YouCount
Youth Citizen Science

D4.1

# Cross-Case Evaluation Methodology, Analysis and Outcomes

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# D4.1 Cross-Case Evaluation Methodology, Analysis and Outcomes

**D4.1: 1. Meta-report of cross-case evaluation**

**This report presents the main findings from the process- and outcomes evaluation of the multiple case study.**

**The vison of YouCount is twofold, addressing and combining both the scientific and societal needs of our time. The scientific *vision* of YouCount is to strengthen the transformative and participatory aspects of CS and social science, by enabling citizen participation in all facets, reaching out for a more egalitarian way of conducting science. The societal vision of YouCount is to contribute to create inclusive and innovative societies for European youths and to empower them in promoting active citizenship and a just and equitable future, particularly for youths with disadvantages.**

*Table 1. Revision history*

| VERSION | DATE | CREATED BY | COMMENTS |
|---|---|---|---|
| 1.0 | 20 / 12 / 2023 | 6 - UNIVIE | Draft version for internal review |
| 1.1 | 21 / 12 / 2023 | 6 - UNIVIE | Final revised draft |
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*Table 2. Terms and Abbreviations*

| ABBREVIATION | FULL TERM |
|---|---|
| CS | Citizen Science |
| CSS | Citizen Social Science |
| DEC | Dissemination, exploitation, and communication |
| DF | Dialogical Forums |
| EC | European Commission |
| ECSA | European Citizen Science Association |
| EU | European Union |
| LL | Living Labs |
| NGO | Non-governmental organization |
| Y-CSS | Youth led Citizen Social Science |
| YCS | Young citizen scientist |

# Executive Summary

This D4.1 Meta Report on the YouCount evaluation methodology, analysis and outcomes is rooted in WP4 – this is to be distinguished from the impact dimension, which is also part of WP4, but will be reported by Lorenz and colleagues (2023). More specifically it addresses Task 4.1 (development of the evaluation framework) to Task 4.9 (external evaluation), including steps like data collection, data analysis, and continuous process evaluation aspects.

The main focus lays in the theoretical foundations of the YouCount evaluation, the implementation and adaptions, the analysis and the outcomes thereof. Lessons learned and suggestions for future projects are discussed.

This Report comprises 7 parts: (1) an introductory overview of YouCount's aims and intentions in evaluating the multiple case study with 10 cases in 9 countries doing social inclusion Y-CSS; (2) the theoretical background of the original evaluation framework as outlined by Juricek and colleagues (2021); (3) the methodological design within the project context; (4) the implementation as adapted for the YouCount context, including derivations and later adaptations; (5) the actual outcomes and results of the analysis of the evaluation data; (6) the lessons learned as derived from the overall evaluation process; and finally (7) the conclusion remarks.

The main target group for this Deliverable are fellow CSS scientists, practitioners, but also lay people genuinely interested in the topic of how to evaluate a multi-country social inclusion Y-CSS project with mixed-methods approaches.

# 1 Introduction

Citizen science (CS) is gaining momentum globally as professional scientists collaborate with non-expert volunteers, unlocking potential not just for scientific discoveries but also for driving social change (Bonney et al., 2016; Heiss & Matthes, 2017). Given its recent emergence, it is crucial to thoroughly examine the strengths, advantages, and challenges of applying CS across various disciplines. Especially when it comes to Citizen Social Science (CSS), different obstacles occur, when compared to the original natural-science-based CS approaches. Thus, a robust evaluation system is needed, one that considers the diverse outcomes, obstacles, and insights generated. Current frameworks for CS evaluation are limited, often lacking precision or a comprehensive scope of criteria (e.g., Kieslinger et al., 2018). Moreover, there is a notable absence of a universally accepted overview, particularly for cross-country citizen science projects spanning multiple thematic areas, a gap prominent in the social sciences. This report aims to fill these voids by providing a comprehensive overview and outlining a strategy for evaluating the YouCount project.

YouCount, a cross-country Y-CSS initiative, focuses on social inclusion of young people (i.e. youth 13-29 years) living in Europe (including the UK), by promoting active citizenship, and building inclusive and innovative societies that prioritize justice and equity, especially for disadvantaged youth. The project's specific focus necessitates consideration of various dimensions in the evaluation, including scientific quality, collaboration, learning outcomes, societal impact, and cross-case standards. The YouCount evaluation framework (Juricek et al., 2021) not only elucidates the evaluation goals but also delineates concrete indicators and methodologies to achieve these objectives. In essence, the framework proposed a comprehensive approach to evaluating Y-CSS at the European level.

While CS is growing worldwide, there is still no universally agreed definition for the field. All CS projects involve collaboration between professional and non-professional researchers, but specific activities vary (European Citizen Science Association, 2020; Haklay et al., 2021). Project designs range from contributory, where volunteers gather data, to collaborative, involving volunteers in one research stage, and co-created, emphasizing equal collaboration throughout (Bonney et al., 2009). With increased involvement, volunteers gain scientific knowledge and empowerment (Robinson et al., 2018). This report focuses on CSS in social sciences, highlighting meta-level reflections on the overall project implementation and outcomes.

While CS projects differ across disciplines, they generally follow principles for scientific standards, active citizen involvement, and ethical considerations (Haklay et al., 2021; Heigl et al., 2020). Compliance with these principles ensures quality findings and opens avenues for citizen education and empowerment, fostering advocacy for socio-ecological issues. Evaluation of CS is crucial, evolving from data quality to assessing project impacts on participants. To enhance CS's standing, a reliable CSS evaluation framework is essential, emphasizing transformation. Thus, the evaluation framework set out to highlight the transformative power of Y-CSS.

# 2 Evaluation Framework Background

While the concept of volunteer helpers in science dates back to the 18th century, today's citizen science emerged in the late 20th century, primarily applied in natural and environmental research (Andersson Burnett, n.d.; Lintott, 2020; Miller-Rushing et al., 2012). Non-professional volunteers played a crucial role in collecting extensive data, enabling observations on animal populations and assessing water and air quality across large areas. The inception of citizen science as a term occurred in January 1989 when the National Audubon Society engaged 225 members in 50 states to measure rainwater acidity, subsequently using the data for lobbying against acid rain (Haklay et al., 2021). The central concept of citizen science lies in incorporating non-professionals into scientific endeavors.

In the realm of citizen science, evaluation serves the purpose of validating projects comprehensively. This involves assessing learning outcomes, reflecting on and improving the project, gathering participant feedback, and evaluating project impacts, among other dimensions. However, most evaluations tend to focus on specific dimensions, such as learning outcomes, rather than addressing the entire spectrum.

## *2.1 The Need for Comprehensive Evaluation Frameworks*

The burgeoning field of CS demands thorough evaluation, encompassing various dimensions such as learning outcomes, project reflection and improvement, participant feedback, and project impacts. However, existing evaluations often focus on specific dimensions, necessitating universally recognized frameworks to gauge project effectiveness (see examples below). Evaluation can be categorized into process-oriented (assessing operational activities' quality) and outcome-oriented (evaluating longer-term effects) aspects (Kieslinger et al., 2018).

## *2.1 Outcome Oriented Framework*

With the Framework for Articulating and Measuring Individual Learning Outcomes from Participation in Citizen Science (Phillips et al., 2018) established a comprehensive framework based on survey results from 114 CS projects, identifying five categories: self-efficacy, motivation, content/process/nature of science knowledge, skills of science inquiry, and behavior/stewardship. The framework addresses the diverse learning outcomes, crucial for aligning project goals with related categories. However, limitations exist in covering all outcomes within a single project, emphasizing the need for alignment and consideration of temporal dimensions.

## 2.2 Process oriented frameworks

The Nibble and Drop Framework (Fischer et al., 2021) explores participant dynamics, categorizing involvement levels, including initial-droppers (no (intrinsic) interest hence no desire to contribute to project, drop-out very likely), nibblers (just “nibble” a at the project input every now and then, medium interest with little to no project contribution), and hooked participants (high interest and involvement desires, thus high contributions). The two main axes of engagement, according to Fischer and colleagues (2021) are the duration of their participation (long- vs. short-term projects) and the level of their willingness to contribute While this framework might appear intuitive at first glance, caution is advised against metaphorical language that may undermine the respectful nature of CS collaborations. The aim of including lay people into research on eye-level does always inherit the necessity of being respectful, building a relationship and gaining trust – something that lays at the core nature of Y-CSS. With wording like in the proposed framework, we deem it rather difficult to build up true eye-level relations.

The Communication, Awareness, Relationships, and Empowerment (C.A.R.E.) Model (C.A.R.E.; Ceasar et al., 2017) focuses on building trust with marginalised communities, emphasising communication, awareness, relationships, and empowerment. This model seeks to measure effective engagement and is particularly relevant for projects like YouCount, where collaboration with participants is crucial.

## 2.3 Process and Outcome-oriented Framework

To bridge the gap between process and outcome, Kieslinger et al. (2018) proposed a Citizen Evaluation Framework. Structured around stakeholders (scientific community, participants, and society), the Citizen Evaluation Framework (Kieslinger et al., 2018) incorporates process and outcome criteria for scientific, participant, and socio-ecological and economic dimensions. It provides a holistic evaluation tool adaptable throughout a project's lifespan.

## 2.5 Moving Towards a Holistic Evaluation in Citizen Science

In conclusion, as CS continues to evolve, the need for robust evaluation frameworks becomes increasingly apparent. An evaluative framework needs to encompass something of all these elements to evaluate a complex intervention such as YouCount in the context of nine different countries and 10 different cases, since multi-facetted dimensions are tapped on both within the cases, and across the cases. The presented frameworks each offer diverse approaches, addressing

both process and outcome dimensions. For the YouCount project, a synthesis of these frameworks will be instrumental in developing a comprehensive and adaptive evaluation strategy. This chapter underscores the importance of ongoing evaluation, ensuring the effectiveness and societal impact of CS initiatives, while the next chapter will give an insight into the translation of this theory into YouCount reality. It will also include a sort of operationalization, entailing how the different framework components will be measured.

## *2.6 Ethics Reflections in Evaluations*

Assessing project quality is the primary goal of evaluation, and it necessitates ensuring the quality of the evaluation process itself. Ethical standards are crucial, as evaluation often has the potential to reveal conflicts of interest. These standards safeguard all involved stakeholders, enabling their free participation in the evaluation and establishing a foundation for an impartial and valid assessment. Ethical principles in evaluation align with those practiced in global social science and academia, emphasizing transparency, confidentiality, impartiality, and respect (Social Research Association, 2021). Beyond these, various criteria exist to ensure both quality and ethical conduct in evaluations.

In literature on citizen science and participatory research, few researchers delve into evaluation, and even fewer address its ethics. Notably, ECSA policy papers #1, #2, and #3 (European Citizen Science Association, 2015, 2016a, 2016b) and the White Paper on Citizen Science (Serrano Sanz et al., 2014) sparingly mention evaluation, neglecting ethics. However, evaluation research yields valuable knowledge, and this chapter later presents a list of criteria for ethical evaluation. The proposed criteria draw from the United Nations Evaluation Group's (UNEG) Guidelines for Ethical Evaluation, aligned with the Sustainable Development Goals (SDGs) that YouCount aims to contribute to. These guidelines prioritize integrity, accountability, respect, and beneficence, providing specific criteria to address ethical issues globally (United Nations Evaluation Group, 2020).

Given potential cultural differences within the YouCount project, common ethical principles are crucial to preventing conflicts and differences of opinion. This is particularly relevant in co-evaluation, involving not just researchers but also citizen scientists. Establishing common standards for evaluation helps prevent conflicts, defines evaluator responsibilities, and fosters successful cooperation among diverse stakeholders.

The literature on evaluation ethics and UNEG publications, along with additional criteria, has been categorized for different aspects of the YouCount evaluation process. Inclusion of these criteria ensures that the evaluation aligns with high ethical standards

**Already outlined in an earlier project report, we created a set of criteria for ethical evaluation in YouCount (for more details see Juricek et al., 2021):**

1. Data collection and usage
   - Protection of data
   - Protection of intellectual property rights (Kieslinger et al., 2018)
   - Informed consent
   - Confidentiality (Barnett & Camfield, 2016)
   - Data minimization (United Nations Evaluation Group, 2020)
2. Communication & transparency
   - of data governance (Kieslinger et al., 2018; United Nations Evaluation Group, 2020)
   - of the evaluation's purpose (Kieslinger et al., 2018)
   - of the evaluation's funding
3. Professionalism
   - Competence, qualifications and experience of evaluators and staff (United Nations Evaluation Group, 2020)
   - Truthfulness of evaluators and stakeholders during the entire process of evaluation (Morris, 2015)
   - Accountability of evaluators and staff
   - Sufficiency of time and resources (Morris, 2015)
   - Adequacy of methods and capability to identify all relevant aspects (Morris, 2015)
   - Consultation of an External review body (e.g., Institutional Review Board) (United Nations Evaluation Group, 2020)
   - Adherence to ethical principles (United Nations Evaluation Group, 2020)
   - Planned (disciplinary) measures in case of misconduct, incompetence or illegal behavior (Morris, 2015)
   - Avoidance of conflicts of interest (Morris, 2015; United Nations Evaluation Group, 2020)
   - Awareness of the evaluators' duty (Barnett & Camfield, 2016)
   - Freedom for the evaluation, no prohibitions of inquiries (Morris, 2015)
   - Impartiality, independence and incorruptibility of evaluators (Morris, 2015; United Nations Evaluation Group, 2020)
4. Reflexivity
   - Responsiveness and adaptability of plans, actions and evaluation tools (Rodriguez & Acree, 2021; United Nations Evaluation Group, 2020)
   - Use of unaltered findings for key decisions (Barnett & Camfield, 2016; Morris, 2015)
   - Continuous consideration of risks and benefits (United Nations Evaluation Group, 2020)
5. Collaborative efforts
   - Inclusion of all relevant stakeholders in the evaluation process (Barnett & Camfield, 2016; Morris, 2015; United Nations Evaluation Group, 2020)

- Equal chances and respect for all stakeholders (United Nations Evaluation Group, 2020)
- Anti-discriminatory working environments
- Representation of diverse voices among staff and participants (United Nations Evaluation Group, 2020)
- Efforts to create good, appreciative and trusting relationships between all stakeholders (Barnett & Camfield, 2016)

# 3 Evaluation Framework Design in YouCount

As for the operationalization of the evaluation framework, we combined the illustrated approaches with further dimensions and novel insights into C(S)S dimensions and fused all of this together to create a comprehensive evaluation framework model (see Juricek et al, 2021). Thus, we chose to focus on the following dimensions to answer our evaluation-based research questions (while the actual methodology and what it entails will be explained in the next chapter):

Citizen science projects, emphasising collaboration between the public and scientific endeavors, have evolved into influential tools for advancing scientific knowledge, citizen education, and empowerment. Evaluating these projects requires a comprehensive approach, encompassing scientific knowledge, citizen education, citizen empowerment, and societal outcomes.

## *3.1 Scientific Knowledge Dimension*

The epistemological foundations lay in positivism, drawing from De Ridder (2020), according to whom knowledge is portrayed as reasonable true belief, focusing on reliability and justification. Gerken (2015) extends this with non-factual and gradable elements of epistemic rationality. Kochan's (2018) synthesis of Heidegger's philosophy and sociology provides a framework, positioning CS within scientific existence and integrates Heidegger's philosophy with sociology, presenting CS as a form of scientific existence. Himsworth (2019) emphasizes historical dependency in scientific rationality, challenging the idea of complete liberation from historical contexts. Bonney et al. (2009) provide measures for evaluating the impact of CS on scientific knowledge, including publications, citations, grants, and database quality.

## *3.2 Citizen Education Dimension*

By the incorporation of informal science education, Phillips and colleagues (2018) ground CS in Informal Science Education (ISE) principles, expanding evaluation beyond traditional educational settings. Berkowitz et al. (2005) propose the notion of 'environmental citizenship' as a form of empowerment by fostering citizenship and ownership – however, here solely in the context of environmental studies.

But regarding Y-CSS, this concept can be adapted with regards to "ownership" of the citizenship: By seeing the core aspect of the project (Berkowitz' project: environment; YouCount project:

social inclusion) as an identity shaping phenomenon, taking on this specific lense throughout the project (and evaluation) can help experiencing and measuring citizen scientists' reality.

It involves motivating individuals, enhancing self-confidence, and creating awareness of values, and empowers them. Alshibly and Chiong (2015) discuss customer empowerment in the context of electronic government, emphasizing the gaining of power in specific domains and the processes that encourage individuals to take power. Even though the context is completely different to YouCount, the notion of taking over the power actively can be compared with YouCount's aspirations for co-creations that are actually youth-led. Here, the individual micro-empowerment strategies and measurements are helpful for the YouCount evaluation operationalization.

## *3.3 Citizen Empowerment Dimension*

Within the context of Resident Empowerment in Tourism, Boley and McGehee (2014) present a framework with four levels of empowerment in relation to the context of giving local residents the opportunity of gaining senses of control in overly touristy areas: psychological, social, political, and economic empowerment. Each level contributes to the residents' (locals who live in areas that are crowded with tourists) sense of control and mastery. This goes back to the means of the Smart City App and citizen empowerment principles, where Zhu and Alamsyah (2022) identify three types of empowerments: psychological, social, and political. Psychological empowerment involves mastery and control. Social empowerment is about community connection, and political empowerment relates to participation in civic collaborative decision-making. Finally, Sundström et al. (2017) define (women's) political empowerment with a three-dimensional approach: choice, agency, and participation. Their argument emphasises the longitudinal measurement of these dimensions.

## *3.4. Societal Outcomes Dimension*

Regarding community-level outcomes, Jordan and colleagues (2012) designed a comprehensive approach to evaluation, highlighting potential impacts on social capital (creating meaningful relationships, networking, gaining a community that helps in one's future), community capacity (similar to group intelligence: a determined group is always more powerful than an individual, so strengthening the sense of community is essential), economic outcomes, and trust at individual, programme, and community levels. Kieslinger et al. (2018) expand this and propose assessing societal impact in terms of increasing civic resilience, social cohesion, and social impact. Their framework includes evaluating collective capacity and political participation. Drawing from Jordan

et al. (2012) the concept of social capital and community capacity is crucial. Enhanced social capital and community capacity contribute to the effective functioning and resilience of communities.

As has been acknowledged, evaluating CS projects requires a holistic understanding of their impact on several dimensions: scientific knowledge, citizen education, citizen empowerment, and societal outcomes. A multidimensional evaluation approach thus ensures comprehensive understanding of the diverse outcomes and contributions of these projects to both individuals, communities and organisations or societies. Thus, we derived the following four main research questions to frame the evaluation of Y-CSS in YouCount:

**RQ1:** How do a) citizen scientists, b) scientists, and c) stakeholders evaluate the value of CS regarding ***scientific knowledge***?

**RQ2:** How do a) citizen scientists, b) scientists, and c) stakeholders evaluate the value of CS regarding ***citizen education***?

**RQ3:** How do a) citizen scientists, b) scientists, and c) stakeholders evaluate the value of CS regarding ***citizen empowerment***?

**RQ4:** How do a) citizen scientists, b) scientists, and c) stakeholders evaluate the value of CS regarding ***societal outcomes***?

## *3.5 Mixed-Methods Approach: Considering Multi Perspectivity*

As explicated previously, the evaluative framework entailed the seamless integration of four distinct measurement instruments into the organic progression of each of the 10 cases: these included in-depth interviews, self-reports completed by the case research teams, focus groups with the young citizen scientists in the research teams (R-YCS), and a pre-post questionnaire survey of R-YCSs.

Pre-eminent among these instruments were the ***in-depth interviews***, constituting the most comprehensive data source. These interviews were conducted with professional researchers, students, and stakeholders at three temporal junctures, were poised to yield a corpus of 90 interviews (10 cases x 3 points in time x 3 perspectives). Originally envisaged for durations of approximately 1 to 1.5 hours for professional researchers and 0.5 to 1 hour for stakeholders and students, these sessions were initially planned as in-person interactions. However, logistical considerations including the impact of Covid-19 lockdown policies in many of the participating

countries at critical points in the evaluation process, prompted adjustments for feasibility, thereby deviating from the original plan of 27 on-site case visits within a 1.5-year timeframe.

The ***self-reports*** took the form of streamlined Excel tables, featuring concise questions necessitating succinct responses. Delegated to the professional researcher team, these inquiries spanned topics such as recruitment, communication, co-creation and scientific skills. The frequency of completion comprised five submissions required throughout the project, with predetermined deadlines established at the project's inception.

Strategic modifications were introduced to the ***focus groups with the R-YCS*** to mitigate the workload burden for each case respectively. Of the three planned focus groups, records of the first two were condensed into summaries housed within an Excel table. The third and culminating reflective focus group retained its comprehensive nature, inclusive of verbatim transcripts and English translations. Recognition of the varied pacing of cases and the potential for burden due to case and work package exigencies prompted the decision to restrict the format to focus group summaries even before the initial deadline. Detailed focus group guides, enunciating pivotal questions, as well as recommending icebreakers and visualization techniques, were meticulously crafted to be applied across all focus groups. Cases were encouraged to use these guides flexibly, with facilitation entrusted to an external academic unacquainted with the R-YCSs to preserve impartial feedback as far as possible.

Foremost in quantitative appraisal was the co-creation of a ***pre-post survey*** with the YCSs, delineating inquiries on scientific knowledge, attitudes toward science, self-agency, and project involvement levels. This survey, fashioned to discern temporal alterations, was translated and disseminated to each case and/or the YCS directly. The pre-survey, positioned at the project's outset, solicited responses from the YCS, while the post-survey was scheduled for completion upon their project involvement's conclusion. This survey, however, was designed to mostly measure impact and will hence be discussed and analyzed in the impact report (Lorenz et al., 2023).

Figure 1 and figure 2 are a visual representation of the theoretical planning of evaluation components, their respective methodology and timeline.

In the following chapter, the diversions and adaptions that were necessary in the means of maintaining case flexibility and securing feasible workloads are elaborated on. This is partly related to the diversity of the case situations (culturally, geographically, socially, etc.) and of course also dates back to the respective topics and their immanent case specific struggles (e.g. hard-of-hearing youth, refugees, rural area youths, etc.), as well as is connected to the individual case team workloads and responsibilities (e.g., being WP lead plus case work).

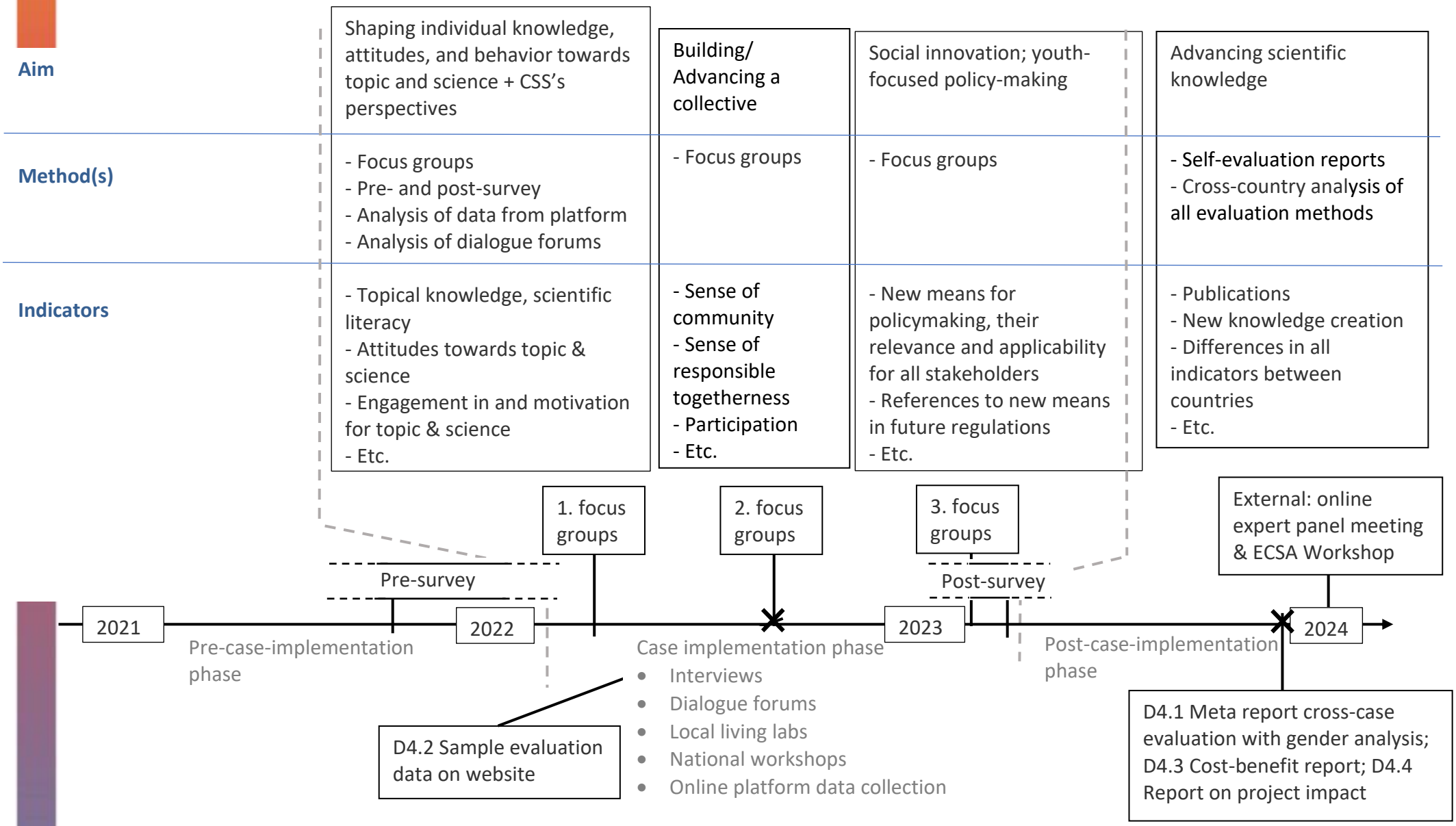


*Figure 1. Outcome evaluation in YouCount.*

| | | | |
|---|---|---|---|
| **Aim** | Active and equal collaboration + CSS's perspective | Scientific quality and openness in collaboration | Cross-case evaluation of employing citizen social science |
| **Methods** | - Self-evaluation reports<br>- Individual interviews<br>- Pre- and post-survey | - Self-evaluation reports<br>- Individual interviews | - Cross-country analysis of all evaluation methods, including recording of costs |
| **Indicators** | - Contact rate, dropouts, time of involvement<br>- Perception of involvement, collaboration, and communication<br>- Etc. | - Data quality & openness<br>- Ethics<br>- Adaptations to procedure due to input from YCS and stakeholders and due to evaluation<br>- Etc. | - Strength and weaknesses during projects<br>- Costs and benefits<br>- Etc. |

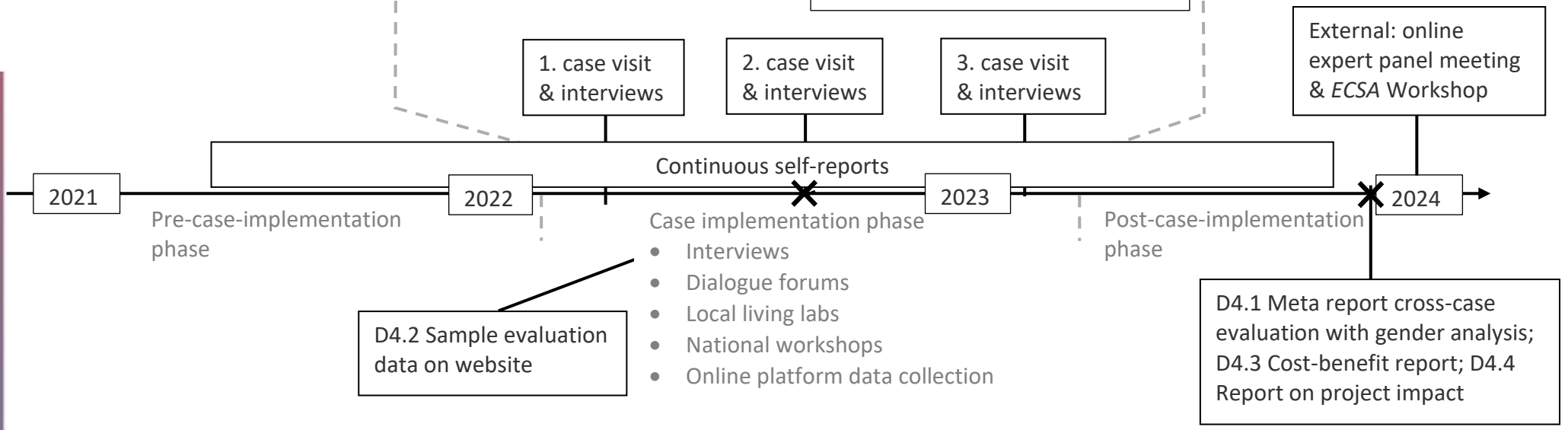


*Figure 2. Process evaluation in YouCount.*

# 4 Methodology: Evaluation Framework Implementation and Adaption

As to be expected, some obstacles were encountered, when the carefully drafted evaluation framework was finally implemented and put into action throughout the project course. Some adaptions have been made, which are outlined below. The numbers stated below are also the final numbers of data sources that were analyzed by two human coders for this present report.

## *4.1 Data Source Adaptions*

(a) A curtailment of the in-depth interview quantity was necessitated to strike a balance between ensuring a manageable workload for the evaluation team and maintaining reasonable time investments for the case teams. The original ambition of conducting 90 interviews—comprising professional researchers, stakeholders, and students at three junctures—was revised. Stakeholder and student interviews were scaled down to a minimum of one per case, and case visits were reduced to one instead of three, with the remaining interviews transitioning to online platforms. This adaptation resulted in a final sample of N = 48 in-depth interviews (n = 27 professional researcher interviews; n = 10 stakeholder interviews; n = 11 student interviews). The adjustment to fewer interviews, particularly for students and stakeholders, was necessitated and well-received by the cases due to prevalent language and time constraints posing common organizational obstacles. This was a flexible adjustment that took account of the workloads of all cases. Notably, in the analysis process, the student insights were largely compatible with the professional researcher insights. This makes sense, since the socialization of the students usually was close to the professional researchers' point of view.

(b) The short self-reports encountered temporal constraints, leading to occasional delays in meeting deadlines and resulting in a few instances of non-submission of the fourth self-report. Nonetheless, each case submitted a minimum of three out of four self-reports, culminating in a final N = 36.

(c) The focus groups involving the R-YCS underwent adaptation to alleviate the workload for each case. The focus group data collection yielded a total of N = 27 data sets (n = 17 extensive focus group summaries; n = 10 full focus group transcripts). Despite three missing summaries, this was offset by the reflective third focus groups, constituting the sole extensive and consequently pivotal focus group, being conducted by each case. Temporal constraints and occasional lack of compensation for the R-YCS emerged as issues warranting consideration in future projects.

(d) The qualitative pre-post survey proved more challenging than anticipated. While previous CS projects had found such surveys to be relatively unproblematic, the YouCount project witnessed unforeseen challenges. Variability in the commencement and conclusion dates of R-YCS involvement in each case, owing to factors like fluctuation, drop-outs, new recruitments, and divergent case timelines, rendered a proper pre- and post-measurement unattainable. Consequently, the survey evolved into a process-survey, assessing R-YCSs' scientific knowledge, attitudes toward science, self-agency, and project involvement levels at distinct time points. The obtained N = 113 complete surveys fell short of the envisaged responses. Contrary to the planned pre-post-comparison, the study now only permits estimation at a single point in time, precluding the evaluation of temporal changes. Despite translation into every case language and collaborative development with YCSs, comprehension barriers emerged in some cases. The distribution via email proved ineffective, with direct allocation of time during in-person workshops by case leaders emerging as the sole successful method. Even the incentive lottery—raffling two pairs of AirPods among survey completers—failed to universally motivate all YCSs, potentially attributable to misunderstandings or inadequate communication efforts regarding the competition. As mentioned, this survey will not be analyzed within the context of the present report, but in another project report which belongs to the same work package (Lorenz et al., 2023).

## *4.2 Data Analysis*

Two human coders coded the vast majority of the outlined data sources. Due to the quantity of having had a total of N = 111 qualitative data sources, theoretical saturation was reached at one point after coding the majority of data entities (for detailed saturation criteria, see Saunders et al., 2018). The rest of the data sources was then checked upon novel insights nevertheless, to ensure not missing out on any valuable points. The coding scheme was deductive and based on the five broad predetermined categories of scientific knowledge, citizen empowerment, citizen education, and further reflections. Those broad categories were iteratively coded and divided into sub-category topics: a) scientific knowledge (example sub-categories: citizen science reflections, impact on researchers, (case specific) scientific output, unique contribution of CS); b) citizen empowerment (example sub-categories: micro- and macro-empowerment, personal future possibilities); c) citizen education (example sub-categories: recruitment, motivation/engagement, involvement/co-creations, YCSs' trust/knowledge, incentives); d) societal outcomes (example sub-categories: social innovations; inhibitors/obstacles; raising awareness); and e) reflections (example sub-categories: ethics, professional scientists workload, YCSs' workload, stakeholder involvement, communication, equality, data quality). Due to the complex matter and different kinds of qualitative material, the codes were not exhaustive or exclusive, but instead were used complementary to each other, when a section within the data was applicable to more than one codes. To ensure honest feedback and reflection, complete anonymity was guaranteed to the interviewees. Thus, all 10 cases were assigned a numbered ID randomly.

# 5 Evaluation Outcomes

## *5.1 Scientific Knowledge Dimension*

**RQ1**: How do a) citizen scientists, b) scientists, and c) stakeholders evaluate the value of CS regarding **scientific knowledge?**

There were two perspectives regarding the unique contribution of CS as far as scientific output is concerned. On the one hand, professional researchers, citizen scientists and stakeholders alike stressed that "*the opportunity to share points of view that they can have a better representation of reality […] I think it's in any case when you have larger involvement of people or different kind of people, including young scientists, it gives a more rooted solution, it's more connected to the needs of the people, and it's not something that comes from the top. It's elaborated by the base as a community project*." (Stakeholder Interview, Case 5).

Further: *"When it's for young people, I also think it makes sense that it's young people who create it. We are the ones who know best what we want to attend."* (YCS Focus Group 3, Case 2).

The statement suggests that the involvement of citizen scientists not only allows for a more accurate representation of reality, but also that solutions generated through the involvement of diverse people are more deeply connected to the actual needs of the community as opposed to top-down solutions imposed on a collective. Furthermore, YCSs expressed the opinion that the long-term involvement of citizen scientists and the co-creational nature of CS prompted "discussion-based" processes (YCS Focus Group 2, Case 2) and in turn led to the generation of comparably more "solid knowledge" (YCS Focus Group 1, Case 7):

*"So, I think that we could have done the project without citizen science […]. Probably we would have run the same activities, but for sure we would have different outcomes in the case. Because the like the setting of the activities, of the research questions, of the research materials, uh of the stimuli would have been created by [name] and I without the youths' perspective. So obviously this would have changed the whole process and the whole results, even though running the same activities."* (Professional Researcher Interview 3, Case 5).

Moreover, the living labs as such represented a novel forum of direct communication between citizen scientists and stakeholders. Thereby they not only allowed citizen scientist to have their voices heard in a public arena but also produced unique data as a result of this new format and its dynamics. The multi- perspectivity of the evaluation adds layers: YCS', stakeholders' and researchers' perspectives do not work purely additive, but enhance each other and go beyond one-dimensionality by thus creating something even broader.

On the other hand, professional researchers and citizen scientists questioned a unique contribution of CS from a perspective of scientific output: "*We identified several of them. It was not something mind-blowing that we could not expect from the kind of regular logic. So, the findings were not unexpected I would say. It was something that you might think of.*" (Professional Researcher Interview 3, Case 6).

Criticism pointed out that the data gathered was not representative due to the small sample as well as not very concrete. Participatory research approaches, especially participatory action research, and other qualitative approaches such as in-depth interviews were compared to CS as yielding similar results and requiring less resources: "*And to be honest, I think if you understand citizen social science as something that includes participatory action research, then the whole thing is organized as a participatory action research, but the focus is on […] experimenting with action plans, and then we analyze the successes and failures."* (Professional Researcher Interview 3, Case 4).

Overall, the findings suggest that CS does not always generate new scientific knowledge, unattainable by other research methods. For instance, traditional qualitative methods are suited for most of the research questions investigated in YouCount. The bar to contribute to theory building is particularly high for citizen scientists, which also relates to the high demands with respect to the required knowledge and skills as well the danger of overburdening citizen scientists. Beyond the notion of democratization of science, the unique value of CS in the social sciences is questionable and needs further elaboration, particularly with respect to the specific conditions under which CSS can help to generate data and theoretical insights that cannot be assessed with traditional social science research.

## *5.2 Citizen Education Dimension*

**RQ2**: How do a) citizen scientists, b) scientists, and c) stakeholders evaluate the value of CS regarding **citizen education?**

As the outcome of C(S)S projects highly depend on the perspectivity (scientific outcomes vs. citizen education vs. societal impact), one of the most targeted topics throughout the evaluation was the potential for citizen education. Interestingly, the perspectives did diverge considerably regarding this; either because the YCSs themselves did not realise (yet) what kind of skills they gathered by having been part of YouCount, or because the professional researchers overestimated the individual relevance of the project involvement. In all cases, YCS report they have learned something; however, sometimes the relevance for their everyday life besides the project is questionable (YCS Focus Group 3, Case 7). This is mostly connected to the sociodemographic characteristics of the YCS, given that scientific knowledge is not always the most urgent concern of

(especially marginalised) youth: To be open for engagement and empowerment discussions, your basic needs have to be met first (food, shelter, work, social connections, etc.). Potential YCS with marginalised refugee backgrounds, for example, often do not have the capacity to care about civic participation possibilities, when their more pressing current concerns revolve around residency permits, getting a permanent flat, and looking for a job (YCS Focus Groups 2, Case 1; Stakeholder Interview, Case 8). For some young people, scientific skills simply don't seem to be relevant and/or interesting, even though they are a "nice to have". This directly connects to the ethical reflections about the ongoing discussion of CS as voluntary or paid (see "Reflections" below).

From a bigger picture perspective, however, the YCS seem to acknowledge that they do indeed "*harvest*" (YCS Focus Group 3, Case 1) a lot of multifaceted skills: On a social (behavioral) level, they learn how to approach constructive teamwork with various kinds of people, for example, also people that are very different from them, like politicians ; on a cognitive level, they learn scientific skills like conducting interviews (which almost all YCS did at one point); and on an emotional level they learn how to create a safe space for themselves and peers, where everyone feels heard. Not all YCS recognized those gradual changes, some professional researchers even indicated that this would have to be measured sometime in the future again, to really estimate potential educational outcomes. When it comes to their self-identified role, they also did not completely view themselves as scientists, but rather saw themselves as both data and data gatherer, so they inhabit a certain "*mediating*" role (YCS Focus Group 3, Case 10) as something "*between a citizen and a scientist*" (YCS Focus Group 1, Case 5).

Regarding the means of teaching science to YCS, creativity and gamification is reported as most engaging by both YCSs and professionals. Interestingly, however, the YouCount app did incorporate all those aspects, but still did not work out as wanted. It was supposedly mostly too complicated, too long questions, and not completely co-planned from the beginning on. Despite those practicalities, the idea behind the app as cross-case data collection on social inclusion was viewed as good and YCS indicated that it has a lot of potential still.

From the professional researcher perspective, a more enthusiastic picture is painted when it comes to anticipated and/or witnessed educational outcomes: Most cases state citizen education to be one of the main foci of their case, only a few do not evaluate this dimension as having been the most fruitful one. But those expectations for scientific aspirations by YCS sometimes collides with the current needs of the respective YCS target group, for example, when migration or even refugee backgrounds are at stake – when fundamental rights are threatened, specific scientific skills are not their current primary concern (Professional Researcher Interview 3, Case 8). The professional researchers did indicate high expectations regarding citizen educational outcomes by professional scientists.

When it comes to the content of the scientific training, the interviews showed consistently that theoretical training is really hard to accomplish, but methodological "hands-on" practical training (e.g. conducting interviews) met some more enthusiasm by the YCS. This also means that the

expectation to incorporate proper theoretical knowledge into CS curricula should be evaluated again, since practical (science) skills are inherently easier to be transferred, than theoretical ones.

Stakeholders and students stress the importance of networks and individual awareness of one's own power – where to find opportunities to make one's voice heard, how to connect to like-minded people: "*I think this project will include some people, some young people, who want to do something more, to influence, as I said, influence decision makers so they can join youth organization council or youth council in [district name] district or in [country], so they can make some changes in youth policy."* (Student Interview, Case 6). This type of ability formation to build meaningful relationships is what we refer to as a potentially empowerment enhancing asset, which directly leads us to our next research question.

## *5.3 Citizen Empowerment (Micro- and Macro-Empowerment)*

**RQ3**: How do a) citizen scientists, b) scientists, and c) stakeholders evaluate the value of CS regarding **citizen empowerment?**

When it comes to empowerment, the outcomes of YouCount are positive. Both on an individual micro-level, as well as on a collective macro-level all cases reported some kind of empowerment. When positive attributes of the project were stated, those codes were amongst the most frequently used ones. More concretely, it was positively evaluated that the YCS were treated as experts (Stakeholder Interview, Case 8), frequently felt heard (as reported by every case in at least one instance), and that they get to own their surroundings: "*Many of the places the youth have investigated […] are spaces they use in their free time, which is both interesting and empowering because they can create a positive change in a place they like and use.*" (YCS Focus Group 2, Case 2). Personal future possibilities are an empowering asset as well, since the combination of networks, skills, and certificates lead to increased future opportunities regarding education and work: "*She [YCS] said that she didn't know that she had these capabilities in her, that she could do this kind of thing. But now she knows. And we were like, wow. That's pretty emotional and like, really amazing to hear*." (Professional Researcher Interview 3, Case 7; about a YCS who co-organized an exhibition).

One of the biggest discrepancies between YCS and professional researchers views initially emerged around the topic of motivation (and, hence, on-going engagement drivers). CS motivation has been known to be a complex matter within the social science context; a phenomenon also clearly visible in YouCount. EU restrictions prohibited the cases to officially pay their YCS, so in the spirit of CS oftentimes being framed as voluntary citizen engagement, most cases tried to spark intrinsic motivation as the main driver.

However, some interesting factors seemed to intervene here: First, our target group were exclusively young people (approximately aged 13 to 29 years). Young people have a different sense of civic/citizen engagement than adults do, and also display other interests when it comes to scientific inquiries: "*And that is also, yeah, I would say a quite big finding, that also you share with other cases, that the interest in research is not the main driver here, kind of. Not what we expected, I guess.*" (Professional Researcher Interview 3, Case 4). Second, unlike in natural CS, the social inclusion topic is hard to grasp even for professional scientists, which makes communication about it difficult. This then also prevents motivating enthusiasm from spreading amongst the youth ("confusion about the exact nature of the project" was an often-mentioned observation in interviews and focus groups). Third, being told that 'eye-level research' (meaning as much equality as possible between YCS and professional researchers) is aimed at, yet professional researchers get a salary and YCS "only" gain experiences and skills seemed to some a bit uneven ("*The idea to become unpaid data collectors in a research process about social exclusion/inclusion for which the academic researchers do get a salary met vivid and open laughter among the older participants*." (Self-report 1, Case 4).

Consequently, the complexity of motivation unfolded in stages within the YouCount project: While initial motivation was best captured in cases where some forms of incentives were given or at least promised (e.g., gadgets, vouchers, travel opportunities), later in the project the scene shifted. After having been involved for some time, having formed relationships, and identifying more with the topic, YCS reported that "now" they of course would also do it without the incentive because instead, they developed or strengthened their intrinsic motivations. Stakeholders, too, tried to raise awareness for this (potential) issue already in the beginning of the project/interviews: "*Also we say [sic!] to them when we go to different places to talk about migration and we take these experts of migration, because they are experts [here the YCS are referred to], we say we've got to pay them. Because if not, it's not an inclusion. When I go to university to talk about my work, I get paid. So, they've got to get paid. And it's not about: "But we're going to give him some box of chocolates". I don't get paid with chocolates. Or with clothes. I get paid with money*." (Stakeholder Interview, Case 8).

On that note, a quick clarification is needed: While official payment was not permitted there have been some workarounds by many cases. Also depending on the respective national and university laws, cases paid stakeholders (NGO's) to pay the YCS, found a way for handing out short-term service work contracts (though this was one of the more complicated inquiries ("*It felt like battling windmills*" (Professional Researcher Interview, Case 7; on the bureaucratic hurdles for employing their YCS), or provided budget for travels, food, and/or devices. This unfolds into an ethical debate whether it should be by default decided to somehow pay CS engagement or not – after all, it is impossible to conduct CS without citizen scientists. Yet, wanting to secure that YCS are interested in the nature of the project and not just want the incentives that might come with it is a legitimate concern as well.

Based on the results of this project evaluation, a mixture of both intrinsic motivation and some form of compensation that is not purely non-materialistic is probably the most promising for CSS as of now ("*Okey so […] salary, food, network, a little bit of socializing... And experience and job opportunities*." Focus Group 3, Case 7). Of course, the prospect to gain participation certificates definitely also contributes to perceived value of YCS project participation; additionally, the later discovered/experienced networks as means for future possibilities do increase both motivation and engagement. Those observations outlined here are more focused on initial motivation and securing engagement in the unfolding phase of a project like YouCount, since all cases reported a lot of dropouts and fluctuation among their YCS core group. The "end" group is in almost all instances being very different to the "beginning" group, which shows once more the different stages of motivation-leading-to-long-term-engagement. Especially when projects are designed to include on-going tasks, it is crucial that not too much fluctuation is happening. Alternatively, project designs can also try to incorporate YCS fluctuation processes due to expected changes in the personal life situations of YCS: "*So, it's people in really different moments and it's really difficult to maintain a group during so much time*." (Stakeholder Interview, Case 8).

The YCS also reported that in many instances, they felt like they could create a meaningful change for their peers by letting stakeholders, especially policy makers, know their needs: "*The international perspective has been really helpful and meaningful for them. And also feeling that "I contribute with my knowledge, with my reflections and so on. It's important for this field and I can contribute to research that might help others as well*" (Professional Researcher Interview 3, Case 9). This "macro meaningfulness" beyond their own individual gain is a dimension which is closely connected to engagement drivers: Having the opportunity of actually making a difference does make the own efforts seem valuable, and thus makes the time and energy spent seem useful. Serving a greater good is prevalent amongst those potential YCS, who are already engaged in other voluntary projects and feeds into their intrinsic motivations. This intrinsic motivation, then again, can only be sparked by personal affectedness.

Seeing that the YCSs in YouCount are simultaneously researchers and researched, CSS inherits a complex yet rewarding duality: On the one hand having to research one's own situation is difficult to understand for lay people, on the other hand the personal relatedness gives meaning and sparks motivation. The mere connection of YCS and stakeholders was thus already deemed innovative in itself by both YCS, stakeholders and researchers. This is evaluated as one of the unique contributions of Y-CSS projects like YouCount, however the long-term impact is yet to be determined. Some voices also questioned whether there are easier and more traditional methods of coming to similar conclusions, since CS is inherently resource consuming both materially and cognitively. Though the original voluntary nature of citizen involvement meant that CS was considered less resource consuming than traditional data collection methods – yet one of the major findings here is the underestimated workload for professional researchers.

But when it comes to the feeling of the YCS, even being part of short-term interventions through a project like this and having felt empowerment by being the center of attention also for big-scale questions is deemed rewarding: "*You feel like you have some responsibility. Other young people may be sleeping right now, but I'm here and want to change something. That's what it is about. […] Being involved is something voluntary that we do because we get something meaningful out of it. We gain more experience and so on. That's what drives us.*" (YCS Focus Group 3, Case 9).

Yet, an often-mentioned downside of those efforts is overburdening on both sides. YCS struggle with time constraints due to the delicate balance of project engagement, free time, school/university/work, social relations, and personal relations ("*The Y-CS want to be involved more, but we sometimes have time struggles because they are all working/studying full time. It will be quite a challenge to increase their involvement without compromising their free time too much*", Self-report 2, Case 1). Professional researchers struggle with multiple roles of not only being a scientist, but also in some cases an activist, social worker (actually not only with young migrants/refugees, but also for most other marginalized youths), organiser, and peer (if possible). This calls for a realistic planning ahead already when the project outlines are determined. At this early point, YCS should already be involved to estimate their view regarding a good amount of YCS involvement. On that note, co-creative designs should be carefully assessed as well: Many YCS reported being overwhelmed when having had to contribute to every single research step. Many professional researchers reported being overwhelmed when having to co-create every single research step ("*So, you know, it's a tyranny of participation.*"; Professional Researcher Interview 3, Case 3). In other words, here the process evaluation backs-up those assumptions: While many YCS were "a little confused" (stated in almost all YCS focus groups of round one) as to a lack of directions in the beginning of the project implementation phase, later on they enjoyed the pathway that was created in the meantime and felt more comfortable with their role: *"[…] improvising is the key. […] We anticipate that the R-YCS will be more vocal and clear about the level of active role they want to take, as they get more experience."* (Self-report 2, Case 7).

It thus appears that a clear topic and some structure in the beginning give scientific lay people some baseline to evolve from. The cases with concrete topics (e.g. labour market, sustainability, etc.) showed a quicker "settling in" than those with completely open research aims. One more important aspect regarding macro empowerment is the future outlook: Creating a perspective of positive change also after the project end was desired by YCS collectively. This is however only possible with stakeholder involvement that continuously carries the project outcomes further – which brings us to potential societal outcomes through social innovations.

## 5.4 Societal Outcomes: Social Innovations

**RQ4**: How do a) citizen scientists, b) scientists, and c) stakeholders evaluate the value of CS regarding **societal outcomes?**

The YouCount project was designed to account for the potential of long-lasting societal change. More specifically, so-called social innovations were supposed to be the outcome of the social inclusion analysis. In other words, arriving at a direct suggestion on how to improve the current situation of the respective YCS and their peers was an original expectation. While everyone agrees that the project has a huge potential to generate valuable outcomes, the reality check of actual societal impact was not favourable. Needless to say, those estimations of course always correlate with resources. YCS as well as professional researchers are very aware of this essential aspect, which is why there is a consensus that the most meaningful societal impact is indeed the project itself and its' learning.

Any further implementations above the estimated time span of the project would need in-depth stakeholder engagement. This, however, is mostly not possible. The fact that stakeholders like NGOs, policy makers, and local associations/unions have been involved thus far, however, indirectly affects future initiatives. Because the stakeholders have been made aware of the exact needs of the YCS, there is the hope of professional researchers and YCS that the stakeholders incorporate this knowledge into their future projects: "*So, there's a possibility due to the stakeholders and stuff, to have an impact in the future, right?"* (Professional Researcher Interview 2, Case 2). Further: "*They see social innovation as something that benefits the social atmosphere in an area or city, and it needs to be something that benefits the community and where innovations and thoughts are made to create a brighter future*." (YCS Focus Group 2, Case 2). Here, professional scientists and YCS' views are largely aligned; also, stakeholders evaluate the insights they gained as "valuable" and expressed a wish for more cooperation between universities and, for example, NGO's. After all, policy change is one of the mostly expressed desires to happen as a long-term outcome of YouCount, since "*real change comes from politicians, and the politicians maybe read more things that university says than what the Association says [sic!].*" (Stakeholder Interview, Case 8).

## 5.5 Reflections: Ethics

Last but not least, ethical reflections have emerged throughout the course of the project at multiple points in time and from all sources. The broadest reflection is probably the need to include YCS "*earlier in the project, already in the development phase*." (Focus Group 1, Case 1). This way, some faced obstacles (e.g., time constraints, engagement hurdles, incentive discussion) could have been either solved or at least anticipated from the start.

Another often debated point regarding the diverse and even untraditional data sources that were collected is that this oftentimes felt strange and not sufficient to the case leaders. This positively enriches the respective case results and has some creativity to it. But it also increases insecurities, seeing that data collection in original natural-science based CS relies on quite hard criteria: "*So, these two sort of frames of the citizen science as originating from natural science where like data is hard data, like it's numbers, it's like quantitative data and that makes us, uh, I think that makes us feel insecure about, you know, the quality of our qualitative data and the process data that we have*." (Professional Researcher Interview 3, Case 7).

On another broader note, the general knowledge that the project (involvement) will eventually come to an end opens up discussions about the "social sustainability" of CSS projects: ("*[…] when YouCount is over in just a couple of months, what do we do then? Is it ethical to just leave them? How can we sort of finalize the project in an ethical way? That's hard, I think. And we don't want to leave them. So that's one ethical concern, I think*." (Professional Researcher Interview 3, Case 9). Here, a clear need for stakeholder involvement emerges: If stakeholder participation is from the beginning on design as aiming at carrying the project outcomes further, even after the project end, this future outlook could increase satisfaction on both YCS and professional researchers' sides.

Something that has been touched upon already but needs to be stressed is the nature of a) inclusion (and certain other wordings thereof) itself, and b) the hurdles that come with proper inclusionary goals. Regarding terms, both the term "citizen" and "inclusion" have been discussed, since "citizen" implies for example, citizenship, which is not conveyed when research is done with refugees. Some terminological sensitivity is needed here to not accidentally signal exclusion for certain already seldom heard populations. As for the framing of inclusion, the professional researchers pointed out that *"[…] if you're a group that has the power to include somebody, it's not good. And on the other hand, when we were saying to them that it's about social inclusion, there were some feedbacks [sic!] which said that they feel included because it's their life, so they are in the society. Why are we saying that they have to be included, when they are in the society? And it has a very negative connotation, I think.*" (Professional Researcher Interview 3, Case 3).

Regarding the practical meaning of inclusion, issues on a systemic ethical level occurred. To not deliberatively exclude certain sub-groups of a population, systemic hurdles need to be lowered or at least adapted to CSS projects with (marginalised) youth: "*It's always challenging to do research with young people, and I know some cases were choosing the older age group because that didn't have the same ethical issues that an ethical board was going to debate.*" (Professional Researcher Interview 3, Case 10). This also means that even in marginalised groups, some members of this groups are excluded. One of the main findings here is the need to find alternatives to those obstacles. The YCS noticed this right away, too: "*They would like to see if the project could reach out to the most vulnerable. This was one of the topics they mentioned (focusing on the shelters for people living in the streets) and see how they can be improved.*" (Focus Group 2, Case 8). Already

at the beginning of the project, the first two self-reports showed calls by YCS to involve more "*average*" citizens (meaning not only YCS that are already engaged in NGOs etc.; Self-report 2, Case 2), while simultaneously structural issues with ethical approvals of certain age-groups were often listed in self-reports as major challenges (Self-report 2, Case 10; Self-report 1, Case 9).

Quite generally the rich experiences regarding ethical considerations does call for an attempt at formulating a specific citizen *social* science ethics guide on EU level.

# 6 Evaluation Lessons Learned: Seven Key Take Aways

The in-depth analyses from the systematic evaluation of hands-on Y-CSS outlined above can be briefly condensed into seven general key messages.

## *6.1. Lesson I: Clear Empowerment of Citizen Scientists*

The evaluation discerns a pronounced empowerment of citizen scientists (YCS), encompassing both short and long-term dimensions. At the micro-level, individual psychological aspects such as "feeling heard," "feeling valued," and a sense of belonging are observed. In the macro dimension, participants exhibit perceptions of societal change feasibility, particularly influenced by stakeholder involvement and social innovations.

## *6.2. Lesson II: Mismatch in Motivational Perceptions*

A misalignment in motivational perceptions is identified, contrasting theoretical perspectives with the views of YCSs. The theoretical framework emphasizing civic participation and scientific insights as rewards, based largely on natural science projects with adults, contrasts with YCS perspectives. Initial engagement for YCS leans towards materialistic incentives, shifting to a stronger social component, including relationship building and rewards to prevent dropouts.

## *6.3. Lesson III: Risk of Overburdening on Both Sides*

The evaluation underscores the risk of overburdening experienced by both professional scientists and citizen scientists. Co-creation demands significant resources, pedagogical training, and intrinsic interest from YCS. Overburdening reasons for CS include time constraints, cognitive overload, motivational challenges, language barriers, and difficulties in group dynamics/hierarchy.

## 6.4. Lesson IV: Adaptation of Ethics Guidelines Needed

The evaluation advocates for the adaptation of existing ethics guidelines to address ethical dimensions more effectively. Concerns include the patronizing nature of the concept of vulnerability and the need for differentiated approaches, considering factors like age and education. The prohibition of monetary incentives and age-related restrictions in some countries is highlighted.

## 6.5. Lesson V: Challenge of Maintaining Data Quality

Maintaining data quality emerges as a challenge despite the richness of data collected. While the data is diverse, there is a significant effort required to ensure usability. The importance of prioritising data quality over quantity is emphasized, prompting a discussion on co-creational (CSS) data quality characteristics.

## 6.6. Lesson VI: Need for Feasible Co-Creational Approaches

The evaluation underscores the need for feasible co-creational approaches. Although moments of co-creation were evident in each case, it was not consistently applied on a meta-project level or continuously within the cases. The recognition that strategic planning should anticipate situations where no co-creation is beneficial is acknowledged.

## 6.7. Lesson VII: Nuanced Understanding of CSS Required

The evaluation advocates for a more nuanced understanding of CSS. While acknowledging the unique contribution of CSS in providing insights into empowerment, challenges, ethics, and rewards, it also highlights the potential generation of some insights through less burdensome methods. Certain limitations are acknowledged, particularly in the specific social science context, emphasizing the need for theoretical contributions and co-creational approaches.

# Conclusion: Future Outlook on Y-CSS Evaluation Frameworks

The evaluation offers a nuanced perspective on Y-CSS, indicating that conducting CSS is not as straightforward as initially perceived. Including 10 very different cases into a Y-CSS project was a matter of complexity and delicacy at the same time, and as such, the immense work that was carried out within YouCount is impressive and groundbreaking in the field of Y-CSS. The tireless efforts throughout years deserve a lot of appreciation. Lessons learned suggest effective future strategies, including avoiding assumptions of comprehensive co-creation, preventing overburdening, and incorporating ethics differently. Also, the unique value of CSS in generating novel data and knowledge is not straight forward. These insights contribute to the ongoing development of robust CSS evaluation frameworks.

Finally, it is interesting how despite the huge diversity between the cases, many patterns seem similar and thus interconnected with situational circumstances (geography, culture, society), yet still somehow connected on a meta-level. This unity in diversity does capture European living realities of young people quite neatly.

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