Annex 1
3. Qualitative measurement of civic engagement in R&I activities	INNOVATE^{K} motivation based approach and in accordance with RI4C2expertise and strategy	The ready to use instrument is included in the Annex 2
4. Quantitative-Qualitative instrument measurement of civic engagement in R&I activities	It is based on the Engagement principles from "Community-engaged research" concept	The instrument is included in the Annex 1

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Table 5. The Toolkit of Instruments Measuring Civic Engagement in R&I activities. Objectives and Expected outcomes

Instrument	Main objective	Expected outcome
1. Measurement of the current stage of the civic engagement	Make an ex-ante evaluation of the civic engagement stage of the organization	Information regarding previous/current level of the citizens engagement in Citizen Science projects
2. Quantitative measurement of civic engagement in R&I activities	Measure the dynamic of civic engagement	Indicators regarding engagement in Citizen Science projects
3. Qualitative measurement of civic engagement in R&I activities	Measure the engagement in R&I projects	Information regarding the categories of motivation for citizens engagement in R&I projects
4. Quantitative-Qualitative instrument measuring civic engagement in R&I activities	Get input from citizens whom the research outcomes will impact	Information regarding effective strategies of civic engagement for future research

The Citizen Science champions (Deliverable D.6.1) gave us a feedback regarding the cooperation mechanisms existing within the local Knowledge ecosystems.

Therefore, they helped us in the design of instrument(s) providing a measure of civic engagement in a given project. Such instrument(s) will be promoted to foster the creation (and submission) of R&I project with significant Citizen Science components, when relevant.

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Annex no. 1.The Toolkit of Instruments Measuring Civic Engagement in R&I activities

Instrument no.1. Measurement of the current stage of civic engagement

(Excerpt from the questionnaire developed by RI4C2 team in D 6.1)

		Strongly disagree	Disagree	Undeclared	Agree	Strongly agree
1	Have you involved the following actors in your research and innovation projects/activities?					
	Individual citizens					
	Informal networks of citizens					
	Civil society organizations					
	Local communities					
	Local authorities					
	Regional communities					
	Regional authorities					
	Other(s)					
2	If yes, your Citizen Science projects/activities are mainly connected to following areas (please indicate up to 3)					
	Agriculture, forestry and rural areas					
	Bioeconomy					
	Energy					
	Environment					
	Food systems					
	Frontier research					
	Health					
	Industry					
	Information and communication technologies					
	Oceans and seas					
3	If yes, your Citizen Science projects/activities are mainly connected to following areas (please indicate up to 3)					
	Social sciences and humanities					
	Space					

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		Strongly disagree	Disagree	Undeclared	Agree	Strongly agree
	Synergies with structural funds					
	Transport					
	Other					
4	If yes, please specify the type(s) of involvement of your entity in Citizen Science projects					
	agenda setting					
	policy formulation					
	decision making					
	policy implementation					
	policy evaluation					
	Other					
5	If yes, in which stages of Citizen Science projects/activities are/were involved citizens/volunteers/non-research entities?					
	Consultation (pre-testing of research tools, identification of community need, etc.					
	Data collection					
	Data processing					
	Valorification of results					
	Dissemination and presentation of results					
	Other					
6	What community issues have been targeted in your Citizen Science projects?					
	societal (inclusiveness, education, active citizenship)					
	innovation, growth, employment					
	economic (innovation, growth, employment)					
	environmental (ecology, nature, protection, sustainable use of resources)					

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		Strongly disagree	Disagree	Undeclared	Agree	Strongly agree
	health (prevention, assesment, monitoring)					
	improving policy making and practices					
	improving the access to science					
	Other					
7	In your opinion, what is the impact level of Citizen Science projects on the communities?					
	none					
	low					
	moderate					
	high					
	very high					
8	How many Citizen Science projects have you implemented/developed?					
9	On average, how much do Citizen Science projects budget represent in your total research and innovation budget?					
	0-20%					
	21-40%					
	41-60%					
	61-80%					
	81-100%					
10	Please indicate the sources of funding of your Citizen Science projects/activities:					
	Self finance					
	Private donation					

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Instrument no.2. Quantitative measurement of civic engagement in R&I activities

Indicator	Definition	Formula
Project appeal	"Total number of volunteers who have contributed to the project divided by project active period squared."	PA = people who have contributed /project active period
Activity ratio	"Ratio of days on which the member was active and executed at least one task in relation to the total days they remained linked to the project."	$A_T=\sum V's$ Active days/(date V leaves project)-(dates Vjoin project)
Level of activity	Number of submitted contributions made over time	LA=Number of total contributions in period t
Daily devoted time	"The averaged hours the volunteer remains executing tasks on each day he/she is active."	$D=\sum V's$Active hours/$\sum V's$active days
Public contribution	"Median number of classification per registered volunteer divided by project active period squared."	PC= median (contribution per volunteer)/(project active period)
Sustained engagement	"Mmedian time interval in weeks between a registered user's first and last recorded classification divided by project active period squared."	SE=median (date V last – date V first contribution)/ (project active period)
Participants in communication and dissemination activities	Number of individuals from different target groups (citizens is the broad category) participating in the Communication Activities	Pc=participants according to the project's specific reports

V = numberof inactive days betweensubmitted contribution

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Instrument no 3. INNOVATEK Qualitative measurement of civic engagement in R&I activities

Key Factor	Affirmation	5 Strongly disagree	4 Disagree	3 Undeclared	2 Agree	1 Strongly agree
Inspiration, initiation of participatory process	"I am interested in the topic of this project"					
Needs identification	"I identified a problem/need/issue that can be solved within project activities"					
New ideas	"Participating in the project give me the opportunity to express my ideas"					
Outcomes, results	"I consider I contribute achieving useful results both for the project and for my needs"					
Value creation	"I want to contribute to science"					
Action, accountability and control	"I consider my engagement is adding value in the following stages of the project:					
	• problem definition					
	• research design					
	• achieving project results					
	• communication and dissemination of the project"					

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Key Factor	Affirmation	5 Strongly disagree	4 Disagree	3 Undeclared	2 Agree	I Strongly agree
Knowledge ecosystem	"I consider that civic engagement in R&I projects may be positively influenced by:					
	• specific public policies					
	• stakeholders networking (universities, companies, ngos, citizens)					
	• benefits for participants					
	• research culture/citizen participation awareness and volunteering					
	• digital/technology instruments for engagement					
	• community R&I infrastructures (living labs-places dedicated to education for citizens in different domains of science, common project proposals support, implementing research results,etc.)"					

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Instrument no 4. Quantitative-Qualitative instrument measuring civic engagement in R&I activities*

The instrument is based on the Engagement principles from "Community-engaged research" concept

Please rate how often you think the academic team did each of the following***	**Quality**				
	Poor	Fair	Good	Very Good	Excellent
	Quantity				
	Never	Rarely	Sometimes	Most of the time	Always
Engagement Principle 1: Focus on local relevance and social determinants of health					
Focus on issues important to my community.					
Focus on health problems that the community thinks are important.					
Focus on the combined interaction of factors (i.e. personal, social, economic etc.) that influence health status.					
Focus on cultural factors that influence health behaviors					

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Please rate how often you think the academic team did each of the following***	**Quality**				
	Poor	Fair	Good	Very Good	Excellent
	Quantity				
	Never	Rarely	Sometimes	Most of the time	Always
Engagement Principle 2: Acknowledge the community					
Show appreciation for community time and effort					
Highlight the community's involvement.					
Give credit to community members and others for work.					
Value community perspectives					

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Please rate how often you think the academic team did each of the following*****	**Quality**				
	Poor	Fair	Good	Very Good	Excellent
	Quantity				
	Never	Rarely	Sometimes	Most of the time	Always
Engagement Principle 3: Disseminate findings and knowledge gained to all partners					
Let community members know what is going on with the project					
Help community members with problems of their own					
Empower community members with knowledge gained from a joint activity					
Get findings and information to community members					

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Please rate how often you think the academic team did each of the following*****	**Quality**				
	Poor	Fair	Good	Very Good	Excellent
	Quantity				
	Never	Rarely	Sometimes	Most of the time	Always
Help community members disseminate information using community publications					
Engagement Principle 4: Seek and use the input of community partners					
Ask community members for input					
Use the ideas and input of community members					
Change plans as a result of community input					

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Please rate how often you think the academic team did each of the following***	**Quality**				
	Poor	Fair	Good	Very Good	Excellent
	Quantity				
	Never	Rarely	Sometimes	Most of the time	Always
Involve community members in making key decisions					
Ask community members for help with specific tasks					
Engagement Principle 5: Involve a cyclical and iterative process in pursuit of objectives					
Share the results of how things turned out with the community					
Seek community input and help at multiple stages of the process					
Inform the community of what happened when their ideas were tried					

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Please rate how often you think the academic team did each of the following***	**Quality**				
	Poor	Fair	Good	Very Good	Excellent
	Quantity				
	Never	Rarely	Sometimes	Most of the time	Always
Plan for ongoing problem solving					
Involve the community in determining next steps					
Engagement Principle 6: Foster co-learning, capacity building, and co-benefit for all partners					
Learn from community members					
Help community members gain important skills from involvement					
Encourage academic partners and community members to learn from each other					

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Please rate how often you think the academic team did each of the following***	**Quality**				
	Poor	Fair	Good	Very Good	Excellent
	Quantity				
	Never	Rarely	Sometimes	Most of the time	Always
Help community partners get what they need from academic partners					
Help community members achieve social, educational, or economic goals					
Engagement Principle 7: Build on strengths and resources within the community					
Build on strengths within the community					
Build on resources within the community					
Help to fill gaps in community strengths and resources					

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Please rate how often you think the academic team did each of the following*****	**Quality**				
	Poor	Fair	Good	Very Good	Excellent
	Quantity				
	Never	Rarely	Sometimes	Most of the time	Always
Work with existing community networks					
Engagement Principle 8: Facilitate collaborative, equitable partners					
Foster collaborations win which community members are real partners					
Handle disagreements fairly					
Demonstrate that community members are really needed to do a good job					
Demonstrate that community members' ideas make things better					

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Please rate how often you think the academic team did each of the following***	**Quality**				
	Poor	Fair	Good	Very Good	Excellent
	Quantity				
	Never	Rarely	Sometimes	Most of the time	Always
Enable community members to voice disagreements					
Engagement Principle 9: Integrate and achieve a balance of all partners					
Enable all people involved to voice their views					
Make final decisions that reflect the ideas of everyone involved					
Demonstrate that community members' ideas are just as important as academics' ideas					
Treat community members' ideas with openness and respect					

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Please rate how often** you think the academic team did each of the following***	Quality				
	Poor	Fair	Good	Very Good	Excellent
	Quantity				
	Never	Rarely	Sometimes	Most of the time	Always
Engagement Principle 10: Involve all partners in the dissemination process					
Make sure that all partners are involved with sharing findings					
Include community members in plans for sharing findings.					
Involve community members in sharing health messages in community settings.					
Listen to community members when planning dissemination activities.					
Engagement Principle 11: Plan for a long-term process and commitment					

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Please rate how often you think the academic team did each of the following***	**Quality**				
	Poor	Fair	Good	Very Good	Excellent
	Quantity				
	Never	Rarely	Sometimes	Most of the time	Always
Make plans for community-engaged activities to continue for many years.					
Make commitments in communities that are long-term.					
Want to work with community members for many years.					

*Instrument elaborated by Melody S. Goodman, Vetta L Sanders Thompson, Cassandra Arroyo Johnson, Renee Gennarelli, Bettina F Drake, Pravleen Bajwa, Maranda Witherspoon, Deborah Bowen (2017) EVALUATING COMMUNITY ENGAGEMENT IN RESEARCH: QUANTITATIVE MEASURE DEVELOPMENT

**The same items are repeated to measure the quality of engagement using the question; Please rate how well you think the academic team did each of the following with Likert response options: Poor, Fair, Good, Very Good, Excellent

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***Quantity Scale Likert Response options: Never, Rarely, Sometimes, Most of the time, Always

Annex no 2. INNOVATE[k] tool design - description and justification

Key Factor	Analysis		Affirmation	Justification
	Description (related to motivational goals)	**Key variables**		
Inspiration, initiation of participatory process	„Freedom to cultivate one's own ideas and abilities" (related to motivational goals) Involvement, Strategy for participation Satisfaction level Self-direction, creativity	"Autonomy of action" (Openness to change)	"I am interested in the topic of this project" (source: Levontin et al. Citizen Science.)	(Schwartz, SH, Cieciuch, J, Vecchione, M, Torres, C, Dirilen- Gumus, O and Butenko, T., 2017)
Needs identification	Security "The motivational goal of this value type is safety, harmony, and stability of society, of relationships, and of self" Schwartz 1992	"Societal security" Perception on problem-solving within the community?	"I identified a problem/need/issue that can be solved within project activities"	(Schwartz, 1992) (Schwartz, SH, Cieciuch, J, Vecchione, M, Davidov, E, Fischer,R, Beierlein, C, Ramos, A, Verkasalo, M, Lönnqvist, JE, Demirutku, K and Dirilen-Gumus, O., 2012)
New ideas	Stimulation	"Challenge, novelty" Stimulation (Openness to change)	"Participating in the project gives me the opportunity to express my ideas"	(Schwartz, 1992), (Schwartz, SH, Cieciuch, J, Vecchione, M, Davidov, E, Fischer,R, Beierlein, C, Ramos, A, Verkasalo, M, Lönnqvist, JE, Demirutku, K and Dirilen-Gumus, O., 2012)

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Key Factor	Analysis		Affirmation	Justification
	Description (related to motivational goals)	Key variables		
Outcomes, results	Benefits for individuals, community Achievements: "Personal success through demonstrating competence according to social standards"	"Achievement" Perception about project outcomes (Self-Enhancement)	"I consider I contribute achieving useful results both for the project and for my needs"	(Schwartz, SH, Cieciuch, J, Vecchione, M, Torres, C, Dirilen- Gumus, O and Butenko, T., 2017)
Value creation	Help to research	Added value of the results Contribution to science	"I want to contribute to science"	(Levontin, L, Gilad, Z, Shuster, B, Chako, S, Land-Zandstra, A, Lavie-Alon, N and Shwartz, A., 2022)
Action, accountability and control	Achievement "Success according to social standards"	"Achievement" Perception regarding involvement in activities (Self-Enhancement)	"I consider my engagement is adding value to the following stages of the project: · problem definition · research design · achieving project results	(Schwartz, SH, Cieciuch, J, Vecchione, M, Davidov, E, Fischer,R, Beierlein, C, Ramos, A, Verkasalo, M, Lönnqvist, JE, Demirutku, K and Dirilen-Gumus, O., 2012)

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Key Factor	Analysis		Affirmation	Justification
	Description (related to motivational goals)	**Key variables**		
			·communication and dissemination of the project"	
Teamwork, cooperation tools	Communication level, "Conformity rules" (Compliance with rules, laws, and formal obligations)	"Benevolence caring" Perception regarding influencing factors for civic participation (Devotion to the welfare of in-group members) (Self-Transcendence)	"I consider my participation the project is enhanced by: • regular feedback and support • forums and apps to communicate with others • matching the project's tasks with my skills • having opportunity for	(Schwartz, SH, Cieciuch, J, Vecchione, M, Davidov, E, Fischer,R, Beierlein, C, Ramos, A, Verkasalo, M, Lönnqvist, JE,Demirutku, K and Dirilen-Gumus, O., 2012)

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Key Factor	Analysis		Affirmation	Justification
	Description (related to motivational goals)	Key variables		
			learning and personal development • being part of a community of trust • meaningful time spent in the project"	
Engagement		Benevolence dependability (Being a reliable and trustworthy member of the in-group) (Self-Transcendence)	"I consider that civic engagement in R&I projects may be positively influenced by: •specific public policies •stakeholders networking (universities, companies, NGOs, citizens) •benefits for participants	(Schwartz, SH, Cieciuch, J, Vecchione, M, Davidov, E, Fischer,R, Beierlein, C, Ramos, A, Verkasalo, M, Lönnqvist, JE, Demirutku, K and Dirilen-Gumus, O., 2012)

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Key Factor	Analysis		Affirmation	Justification
	Description (related to motivational goals)	Key variables		
			•research culture/citizen participation awareness and volunteering •digital/technology instruments for engagement •community R&I infrastructures (living labs-places dedicated to education for citizens in different domains of science, common project proposals support, implementing research results, etc.)"	
Knowledge ecosystem	Champions of citizen science- "Citizen Science actors are champions of change that operate the wheels of	"Universalism"	"I consider that civic engagement in R&I	(Schwartz, SH, Cieciuch, J, Vecchione, M, Davidov, E, Fischer,R, Beierlein, C, Ramos, A, Verkasalo, M, Lönnqvist, JE,

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Key Factor	Analysis		Affirmation	Justification
	Description (related to motivational goals)	**Key variables**		
	knowledge production together with everyday people motivated to make a difference every day" (RIC4.D6.1)	Impact for KES (Self-Transcendence)	projects may be positively influenced by: •specific public policies •stakeholders networking (universities, companies, NGOs, citizens) •benefits for participants •research culture/citizen participation awareness and volunteering •digital/technology instruments for engagement •community R&I infrastructures (living labs-places dedicated to education for citizens in different domains of science, common project proposals support,	Demirutku, K and Dirilen-Gumus, O., 2012) RIC4.D6.1

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Key Factor	Analysis		Affirmation	Justification
	Description (related to motivational goals)	Key variables		
			implementing research results, etc.)"	

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