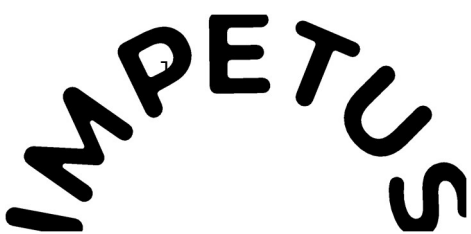
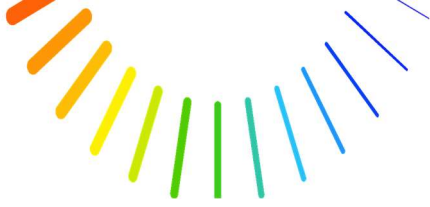


D5.1

**IMPETUS impact
assessment
methodology and
collaterals**

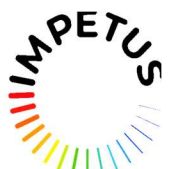


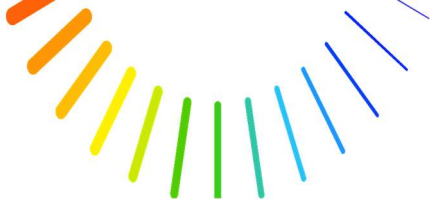


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Log of changes

To ensure the quality and correctness of this deliverable, we implied an internal review.

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V4	14/07/07	Final	Antonella Passani and Andrea Ancona	Integration of reviewer's comments and finalisation of the deliverable



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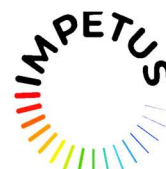
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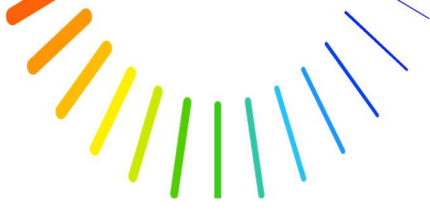
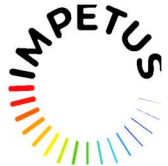


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Summary

This document presents the overall approach of the IMPETUS project to impact assessment.

More precisely, it includes:

- the methodology that will be used for evaluating the impacts of the CSIs participating in the project Accelerator
- the methodology for assessing the impact of the European Citizen Science Prize on the awarded CSIs
- the methodology for evaluating the impact of the IMPETUS project as a whole.

It updates, refines, and improves the methodology developed during the ACTION project (Passani et al., 2021), that was co-designed and successfully tested with 16 Citizen Science Initiatives (CSIs).

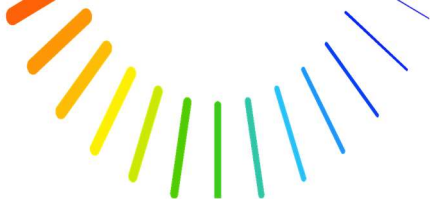
The IMPETUS impact assessment methodology for assessing the CSIs participating in the project Accelerator considers five areas of impact: scientific, social, economic, political, and environmental. These five areas of impact are articulated in several dimensions each, for a total of 25 dimensions. These include, but are not limited to, impact on scientific knowledge, community empowerment, social inclusion, impact on knowledge, skills and competences, impact on health and wellbeing, impact on policy process, job creation, economic empowerment of local communities and impact on environmental awareness. Each dimension is operationalised in variables and accompanied by data gathering tools such as questionnaires.

Besides these five areas of impact, the methodology considers also how CSIs contribute to the United Nations Sustainable Development Goals (SDGs). Such a contribution can take different forms that goes from data provision for SDGs monitoring, to actual support for the achievement of the SDGs targets through policy innovation. Other possible impacts on SDGs are related to the capability of CSIs to support citizens' behavioural change or to develop new metrics and methods for SDGs monitoring.

Finally, the methodology considers the capability of CSIs to align with Responsible Research and Innovation (RRI) practices addressing the link between research, ethics, inclusiveness, and openness.

The methodology is quali-quantitative and is designed to be modular and flexible to be able to adapt to the specificities of each CSI but, at the same time, assure a cross-project and aggregated analysis. Indeed, not all the dimensions are (equally) relevant for all the CSIs, depending on their nature, their specific focus and the level of citizen engagement they show. The methodology allows each CSIs to personalise it to their needs.

In the following months, the methodology here described will be used by the 34 CSIs that are participating to the first circle of the IMPETUS Accelerator. An aggregated analysis of their assessments will be conducted, and the results will be visualised in



the IMPETUS dashboard on the project website (see D5.2). This process will be repeated for each acceleration circle.

The impact of the European Citizen Science Prize on the awarded CSIs will be assessed referring to the same five areas of impact: scientific, social, economic, political, and environmental. The approach to data gathering and analysis will be mainly qualitative and explorative and will strongly rely on in depth interviews to winners' teams. The output of the analysis will be twofold: on the one hand a summary of the results will be visualized in the IMPETUS dashboard on the project website and, on the other hand, will be used to develop a series of case studies.

Finally, the same areas of impact will be explored when assessing the achievements of the IMPETUS project as a whole. This additional assessment will look at the aggregated effects of the project activities and at the impacts of specific outputs such as scientific publications, policy briefs and training materials developed for the Accelerator.

At the end of the IMPETUS project a final impact assessment report will be released (D5.3), and it will present the results of all the impact assessment activities mentioned in the previous paragraphs.

What presented in this document must be considered as a work in progress: the methodology will be constantly improved during the next years of the IMPETUS project by taking on board the lessons learned during its application and for assuring its alignment with the topics of the next Accelerator circles and with the next editions of the European Citizen Science Prize.



1. Introduction

The aim of this deliverable is to describe the IMPETUS impact assessment methodology which is the main output of Task 5.1 titled “ACTION impact assessment methodology’s adaptation”.

As per the task title, the IMPETUS methodology updates, refines, and improves the methodology developed during the ACTION project¹, that was co-designed and successfully tested with 16 Citizen Science Initiatives (CSIs) (Passani et al., 2021). The ACTION methodology was presented at several conferences; it was also included as a dedicated training module in the Mutual Learning Exercise on Citizen Science² and has been an important source of inspiration for the NEWSERA project³ evaluation methodology. It has also been published, with reflections on the related lessons learned, in a special issue of the Journal for Research and Technology Policy Evaluation (Passani et al., 2022b) dedicated to the impact assessment of CSIs.

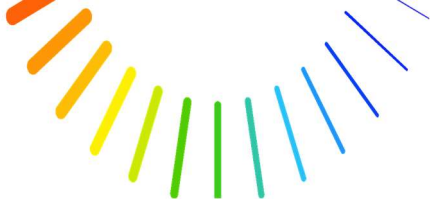
As described in the DoA, the ACTION methodology needs to be updated:

- to ensure it can consider the impact of CSIs working on different topics, while the CSIs supported by ACTION were all focusing on pollution
- to assist with a more effective exploration of the impacts of CSIs on the UN Sustainable Development Goals (SDGs) and EU Green Deal Targets

¹ The [ACTION project](#) (Participatory science toolkit against pollution) was a three-year programme that supported via cascading calls and a training and mentoring program CSIs to become more participatory, inclusive and citizen-led. It was implemented by ten research and third-sector organisations, universities, institutes, and SMEs, working together with 16 CSIs tackling major forms of pollution. Among them KCL and T6 that are also in the IMPETUS consortium respectively as project scientific coordinator and impact assessment leader. The programme had a duration of 3 years and concluded its activities in January 2022. IMPETUS proposal writing was highly influenced by the experience of the ACTION project and the lesson learned.

² The Mutual Learning Exercise on Citizen Science Initiatives - Policy and practices was an EC initiative aimed to facilitate the exchange of information, experiences and lessons learned among policy workers across Europe. It took place in 2022 and hosted several thematic session. the ACTION methodology was presented in the session dedicated title “ensuring good practices and impact” <https://ec.europa.eu/research-and-innovation/en/statistics/policy-support-facility/psf-challenge/mutual-learning-exercise-citizen-science-initiatives-policy-and-practice>

³ The NEWSERA project (ended in 2023) used a bottom-up approach to co-design strategies for selected H2020 Citizen Science projects, in order to improve their science communication practices and their impact towards each quadruple helix stakeholder group. More info at: <https://newsera2020.eu/about-the-project/>



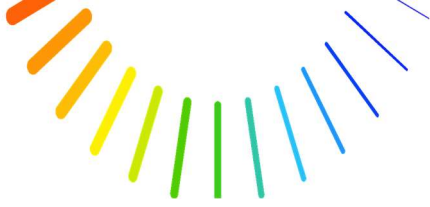
- to integrate the analysis on CSIs alignment with Responsible Research and Innovation (RRI) practices, considering the work done on this by the NEWSERA project
- to analyse the impact of the European Citizen Science Prize on the awarded CSIs
- to map the overall impact of IMPETUS against the expected impact of the call and its KPIs

As per the ACTION impact assessment methodology, the IMPETUS approach needs to be modular and flexible to be able to adapt to the characteristics and needs of different CSIs.

The aim of the methodology is primarily to describe the results and effects of the CSIs, of the European Citizen Science Prize and of IMPETUS overall. However, it has also a meta-objective of supporting the CSIs to think about the impacts they actually want to achieve from the outset of their project. The CSI teams are learning how to use the impact assessment approach and will adapt it to their needs over the course of the Accelerator. T6 delivered dedicated training and mentoring on this topic during the Accelerator bootcamp, which was technically before the kickstarting grantees even started their projects. Being exposed to this methodology so early in the project lifecycle enables the teams to reflect on how to maximise the potential positive impacts of their projects, and to also minimise any negative one. In parallel, the teams learn by doing and carry out an impact assessment process. Since this is a competence that is often lacking in CSI teams, the IMPETUS methodology needs to facilitate and support this learning process.

It is important to note that the IMPETUS methodology described in this deliverable will be *updated continuously* during the project to ensure it aligns with each cohort of CSIs, whose topics will vary with the challenge of the open calls. The version here presented already incorporates the feedback gathered from the CSIs that participated in the first bootcamp.

The structure of this deliverable follows the above-mentioned need so that section 2 summarises the ACTION impact assessment methodology, and section 3 shows the changes introduced and the reasoning behind them. Section 4 summarises the IMPETUS methodology for the impact assessment of the CSIs. Section 5 is dedicated to the methodology that will be used for assessing the impact of the European Citizen Science Prize on the awarded CSIs and section 6 describes the methodology that will be used to assess the impacts of IMPETUS as a whole. Section 7 concludes this report and presents the timing for the different impact assessment activities and reporting.



2. The ACTION methodology

The ACTION impact assessment methodological framework (Passani et al., 2021) includes a detailed literature review and accounts for the works that informed the development of the methodology. Section 2.1 highlights the main characteristics and components of the ACTION framework which form the basis of the IMPETUS methodology. However, we recommend referring to the detailed ACTION impact assessment methodological framework in full for a more detailed description of the methodology. Considerations on the co-design process followed for its development and lessons learned are discussed in Passani et al. (2022b).

2.1 The ACTION methodology for assessing the impacts of CSIs

The ACTION impact assessment framework considers five areas of impact: scientific, social, economic, political, and environmental which are articulated in several dimensions each, for a total of 22 dimensions. These include, but are not limited to, impact on scientific knowledge, community empowerment, inclusiveness, impact on learning, behavioural change, impact on policy process, job creation and economic empowerment of local communities (see Fig. 1).

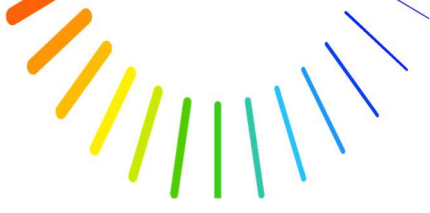
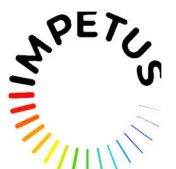


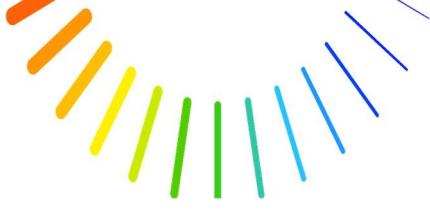
Fig. 1 - The ACTION impact assessment framework: areas of impact and dimensions

Besides these five areas of impact, the methodology also considers the transformative potential of the CS pilots, i.e. the degree to which the pilot can help to change, alter, or replace current systems, or ways of working in one or more fields such as science production or environmental protection. Finally, the methodology considers how CSIs contribute to the United Nations Sustainable Development Goals (SDGs), even if in a preliminary and limited way.

Each dimension is operationalised via different variables⁴ and ad hoc data gathering tools (such as a questionnaire and also guidelines for a focus group) have been developed to gather the required information from the CSIs' teams, the volunteers

⁴ The complete list of variables, together with the information about who is meant to provide the related data (CSI team or volunteers) and the timing for the data gathering (before the CSI start and/or at its end) are reported in the Impact Assessment Matrix (<https://zenodo.org/record/4881064>).





involved in the initiatives and, in some cases, other stakeholders.⁵ The data gathering was carried out by the CSIs and by the T6 team and the data were analysed by the T6 team. Results were visualised, at least partially, in the ACTION dashboard⁶ and fully analysed at aggregated, and at CSI level, in the final impact assessment report (Passani et al., 2022a).

The ACTION methodology follows the Impact Value Chain approach (Fig. 2). Following this approach, the impact is the result of the input available (i.e., the EC grants), of the activities carried out and the tangible results developed during the project lifetime (outputs). The aggregation and analysis of the outputs is the preliminary step to derive the outcomes of the CSI's activities. Another important element is the identification of the stakeholders and the analysis of how each of them will be impacted by the considered activities/outputs.

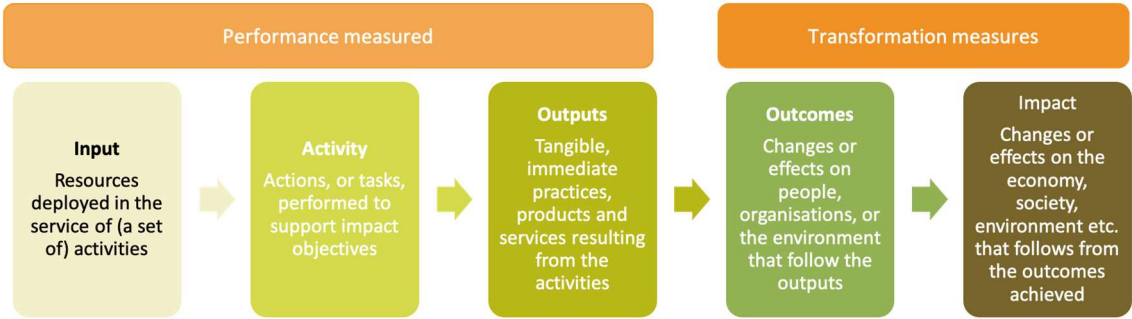
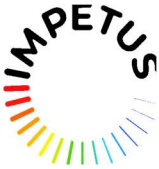


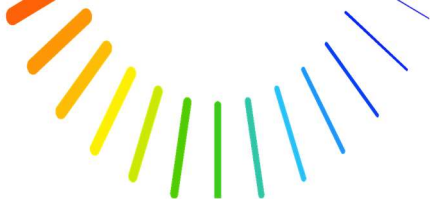
Fig. 2 - Impact assessment framework: the value-chain approach (T6 elaboration on IMWG, 2014:6).

The methodology uses a mixed-method approach (Cresswell, 2008) and is designed to be modular and flexible so to adapt to the specificities of each CSI but, at the same time, to ensure the analysis at aggregated level. Not all the dimensions are (equally) relevant for all the CSIs, and the impact dimensions depend on their aim, their specific focus, and the level of citizen engagement they show. The specific needs of each CSI in terms of impact assessment and the relevance of the various dimensions are collected and presented through the Impact Assessment Canvas - a graphic form that supports CSIs in mapping their stakeholders, their main outputs, and the relevance of the impact dimensions (the updated Impact Assessment Canvas is in Annex 1 and reflects the changes described in section 3).

⁵ The data gathering tools developed during the ACTION project are available, in different languages at: <https://zenodo.org/record/5938332#.Yfj6GCzSIXo>

⁶ <https://actionproject.eu/pilots-results/>





The whole impact assessment process at CSI level is described in the Final impact maximisation and sustainability guidelines (Passani and Anelli, 2022) and in the ACTION toolkit⁷.

In terms of the impact of CSIs on the SDGs, the ACTION framework mapped the targets addressed by the CSIs with the following considerations:

- a target is addressed by providing useful data
- a target is addressed with dedicated actions at the local level
- a target is addressed by demonstrating innovations with potential impact at regional, national, or international levels.

Here a more detailed analysis was needed to be able not only to map the relevant targets, but also the actual impact in achieving them and the related indicators. This is the work we are aiming at with the IMPETUS methodology.

2.2 The methodology used for assessing the overall ACTION project

The impact of ACTION as a project was conceptualised as the sum of the impacts of the supported CSIs, plus the impact generated by its additional outputs (such as scientific papers, policy recommendations, the ACTION toolkit, etc.). Consequently, the assessment of ACTION's impact was carried out by:

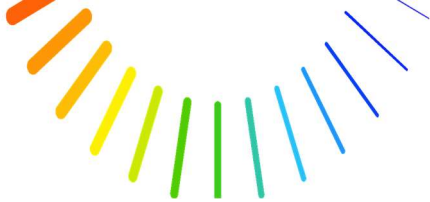
- Applying the indicators of the scientific impact area to the scientific production of ACTION for evaluating the new knowledge generated, its openness and the interdisciplinary work conducted.
- Applying the indicators of the dimension “Impact on policy process” and “political support for CS” for evaluating the political impact of ACTION.
- Applying the indicators of the dimension “community building and empowerment” for evaluating the capacity of the project to create and provide “value” to the CS and research community engaged by the project.

Even if not planned initially, we also analysed the economic impact generated by the project both in terms of impact on employment and capability to attract additional funds. Data for this part of the assessment were gathered via questionnaires sent to project partners, and secondary analysis of project reporting documents.

The framework initially foreseen an evaluation of ACTION project performance with the super-MORRI indicators. However, this comparative aspect did not take place due to a lack of alignment between the different timeframes of the two projects (ACTION and Super-MORRI⁸). Indeed, when the ACTION methodology was designed and

⁷ <https://actionproject.eu/toolkit/research-implem>

⁸ The SuperMORRI project was an EU Horizon2020 SwafS-21 project that departed from the MoRRI project, the first large-scale attempt at creating a monitoring and evaluation system for RRI with the aim of further enhancing it. More info available at: <https://super-morri.eu/>

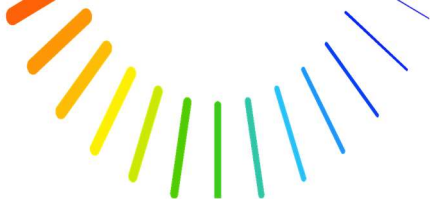


applied, the SuperMORRI project was still ongoing and, even though the exchange with them was constant, we were not able to apply their outputs to the ACTION project as initially planned.

3. Updating and adapting the ACTION methodology for assessing the IMPETUS CSIs

The table below shows the main changes introduced in the IMPETUS impact assessment methodology and their relation to the needs mentioned in the introduction.

Need	Changes introduced
Ensure the IMPETUS methodology is able to consider the impact of CSIs working on different topics	<ul style="list-style-type: none">• The dimension “impact on health” was moved from the area of impact “Environmental impact” to the “Social impact”.• The dimension “impact on health” was enlarged to include the topic of wellbeing and it is now labelled “Impact on health and wellbeing”. See subsection 3.1 below.
Better investigate the impact of the CSIs on the SDG and Green Deal Targets	A new operationalisation of this aspect has been added to the methodology and the impact assessment canvas was updated accordingly (see subsection 3.2 and Annex 1).
Integrate the analysis on CSIs alignment with Responsible Research and Innovation (RRI) practices	This aspect has been operationalised and included in the methodology (see subsection 3.3 and Annex 2). Some indicators have been added in different areas of the impact assessment methodology to allow for the analysis of RRI- related practices.



Analyse the impact of the European Citizen Science Prize on the awarded CSIs	The methodology for assessing the impact of the European Citizen Science Prize has been designed and is presented in section 4.
Map the overall impact of IMPETUS	The methodology for project impact was revised and is presented in section 5.

Tab. 1 – Changes introduced in the IMPETUS impact assessment methodology based on the needs identified

In addition to the needs mentioned in Tab. 1 (and in the DoA) we revised the methodology to improve its usability and to align its terminology with that of IMPETUS. This led to a revision of all the ACTION variables, especially the scientific impact variables and political impact variables. The updates do not change the overall conceptualisation of the dimensions and related variables but simplify them, aligning them with other tools used in the project that are potentially already familiar to the CSIs in the IMPETUS Accelerator programme. With reference to the scientific impact variable, for example, we analysed the alignment of ACTION variables with those of the Science Products Inventory by Wiggins et al. (2018) and increase it by adding few variables and changing the wording of others.

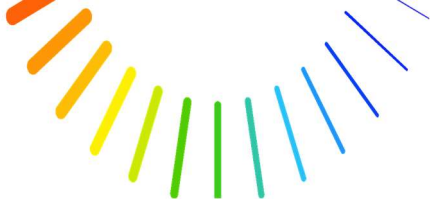
In the economic impact area, we added a new indicator to be able to monitor the capacity of CSIs to attract additional funding. This could be a good indication of increased CSIs sustainability, which is one of the expected impacts of IMPETUS.

Finally, the environmental impact area of the ACTION methodology proved to be particularly challenging to operationalise and apply to the CSIs (see Passani et al., 2022b). For this reason, we worked on its fine-tuning. This work will probably need additional time and testing, but our reflections and updates are presented in subsection 3.4.

The updated list of variables is presented in section 4.

3.1 Impact on Health and Wellbeing

Citizen science is gaining increasing interest in the medical field and in the broader health fields (Kings, et al., 2018) with several projects in different EU countries and abroad. They span from contributory projects (Bonney et al., 2009), in which citizens are requested to collect, for example, biological samples or provide biomedical data via Apps and wearables, to more participatory practices, especially in the field of preventive medicine. Some of the CSI supported by IMPETUS are working in this field and are expected to positively impact the physical and psychological (or mental) health of citizens participating in the project activities and, in some other cases, of a larger group of citizens. Indeed, some of these projects aim to improve the health conditions of specific categories of people (beyond those directly engaged in the



activities), such as people with disabilities or women with specific health conditions. Impact on health can also happen at a larger scale by promoting more healthy habits such as active mobility, as some of the IMPETUS projects will do. This dimension is, therefore, potentially useful also for projects not directly addressing the topic of health and wellbeing⁹.

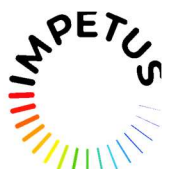
Other CSIs focus more on wellbeing, than actual physical and psychological health. However, it is advisable to keep the two connected. The concept of wellbeing emerged during the interactions with CSIs in the bootcamp in reference to the capability of CSIs to positively impact different aspects of the life of people, that are related to “a state of happiness and contentment, with low levels of distress, overall good physical and mental health and outlook, or good quality of life”¹⁰. It is important to stress that the concept of wellbeing is used in many different disciplines and that there is no consensus on its operational definition. There is consensus, however, on the fact that wellbeing is a multidimensional concept that engages the broad categories of emotion, behaviour, cognition, and relationships (Jarden and Roache, 2023). There is also an overlap here between wellbeing and health status.

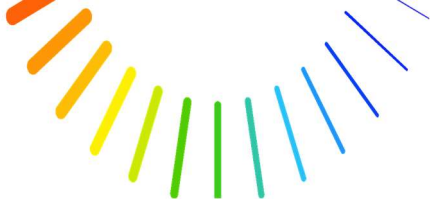
For these reasons, we draw on the approach of the World Health Organisation (WHO) that uses the label “Health and wellbeing” and defines it as “*a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity*”.¹¹ Mental and physical health are separated in our methodology only because some projects in the current Accelerator cohort focus on only one of these

⁹ In the ACTION impact assessment framework, there was an “impact on health” dimension and it was in the area of environmental impact. In that context (ACTION was engaging CSIs dealing with different types of pollution) the impact on health was conceptualised as an effect of improving conditions at an environmental level. For example, a project working on air quality could improve the health conditions of local families participating in air quality monitoring by providing information on the walking routes to be avoided and the practices to be implemented to reduce their exposure to polluted air. The dimension, however, was not fully operationalised as it was not selected as relevant by most of the ACTION CSIs. In the ACTION impact assessment framework, there was an “impact on health” dimension and it was in the area of environmental impact. In that context (ACTION was engaging CSIs dealing with different types of pollution) the impact on health was conceptualised as an effect of improving conditions at an environmental level. For example, a project working on air quality could improve the health conditions of local families participating in air quality monitoring by providing information on the walking routes to be avoided and the practices to be implemented to reduce their exposure to polluted air. The dimension, however, was not fully operationalised as it was not selected as relevant by most of the ACTION CSIs.

¹⁰ This definition is based on that of the American Psychological Association. APA Dictionary. American Psychological Association; Washington, DC, USA: 2023. Wellbeing. Available online: <https://dictionary.apa.org/wellbeing>).Acceded on June the 20th, 2023).

¹¹ Retrieved from the WHO website on June the 30th <https://www.who.int/data/gho/data/major-themes/health-and-wellbeing>





aspects (and no doubt there will be future Accelerator projects in a similar position). Thus, it is easier to report these impacts separately.

Consequently, this dimension can be articulated in two sub-dimensions, which are:

- Impact on physical health and wellbeing
- Impact on psychological health and wellbeing

Defining and conceptualising these two dimensions is a potential project in the end of itself. However, for the purposes of the IMPETUS impact assessment methodology, we will rely on the existing operational definition and measuring practices of international bodies such as the World Health Organisation (WHO), Eurostat and the OECD.

EUROSTAT analyses citizen health by combining objectives and self-reported measurements that include:

- healthy life years
- self-perceived health and wellbeing
- functional and activity limitations
- self-reported chronic morbidity
- injuries from accidents
- absence from work due to health problems

Since it is difficult to expect CSIs to have an impact on the most objective indicators, we propose focusing on the self-reported indicators and ask volunteers and eventual beneficiaries if the CSI improved their “general physical health and wellbeing” and their “general psychological health and wellbeing”. This directly echoes the question used by EUROSTAT for the indicator “self-perceived health and wellbeing”. On this, the statistical manual of EUROSTAT reports the following:

“The indicator is a subjective measure on how people judge their health in general on a scale from “very good” to “very bad”. [...] Indicators of perceived general health have been found to be a good predictor of people’s future health care use and mortality”.

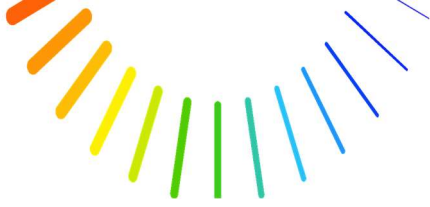
This indicator is also used, together with others, for assessing the progress of EU countries against SDG 3 on good health and wellbeing¹². The OECD uses a similar self-reported indicator analysing the different ways in which countries assess health status¹³.

As already mentioned, the topic of “wellbeing” lacks a consolidated definition. From a statistical point of view, its multidimensionality is close to what is defined as “quality of life”. Quality of life indexes, such as the one from the OECD¹⁴, include 11 key dimensions ranging from traditional measures such as income and jobs, health, education, to housing, personal safety, life satisfaction, environment, community, and

¹² Source: https://ec.europa.eu/eurostat/cache/metadata/en/sdq_03_20_esmsip2.htm

¹³ file:///Users/antonella/Downloads/HEALTH_STAT_6_Perceived%20health%20status.pdf

¹⁴ <http://www.oecdbetterlifeindex.org/#/23224325342>



work-life balance. Assessing the impacts of CS on all these dimensions would go beyond the scope of our methodology. Previous experiences in using the quality of life approach to CS-like practices (Vaino et al., 2017) suggest using a more direct and simple approach.

Another path was followed by Linton et al. (2016) who reviewed 99 self-report measures for assessing wellbeing, mapped 196 dimensions of wellbeing and concluded that those dimensions cluster around 6 key thematic domains: mental wellbeing, social wellbeing, physical wellbeing, spiritual wellbeing, activities and functioning, and personal circumstances. However, given the lack of agreement on how to assess wellbeing separately from health, we suggest avoiding separating them out, at least for now.

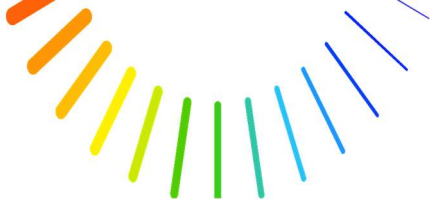
It is worth noting that this first round of the Accelerator will be an opportunity to test this approach and to learn more about these issues. The CSIs that work directly in the field of physical and mental health will assess the impacts of their project on these dimensions in a more precise way using ad hoc instruments already in place in their organisations or co-designed with the volunteers as part of their project. We will evaluate those instruments and the possibility to integrate them, at least partially, in the overall methodology in the coming months.

3.2 Impact on SDGs

The 17 Sustainable Development Goals (SDGs) are at the core of the 2030 Agenda for Sustainable Development adopted by the United Nations (UN) Member States in 2015 to address global challenges. These include poverty, inequality, climate and environmental degradation, and peace and justice in order to achieve “a better and more sustainable future for all” (United Nations, 2018) (see Fig. 3).

Each SDG is articulated by different targets (169 overall), which are in turn operationalised through specific indicators. The SDG Framework includes 231 indicators¹⁵. Custodian agencies assume particular relevance in the process of monitoring and reviewing the indicators regularly, while national statistical offices are involved in the data provision toward their measurement. In particular, custodian agencies correspond to UN bodies (or other international organisations) that have the responsibility of compiling and verifying country level data and metadata to submit them to the UN Statistics Division (UNSD). For instance, the UN Food and Agriculture Organization (FAO) is the custodian agency for several indicators across different SDGs (e.g., indicators 6.4.1, and 12.3.1).

¹⁵ The total number of indicators is actually 248 but 13 of them appear under more than one target so that the actual indicators monitored are 231



SUSTAINABLE DEVELOPMENT GOALS



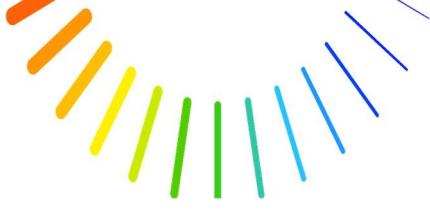
Fig. 3 - The UN Sustainable Development Goals (SDGs)

Several authors analysed the actual or potential contribution of CS to the SDGs, both theoretically (e.g., proposing theoretical frameworks about the areas in which CS can play a role) and empirically (e.g., collecting data about CS projects that have an impact on SDG targets and indicators through their monitoring). Recent analysis suggests that even though CS has enormous potential to contribute to SDG monitoring, it is a method that is currently underused (Fraisl et al., 2020).

West and Pateman (2017) investigated how CS approaches could contribute to the definition and monitoring of the SDGs at the target level and to the implementation of related policies. Fraisl et al. (2020) provided a more extensive analysis on the current link between CS and SDGs, highlighting those areas where CS already contributes to the SDGs monitoring, where it has the potential to contribute, and where there are neither actual nor potential links between the two streams, nor across the different tiers of SDG targets and indicators.

Fritz et al. (2019) presented a roadmap that outlines how CS can be integrated into the traditional SDGs reporting mechanisms. To do it, governments must know how non-traditional data provided by CS projects can be exploited for SDGs monitoring (Lammerhirt et al., 2018).

Together with our colleagues from Nesta's Centre for Collective Intelligence Design, we explored the relationship between CS and SDGs in more depth (see as related output Albert et al., 2023). In addition to reviewing the literature and identifying case studies, we also undertook a series of interviews (led by our colleagues from Nesta) with experts from relevant organisations (such as the Joint Research Centre, the Global Partnership for Sustainable Development Data, the Stockholm Environment Institute, Leiden University, the International Institute for Applied Systems Analysis,



and others¹⁶) to gain insights into the link between CS and SDGs, as well as the key enablers and barriers to CS outputs contributing towards local and national sustainability targets.

This round of expert interviews provided interesting insights. On one hand it emerged the need for a top-down approach in which national statistical offices and custodian agencies drive the process of CS data development and usage. Indeed, alternative sources of data (as data collected by CSIs) should be considered reliable by them and this “data reliability” is one of the main topics mentioned as a challenge in the usage of CS-generated data.

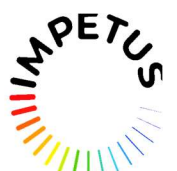
For this to happen, however, awareness needs to be raised about the benefits of using CS data in SDGs monitoring and also about CS data reliability as in many cases CSIs are already implementing trustable data quality procedures. This can be done through creating success stories and best practice on where CS data has been used (this topic will be further explored in the policy brief under preparation as part of T4.3). This last point has also emerged as essential in a workshop that we conducted at the EUSEA Conference 2023. However, this is an ongoing process. National statistical offices and governments can also support this by communicating their needs in terms of data gaps that CS initiatives could potentially help fill. One of the main challenges, however, is that CS initiatives act locally, while the UN SDGs indicators are at a national scale.

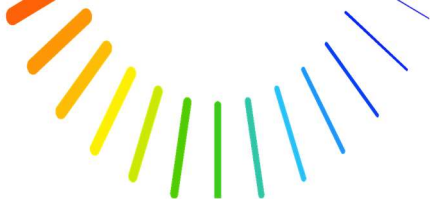
Downscaling SDGs as a ground for more effective collaboration between local authorities and CSIs

Another element limiting or preventing the use of data generated by CSI or for including their actions more explicitly as a way to advance towards SDGs targets, is the *misalignment between the geographical coverage of SDGs and of CSIs*. Indeed, most CSIs act at local level (at city level for example) or also at micro level (within a specific neighbourhood for example) while SDGs targets and indicators are at national level. This is why IMPETUS has a dedicated task (Task 4.1) on the localisation of SDGs, a work needed to better support CSIs in exploiting their potential in this sense. The following paragraphs report the state of the art on methods, challenges and open questions related to SDGs downscaling.

In recent years, some effort has been made to downscale the SDG targets and indicators to the regional and municipal level. Through the proposal of the New Urban

¹⁶A total of 11 interviews were conducted, involving persons from the following organisations: Joint Research Centre, Global Partnership for Sustainable Development Data, Stockholm Environment Institute, Leiden University, International Institute for Applied Systems Analysis, Delft Institute for Water Education, Earthwatch, Bürger Schaffen Wissen, United Nations Institute for Training and Research, CS Global Partnership.





Agenda (NUA),¹⁷ the UN committed to the development and implementation of national urban policies (NUPs) in order to achieve the national SDG targets. Indeed, a co-designing process of implementable urban policies is essential, recognising the leading position of national governments, while including the participatory role of sub-national governments, civil society and other local stakeholders. In particular, the Action Framework for the implementation of the New Urban Agenda (AFINUA), developed by UN Habitat (2017), includes a series of key items providing policy guidelines to achieve the SDGs targets at the urban level. This framework does not exclusively address SDG 11 (i.e., “make cities inclusive, safe, resilient and sustainable”), but it also takes into account other relevant factors contributing to further SDGs, such as employment (SDG 8), energy (SDG 7), water supply (SDG 6), food security (SDG 2), health (SDG 3) and education (SDG 4), gender (SDG 5), sustainable consumption and production (SDG 12), and biodiversity (SDG 15).

Given the relevance of the topic, several studies contribute to mapping or proposing new approaches toward the localisation of the SDGs. According to Gilles-Corti et al. (2020), if appropriate data is available, only 119 of the 244 SDG and UN Habitat’s New Urban Agenda indicators can be spatially disaggregated at the city level. This means that an alternative approach to assess progress towards the realisation of sustainable cities is needed.

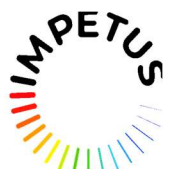
One possible solution comes from Wiedmann and Allen (2021), who propose to include footprint indicators in city level SDGs assessment to establish a global-local integration. Kawabkubo et al. (2018) propose to combine SDG indicators with greenhouse gas (GHG) emissions data. After reviewing different sets of indicators¹⁸ Zinkernagel et al. (2018) observe that the SDGs are all quantitative and open to the possibility to add qualitative indicators based on subjective aspects to better understand local needs and desires.

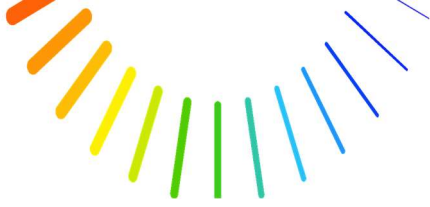
In the 2019 SDG Index and Dashboards Report for European Cities, Lafortune et al. (2019) provide an overview of the main strengths and weaknesses of 45 cities across Europe based on SDG measurement, also reporting the main constraints in terms of data gaps at the subnational level. As highlighted in their report, major performance gaps take place in addressing environmental goals, specifically SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action) and SDG 15 (Life on Land). These dimensions could be at least partially covered through CSIs activities and data.

A similar approach was formerly applied by Prakash et al. (2017) to measure the sustainable development of the 100 most populous cities in the United States of

¹⁷ <https://habitat3.org/the-new-urban-agenda/>: “The New Urban Agenda represents a shared vision for a better and more sustainable future. If well-planned and well-managed, urbanisation can be a powerful tool for sustainable development for both developing and developed countries.”

¹⁸ i.e, UN Habitat's Urban indicators; Commission for Sustainable Development’s Sustainable Development indicators; EU’s Urban sustainability indicators; European Common Indicators; OECD’s Better Life Index; ISO 37 120 indicators; SDG indicators)





America. This report shows that the top performing cities are still 55-60 percent of the way to achieving the SDGs targets, much behind the national score reported in the 2016 Global SDG index (Sachs et al., 2016). This shows that not all SDG indicators are relevant at the urban level and here CSIs could become relevant in designing additional indicators and ways of measuring achievements towards SDGs at city level.

Some cities within NorthWestern Europe and the United Kingdom are already developing initiatives to localise SDGs (Jones and Comfort, 2019). For instance, the Association of Flemish Cities and Municipalities (2020) has worked on localising the SDGs in a pilot project (2017-2019) with 20 local governments in Flanders. Starting from the SDG indicators, they formulate 205 indicators that are meaningful in the administrative context of Flanders. Then, they ultimately propose a chart with 54 basic indicators covering all the 17 SDGs based on their relevance, data availability, how much they are representative of the whole set of SDGs, and their link with the global indicators. The City of Copenhagen (2018) presented an action plan for the SDGs containing an overview of the city's current contribution to the realisation of the goals as well as a plan for the municipality's strategic future actions. Through this report, the City of Copenhagen contributes to the operationalisation of the SDGs at the city level, also providing an overview of selected initiatives and policies implemented by the municipality.

As evident, a common approach to SDGs downscaling has not been developed yet among European cities and regions. Nonetheless, some guidelines towards SDGs downscaling are provided by international organisations.

The Global Taskforce of Local and Regional Governments (2016) together with the UNDP and UN Habitat developed a roadmap for localising the SDGs to support cities and regions towards delivering the 2030 Agenda. The first step of this roadmap (see Fig. 4) consists in increasing the awareness of SDGs at the local level, empowering citizens to actively participate in the achievement of the targets. The second step is at the policy-level, where it is necessary to align sub-national programs to SDG national strategies. The third step entails an implementation phase, where local governments need to design the most effective way in which the SDGs can be adopted in their communities (e.g., engaging the relevant stakeholders, determining the main priorities, aligning with regional paths, and so on). In the fourth step, the SDGs should start being monitored regularly by gathering data at territorial level, with a follow-up phase collecting learning and feedback. The active participation of local and regional governments will help the international community going forward with the localisation of the SDGs across the world.

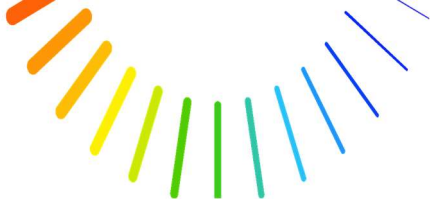


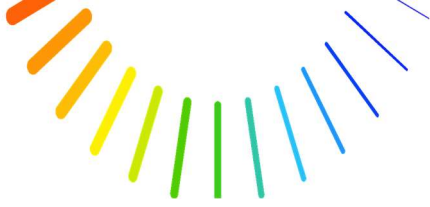
Fig. 4 - Roadmap for localising the SDGs: implementation and monitoring at subnational level (from the Global Taskforce of Local and Regional Governments, UNDP, UN-Habitat, 2016).

Siracusa et al. (2022) recently worked on the second edition of the European Handbook for SDG Voluntary Local Reviews (VLRs). VLRs are reports drawn up by local governments providing an overview about their “achievements, shortcomings, strategies and measures for sustainable development, using the SDG framework”, in line with the Voluntary National Reviews (VNRs).

The main objective of the Handbook is to demonstrate that cities and local governments can assess SDGs through the adoption of a set of indicators which are locally relevant but also comparable over time and with other cities. To this aim, the authors have reviewed a great number of databases to define appropriate indicators to measure different SDGs and related targets at the local level. In the end, they come up with 72 indicators, each of them associated with a specific goal and target. In any case, the process should be flexible, and the related targets and indicators should be tuned according to the specific municipal or regional strategies and needs. The main purpose of SDG monitoring at the local level should be guiding municipal and regional actors towards the achievement of strategic objectives in line with the UN global framework. However, there can be substantial differences across municipalities and regions in terms of indicators that can be relevant to them, and data accessibility. The proposition of a unique, fixed framework is not suited to this aim.

Acting at a local level, CSIs can contribute to SDG monitoring, SDGs indicators design and towards targets' achievement. This is a field of study that needs to be given due attention to better support the collaboration between public administrations and CSIs.

Clearly, the landscape differs substantially among cities and regions, and this will influence the possibility of the IMPETUS CSIs to actually have an impact in this sense.



However, we will support them in setting the stage for a dialogue with local authorities. In parallel, we will also work with our colleagues from Nesta towards increasing the awareness of local policymakers in terms of both the downscaling of the SDGs, and the use of CS data as a source for their monitoring.

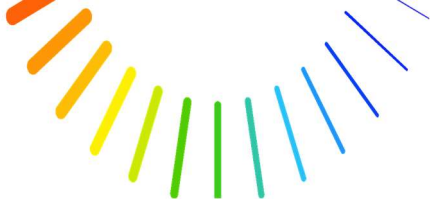
All the points raised so far, consider almost exclusively the possible contribution of CSIs to the monitoring of the SDGs indicators. Their expected role is that of *data providers* and the literature on the subject focuses on this. However, we want to emphasise the role CSIs can play in contributing not only to the data provision, but also to the *achievement of the SDG targets*. We started this work in ACTION, mapping such potential contributions and will pay dedicated attention to this in IMPETUS. For example, let us consider SDG6, i.e., “ensure availability and sustainable management of water sanitation for all”, and the related indicator 6.3.1, i.e., “proportion of bodies of water with good ambient quality”. Here, there may be a CSI working on, e.g., the analysis of bodies of water through innovative and efficient methods. One of the activities this CSI can perform is to advocate towards local policymakers for new or better policies aimed at reducing the presence of pollutants. The data they gather will support evidence-based policy making and, in this way, a CSI would have an impact on the achievement of an SDG target. This is an important impact of CS on the SDGs, and we want to map and stimulate this kind of impact. Similarly, a large-scale CSI can have an impact on citizen behaviour (for example by promoting active mobility) that can, in turn, support the achievement of an SDG target (for example, improving air quality at city level).

Considering the interest in monitoring different ways in which CSIs can contribute to SDGs, we identified four different possible impacts:

1. Data provision: CSIs can work on collecting and providing data related to one or more SDG indicators (national or downscaled ones according to their geographical focus). Moreover, collected data may eventually be used to train AI tools and algorithms aimed to either analyse or estimate the stage of development toward the achievement of specific indicators.
2. Impact on policies and regulations: CSIs can engage local, national (or eventually international) policymakers and promote policy innovations that can support the alignment with and the achievements of SDG targets.
3. Behavioural change: CSIs can have an impact on people’s behaviours and this, if at scale, can contribute to the achievement of SDG targets.
4. Development of new indicators: the SDG framework is updated regularly¹⁹. The proposal of new indicators is one of the ways a CSI can contribute to SDGs monitoring and achievements.

These four ways of impacting on SDGs have been included in the impact assessment canvas (Annex 1) so as to better support IMPETUS CSIs in working towards them. The

¹⁹ <https://unstats.un.org/sdgs/metadata/>



work of NESTA, supporting CSIs in achieving political impact, is aligned with this framework (see D4.1) and in the next months we will be able to see in which ways and to what extent our CSIs will impact on SDGs.

We didn't mention so far, the potential impact of CSIs on the Green Deal objectives. We did not include them explicitly in the methodology, but the data gathered in relation to the impacts on SDGs will be used by us, the T6 team, for analysing their relevance for the Green Deal objectives too. At the present stage we considered that adding the Green Deal objective would add an additional level of complexity for the CSIs so we want to that is, with the data they will provide for their impact assessment, it would be possible to derive this information too.

The next subsection is dedicated to a new dimension we added to the impact assessment methodology, which considers the alignment of the CSIs activities with Responsible Research and Innovation (RRI) principles.

3.3 Evaluating the performance of CSIs in terms of Responsible Research and Innovation (RRI)

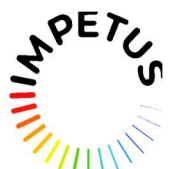
In the previous sections of the methodology, we discussed what the CSIs will deliver in terms of output and impact; here we will focus on the "how", i.e. we will consider to what extent their activities are aligned with the RRI principles.

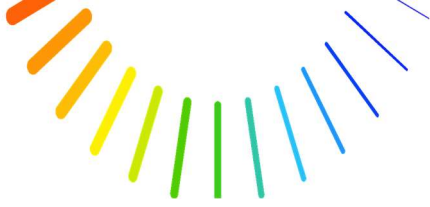
According to the European Commission, "RRI is a comprehensive approach to scientific research that aims to engage societal actors – from researchers to policy makers, citizens, entrepreneurs, etc. – in the research and innovation process, in order to ensure that the results meet the needs of the world we live in" (Archibugi et al., 2015). The main objective consists in aligning the processes and outcomes of research and innovation, with the societal values and needs, so as to tailor research and innovation actions accordingly.

To integrate the RRI dimensions into the IMPETUS Impact Assessment methodology, we draw on the work done by the MoRRI, SUPER MoRRI, and NEWSERA projects. In doing so we had to bear in mind that the impact methodology is already rich, and a key aim was to minimise the effort requested of CSIs to implement it. We therefore tried to align as much as possible the ACTION indicators with the ones proposed by the above-mentioned projects.

The MoRRI project²⁰ ran from 2014-2018 and represents the first attempt to create an RRI monitoring system in Europe. The MoRRI approach proposes 36 indicators within six key areas of RRI (called RRI pillars below): gender equality, science literacy and education, public engagement, ethics, open access, and governance. They focus on the analysis of EU countries and their main unit of analysis is the national research system made up of public research funders, universities and research organisations.

²⁰ <https://super-morri.eu/morri-2014-2018/>





The SUPER MoRRI project²¹ represents the continuation of MoRRI. It aimed to support the transformation of the R&I system, considering societal values, needs and concerns, by engaging social actors in co-designing and co-developing the entire R&I process. Beyond its overall mission, SUPER MoRRI is interesting here because it focused on the links between the RRI indicators proposed in MoRRI and CS.

The NEWSERA project²², which recently ended, aimed to give recognition to CS as an instrument to bridge the gap between science communication and society through the promotion of science literacy. In this vein, we are particularly interested in their work on the link between the areas of impact of CS projects and the RRI pillars adapted from MoRRI and SUPER MoRRI. Some pillars of RRI, as defined in MoRRI, are already integrated into dimensions of CS (i.e., public engagement, open access, and science education), while gender, ethics, and governance deserve additional effort (Giardullo et al., 2021).

We proceed in the following way:

1. We analysed the RRI pillars, dimensions, and indicators as set out in the MoRRI and SUPER MoRRI projects.
2. We matched the ACTION indicators to the different RRI pillars and dimensions.
3. We conducted a gap analysis to identify the missing elements in the intersection between the ACTION indicators and the RRI dimensions. The gap analysis highlighted that the majority of RRI dimensions were already covered in the ACTION methodology, while some others needed to be integrated appropriately. To address the missing links, we integrated the ACTION framework either by taking inspiration from NEWSERA (Giardullo et al., 2021), or by introducing new indicators into the IMPETUS methodology.

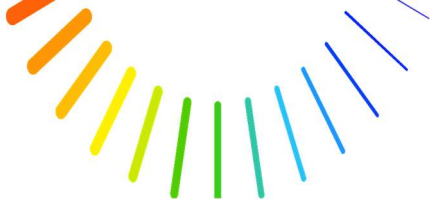
In the end, we came up with 33 indicators linked to a specific RRI pillar and dimension. In more detail, 24 of them were already included in the ACTION methodology, while 9 were added to the IMPETUS methodology. Out of these 9 new indicators 4 are the ones introduced by the NEWSERA project and the other have been added by us (see annex 3).

3.4 Environmental impact

In the ACTION methodology, environmental impact included six different dimensions, comprising both direct and indirect impacts. The methodology was developed by adapting the environmental assessment criteria presented in the assessment systems reviewed by Wunder et al. (2019). Most recent works have focused on identifying best practice and approaches in the field of environmental psychology for the assessment of environmental attitudes and behaviours (Somerville and Wehn, 2022), while van Noordwijk et al. (2021) contribute to the proposal of pathways through

²¹ <https://super-morri.eu/>

²² <https://newsera2020.eu/>



which CS can foster environmental change. However, despite the need to foster public participation in Environmental Impact Assessment (EIA) (O'Faircheallaigh, 2010), a comprehensive framework for conducting EIA in CS projects is still lacking. In this vein, the H2020 funded project MICS²³ developed a platform to guide CS projects toward impact assessment activities. In particular, they identified two key dimensions of environmental impact: environmental footprint, and environmental awareness. The former dimension aims to evaluate the extent to which the project contributes to reducing the consumption of resources, waste generation, and polluting emissions. The latter one focuses on monitoring human behaviour and environmental attitudes.

The dimensions are assessed through different questions, defined as follows:

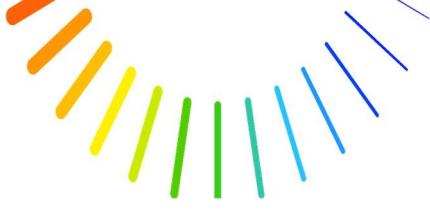
- Environmental footprint:
 - Does the project take measures to decrease material footprint?
 - Does the project take measures to reduce polluting emissions?
 - Does the project take measures to increase soil quality?
 - Does the project take measures to improve water quality?
 - Does the project take measures to protect and restore biodiversity?
 - Does the project take measures to improve air quality?
 - Do the project activities include pro-environmental actions g. litter picking?

- Environmental awareness:
 - Does the project explicitly disseminate information on sustainable development or lifestyles?
 - Does the project educate participants on environmental challenges?
 - Does the project explicitly contribute to a higher awareness of, or positive attitude towards, the natural environment, on this planet or others?
 - Does the project lead to an increased stewardship of the natural environment among participants?

The questions related to the first dimension are well aligned with the dimensions that are already included in the ACTION methodology (under the area of environmental impact). This dimension has the advantage of asking for actual data on the changes to the environment (direct impacts) produced by the project.) and how it was measured and with what results. The questions for the second dimension have been added in a new dimension called "impact on environmental awareness' In case of an affirmative answer we will also ask to provide more descriptive information of the types of activities performed.

It will be interesting, data allowing, to link the results of this set of questions with the results of the questions related to changes in way of thinking and impact on

²³ <https://about.mics.tools/>



behavioural change, where special attention is dedicated to pro-environmental changes. These are actually in the social impact dimension.

The next section presents the IMPETUS methodology for assessing the impact of the CSI participating in the IMPETUS Accelerator that includes the dimension and indicators discussed in this section.

4. IMPETUS impact assessment methodology for CSIs

We presented in the previous section the changes that have been introduced in the ACTION methodology to better align with the IMPETUS needs.

This section presents the IMPETUS impact assessment methodology in terms of areas of impact, dimensions and variables.

The IMPETUS impact assessment methodology considers 5 areas of impact (scientific, social, economic, political, and environmental), which are articulated in 25 dimensions (Fig. 5).

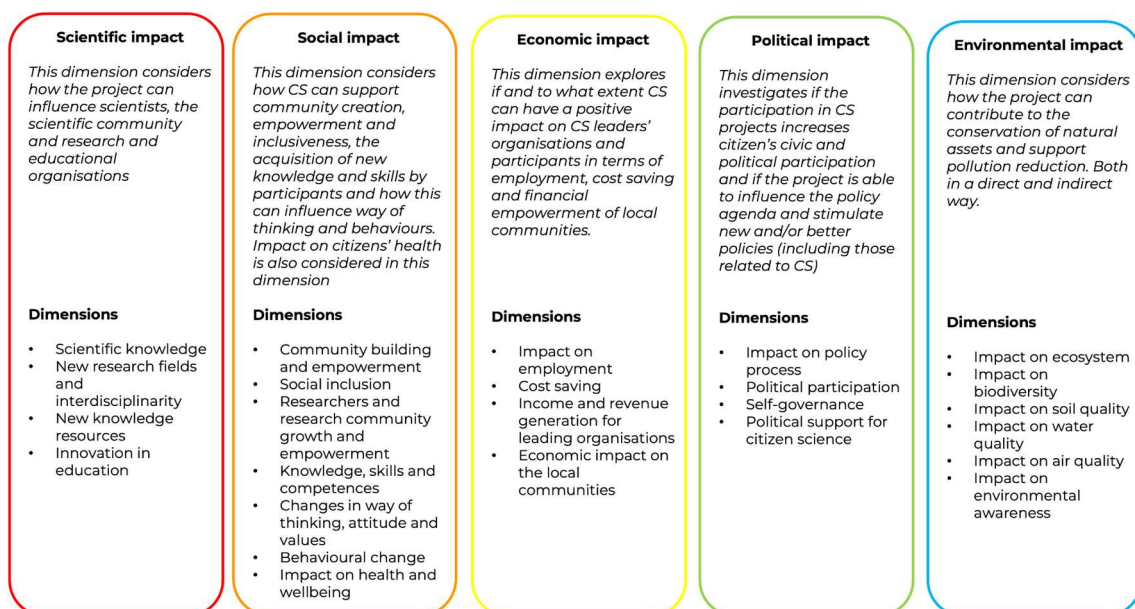
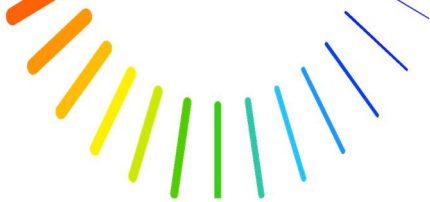


Fig. 5 - IMPETUS areas of impact and dimensions



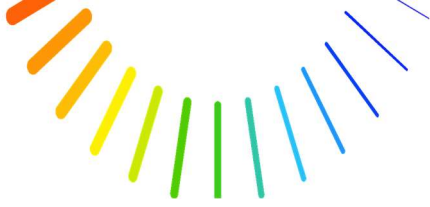
Each dimension is then operationalised²⁴ in several indicators and variables, set out in the tables below.

The next subsection describes how the data to assess each dimension will be gathered and analysed.

<i>Scientific impact</i>	
<i>Knowledge in academia</i>	
	Quantity of new data created
	Quality of data assurance procedures
	Data compliance with FAIR principles
	Research outputs
	Research outputs visibility
	Citizen scientists' participation and recognition in the research output.
	Non-scientific publications
<i>New research fields and interdisciplinarity</i>	
	N. of disciplines represented in the project team
	Self-reported interdisciplinarity
	N° of new research groups created
	Sub-disciplines emerging
<i>New knowledge resources</i>	
	Ease access to knowledge that is otherwise hard to access
	Facilitate knowledge creation among societal actors and groups
	Development of new data-gathering tools
<i>Innovation in (academic) education</i>	
	Innovation in academic or school curricula

²⁴ "In the social sciences, operationalisation has come to mean the process through which (abstract) concepts are translated into (measurable) variables" definition retrieved in July 2023 from

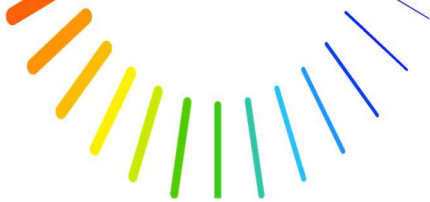
<https://www.qualityresearchinternational.com/socialresearch/operationalisation.htm>



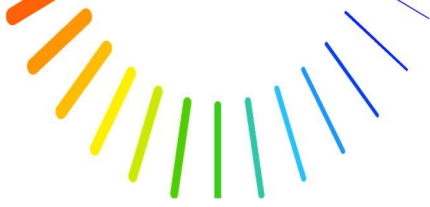
	Innovation in (other) educational/training methods
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Tab. 2 – Scientific impact: dimensions and variables

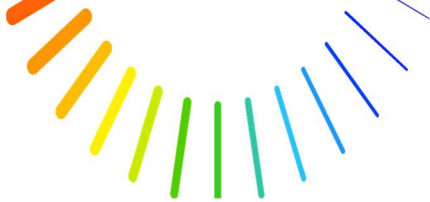
Social impact	
Community building and empowerment	
Community building	N. of citizens scientists engaged in project activities
	Role of the citizen scientists in the participatory research process
	Level of participants' awareness about the objectives of their research
	N. of awareness level/dissemination events organised (face to face)
	N. of participants to organised events (face to face)
	N. of awareness level/dissemination events organised (online)
	N. of participants to organised events (online)
	N. of persons/organisation reached trough social media
Community empowerment	Level of interaction among citizen scientist
	Changes in bonding social capital among citizen scientists
	Changes in bridging social capital among citizen scientists
	Changes in linking social capital
	N. of new social relations established
	Increase in the perceived quality of social relations
	Self-assessment on project capability to influence trust among participants
	Project self-assessment of its capacity to foster the creations and the enlargement of local communities/groups
Improvement in the self-perceived efficacy of citizen scientists	



Social Inclusion	
Diversity within the project team	Ratio of female and non-binary researchers within the project team
	Project lead by a woman or a non-binary person
	Number of members of the team that self-identify them as belonging to an under-represented social group
	Percentage of female authors or co-author in projects scientific outputs (<i>data collected in the scientific impact but analysed here</i>)
Diversity of participants/volunteers	Percentage of participants belonging to underrepresented social groups
	Typologies of underrepresented social groups engage
	Ration among age groups of participants
	Male/female/non-binary share among participants
	Diversity of participants in terms of education level
	Diversity of participants in terms of income
	Diversity of participants in terms of cultural differences
	Diversity of participants in terms of value orientation (materialistic/post materialistic)
Diversity management practices	Presence and description of a dedicated strategy for social inclusion and diversity management
	Sex- and/or gender disaggregated data collected
Researchers and research community growth and empowerment	
	N. of new collaborations established with other researchers/research organisations
	N. of new collaborations established with other organisations (excluding research organisations)
	Changes in researchers' carrier path
	Changes in researchers' level of trust for citizens, other CS managers and decision-makers
Knowledge, skills and competences	
Motivation and interest for science	N. of CS projects in which participants have been enrolled/are enrolled

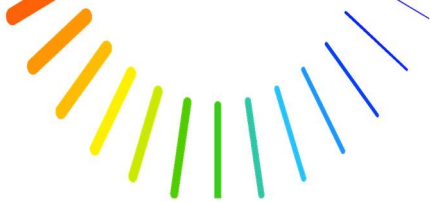


	Probability to engage in CS projects in the future
	Participation in cause-oriented initiatives (see political impact)
	N. of participants considering a scientific carrier because of the project (for student only)
	N. of participants considering enrolling in life-learning educational program related in the science field (only for adults)
	Changes in the interest for the specific topic covered by the project
	Changes in the interest in science related topics and activities
Content, process, and knowledge of the nature of science	Changes in the understanding of the scientific method
	Changes in the understanding of the scientific process
Skills of science inquiry	Acquisition of new skills in the research design-related activity
	Acquisition of new skills in the data gathering- related activities
	Acquisition of new skills in the data curation- related activities
	Acquisition of new skills in the data analysis- related activities
	Acquisition of new skills in the data interpretation- related activities
	Acquisition of new skills in shaping and commenting results
	Acquisition of new skills on impact assessment
	Acquisition of new skills in communicating results
	Acquisition of new skills in the valorisation of project results for policy making
	Acquisition of new skills on project sustainability
	Increment in technological literacy
	Acquisition of new skills related to critical thinking
Project-specific contents/topics	to be elaborated on a project-by-project base



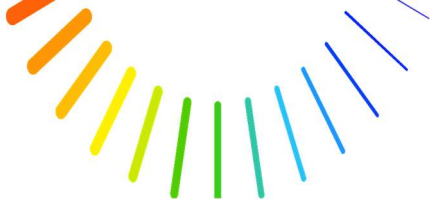
Soft skills	Changes in interpersonal communication related competences
	Change in the class social dynamics (only for school class-based projects)
	Changes in the capacity to collaborate (do it together)
	Changes in the capacity to collaborative discuss (think it together)
	Changes in organisational/management related competences
Changes in way of thinking, attitude and values	
	Changes in way of thinking related to the specific topic of the project. Index to be selected/elaborated on a project-by-project base
	Changes in way of thinking on environmental issues/concerns (NEPS scale)
	Changes in the way of thinking on science (MATOSS index)
	Changes at value level (post-materialistic index)
Behavioural change	
	Impact on green consumption behaviours
	Impact on project-specific related behaviours
Health and wellbeing	
	Impact on physical health and wellbeing
	Impact on phycological health and wellbeing

Tab. 3 – Social impact: dimensions and variables

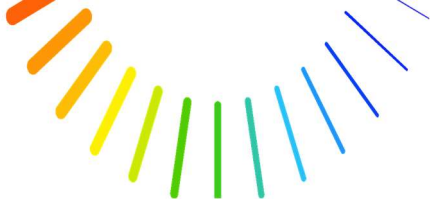


Economic impact	
Impact on employment	
	N. of new job places created within the leading organisation
	N. of participants that change or get a new job as a result of their participation in the CS project
Cost saving	
	Average n. of hours dedicated to the project by volunteers
	N. of hours dedicated to citizens' engagement and support
	Cost-saving for project stakeholders
Income and revenue generation	
	N. of proposals for additional funds submitted and that are related to the project activities and outputs (international, national and local private and public funds)
	Total monetary funding (in Euros) awarded from private and public funders as a result of the project
	Income generation for the organisation
	Income generation for the volunteers
	N. of new or improved products
	N. of new or improved services
	Revenue generated by each of the new or improved products
Economic impact on the local community	
	Qualitative economic impact on the local community
	Quantitative economic impact on the local community

Tab. 4 – Economic impact: dimensions and variables



Political impact	
Impact on policy processes	
	Number of new/changed policies (e.g. regulatory, management or conservation actions)
	Agenda setting: support in open new discourses and problem definitions
	Self-reported contribution to policy implementation and enforcement
	Self-reported contribution to monitoring and evaluation of policy implementation
	Contacts established with local/national/international statistical offices
	Policy influence and advocacy plans developed
	Number of policy recommendations produced by citizen science project
	Number of meetings/conferences organised/attended for influencing policymakers
Political participation	
	Political literacy: self-reported changes in the time spent by individuals in getting informed about political issues
	Self-reported changes in engagement in political groups or activities (e.g. party membership, work for candidates, protesting, lobbying)
	Self-reported changes in civic engagement (e.g. membership in voluntary associations, charities or environmental groups)
Self-governance	
	Active involvement in or creation of new civic society organisations and/or informal groups created at the local level
	Number of political events (e.g. rallies) organised/attended for involving wider actors
Political support for citizen science	
	Change in policy support and funding for citizen science



	Number of new partnerships between government decision-makers/policymakers and citizen science initiatives and organisations
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Tab. 5 – Political impact: dimensions and variables

Environmental impact	
Impact on ecosystem	
	Direct reduction of emissions
	Indirect reduction of emissions
Impact on biodiversity	
	Direct improvement of biodiversity
	Indirect improvement of biodiversity
Impact on soil quality	
	Direct improvement of soil quality
	Indirect improvement of soil quality
Impact on water quality	
	Direct improvement of water quality
	Indirect improvement of water quality
Impact on air quality	
	Direct improvement of air quality
	Indirect improvement of air quality
Environmental awareness	
	Dissemination of information on sustainability
	Education on environmental challenges
	Self-assessment of contribution to the increment in environmental awareness
	Stewardship of natural environment

Tab. 6 – Environmental impact: dimensions and variables

4.1 Data gathering and data analysis process

As mentioned in the introduction, the data gathering, and analysis process will be a joint effort between the CSIs teams and the T6 team.

The role of T6 is mainly that of facilitating the uptake of the methodology through training and mentoring and then to conduct an aggregated analysis of the data and assessment gathered by the CSIs. This represents an important difference with the ACTION project, in which the T6 team had a more prominent role in designing the data gathering process for each of the supported CSIs, and in designing all the data gathering tools for them, as well as in analysing the related data. During ACTION, the T6 team developed an impact assessment report for each of the supported CSIs, plus two reports analysing their results at an aggregate level (Passani et al., 2022a).

Due to the relatively high number of CSIs supported by IMPETUS, in addition to the intent to empower the CSIs to carry out impact assessments in an autonomous way, we designed a different approach, and we planned the training and mentoring activities accordingly.

The data gathering process at the level of the single CSI will follow 4 steps (see Fig. 6).

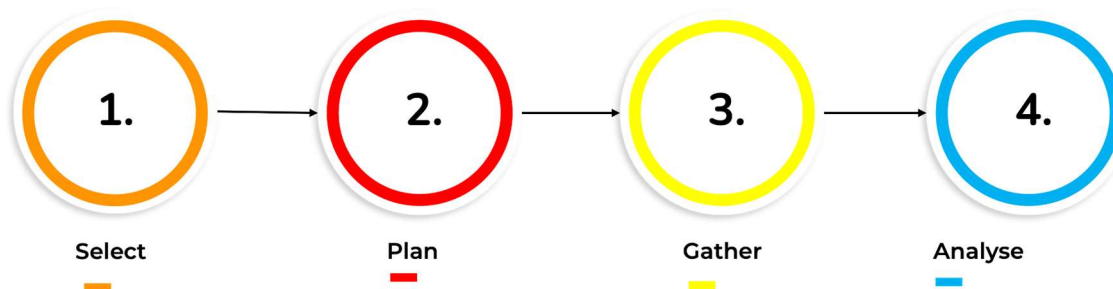
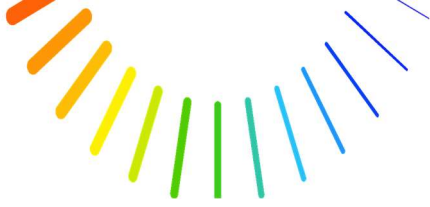


Fig. 6 – Data gathering process from the point of view of the CSIs

1. Using the Impact Assessment Canvas (see annex 1), each CSI defines its expected impacts, their stakeholders and selects the dimensions that are more relevant for the project.

They select the dimensions by attributing a value from 1 to 5 to each of them. Only the dimensions that score 3 or higher are considered for the impact assessment. The other will be excluded. This step is crucial as it defines the boundaries of the impact assessment and determines the effort to be invested in the process (the more dimensions that are selected, the heavier the data gathering and analysis process). This step happens at the real beginning of the project, even before its official beginning. Indeed, the Impact Assessment Canvas was filled in during the bootcamp and refined and added to the CSIs' work plan.

2. Each CSI team plans the data gathering process, especially considering: a) the information to be gathered at team level and those that need to be requested by their volunteers and b) the timing of the different data gathering activities.



In terms of timing, some information needs to be gathered twice: at the beginning of the project outset and at its end. This is the case, for example, with information related to the impact of a project on volunteers' skills and competences. It is recommended to assess the skills and competences of volunteers before the project starts, as well as at its end to monitor any changes or new developments. However, this is not always possible and there is the need to balance the data gathering requirements with the priority of avoiding overburdening volunteers. To this end, different questionnaires have been developed to cover both options (see next point and annex 4). The Impact assessment matrix, a visual showing who to gather data from and when for each of the IMPETUS dimensions, helps with this planning (see annex 3).

3. The teams develop the most appropriate data gathering tools and start the data gathering process.

For the information that can be gathered at the CSI team level, the reporting templates that each of them will need to fill in as part of the Accelerator process (intermediate report and final report) will help with the process. At the time of writing, we are aligning those templates with the impact assessment process. Further to this, the questionnaires developed during the ACTION project have been updated so that the CSIs can use and adapt them as needed (See annex 4).

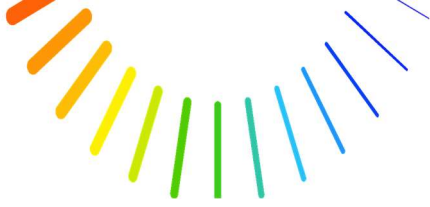
4. Finally, each CSI will analyse the gathered data and will write an impact assessment report that will be delivered at the end of the Accelerator. This is a formal deliverable, and it is included in their Accelerator-related duty. Formats and examples on how to write such a report will be provided to the CSIs and will be accompanied by a dedicated training session.

This process was presented to the CSIs during the IMPETUS bootcamp in May 2023, via a dedicated training session. In addition, hand-on sessions during the bootcamp supported the teams in filling in the impact assessment canvas and in designing their impact assessment process. Each CSIs included this in their work plan, a formal document attached to their contracts with IMPETUS that were signed off in early June 2023 before the first round of the Accelerator programme began.

In order to ensure additional support for the CSIs, the T6 team made itself available for two hours on a weekly basis in what has been labelled as "the impact assessment clinic". CSIs teams could book an appointment with the T6 team to ask for additional support on specific aspects of the impact assessment process. Additional training will be provided in the following months on how to analyse the data and how to write the impact assessment report. All slides and video recordings of the training session are, and will be, available to the IMPETUS CSIs.

In parallel, T6 will conduct, at the end of each acceleration circle, an aggregated analysis of the data provided by the CSIs. This activity will result in two main outputs: the impact dashboard (D5.2) and the final impact assessment report.

The impact dashboard is a visual representation (infographics) of information related to the CSIs' characteristics, outputs and impact. As described in detail in the deliverable dedicated to the dashboard (D5.2), it will be incorporated on the IMPETUS



website and will be updated regularly. More precisely it will be update twice for each acceleration circle:

- after the delivery of the CSIs' intermediate reports (Month 4 of the Accelerator) and
- after the end of the Accelerator when the final impact assessment report and final activity reports will become available.

This means that for the first cycle of the Accelerator, the dashboard will be published on the IMPETUS website in October 2023 since the first cohort of CSIs will deliver their intermediate report at the end of September 2023. The second one will go live in February 2024 and will elaborate on the final impact assessment reports that will be delivered in the second half of December. A similar approach will be used for the second and third cohorts in 2024 and 2025 respectively.

The first cycle of the Accelerator enables us to test this process and to improve it as needed for the next cycle. The T6 team will also conduct interviews with each CSI team at the end of the Accelerator and will complement the analysis of these interviews with desk research if needed.

Additionally, since some of the impacts could take some time to become manifest, T6 will develop a survey that will be sent to the CSIs' teams six months after the end of each Accelerator circle so as to be able to monitor additional results and impacts.

All the data gathered during the three Accelerator cycles will be used to draft the final impact assessment report that will be delivered by the end of the IMPETUS project (D. 5.3 due in month 48).



5. Assessing the impact of the European Citizen Science Prize

While the previous sections were focusing on the CS participating in the IMPETUS Acceleration, in this section we focus on those participating in the European Citizen Science Prize (the Prize from now on).

Here the research question is very different from the one driving the methodology described in the previous sections. To assess the impact of the Prize indeed, the research question is: “what is the impact of the European Citizen Science Prize on the awarded CSIs?”. This will be assessed by examining the impact of the Prize on the winning CSIs. This impact includes:

- Providing the prize winners with financial support
- Providing the prize winners with visibility and networking opportunities

We are therefore interested in understanding:

- How the prize money is used/invested by the CSIs
- If the prize increases the CSIs' visibility, recognition and networks, and what changes the eventual increase in these dimensions means for the CSIs, and those involved in the CSI team.

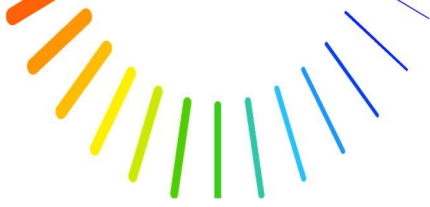
Analysing how the prize money is used is of particular interest as it could show the funding needs of successful CSIs that, possibly, are not covered by other funding opportunities. This could help in designing other support mechanisms and could be of interest for the European Commission as well.

In assessing the impact of the prize, we will consider all the 5 dimensions of the IMPETUS impact assessment methodology. We will therefore consider scientific, social, economic, political impacts and environmental impacts. Since the Prize is brand new, we will follow an exploratory and descriptive research design (De Vaus, 2006). This is especially true for the assessment of the first award round of the prize (see subsection 5.1) that will help us in better refine the methodology for the next editions.

Below is a non-exhaustive description of possible impacts for each of the 5 areas; they are aligned with the dimensions of the IMPETUS impact assessment used for assessing the impacts of the CSIs in the Accelerator. Since this is the first award of the prize, these are more hypotheses to be explored than actual expected impacts.

Scientific impact

The Prize could result in changes in the scope, research questions, geographical coverage of the project and supporting them in producing more scientific outputs. The money prize could be invested for investigating new research questions not previously considered due to lack of economic or human resources. Or it could be



used for buying equipment that could allow new scientific analysis. This could also lead to an increase in scientific outputs (scientific publications, data points in already existing data sets, new data sets, etc.) or to the development of new training materials for volunteers.

Social impact

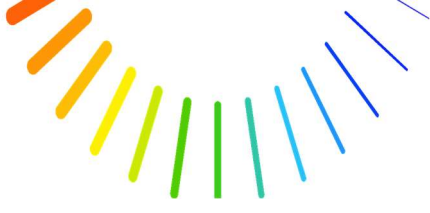
The money of the prize could be invested in new or improved citizen engagement campaigns, increasing the number of volunteers in a project, or it could be used to offer more training to team members or volunteers, which might positively impact their skills.

The visibility provided by the prize could increase the CSIs symbolic capital, i.e. the benefits, the non-material richness that come with recognition, prestige and reputation (Bourdieu, 1989). This could also lead to new collaborations and partnerships, resulting in an increase in the social capital of the CSIs' teams. Social capital²⁵ (Bourdieu, 1986). It would be interesting to investigate both the increase in bonding, bridging social and linking capital so as to analyse if the prize helps reach new communities, beside the one of CS or the ones of the disciplines represented in each of the CSI. Bonding social capital, as described by Robert Putman (2000), refers to the relationship within a group, or better, is the social capital owned by a person when she links with persons similar to her, people that belong to the same social group, location, or which share common values and attitudes. Bridging social capital, instead, refers to the capability to get in touch with people from different social groups, communities or with different values and attitudes. Finally, scholars at the World Bank (Healy et Cote, 2001) added the concept of linking social capital to describe relationships among people or institutions at different levels of societal power hierarchy and this can be of interest in analysing the capability of the CSIs to get in touch with founders, decision makers and other influential stakeholders.

Economic impact

For economic impact, we will analyse if the Prize influences the economic sustainability of the winning CSIs, and if there is an impact on the employment level. Besides this we are interested in analysing if the money prize is invested in innovation, i.e., if the CSIs will adopt or develop methods, services, or products. It would be interesting to explore if the prize has a multiplier effect in the sense of positively influencing the capacity of the CSI to attract additional funds or to open new revenue streams (such as potentially designing services in addition to the previous CSI activity).

²⁵ Social capital theory suggests that interpersonal relations create value for individuals as they provide resources which can be used for the achieving desired outcomes. From: International Encyclopaedia of the Social & Behavioural Sciences (Second Edition), 2015 retrieved on July 2023.



Political impact

The increase in funds, networking and visibility could have a positive impact on the capacity of the CSIs to influence policy and decision making. Previous projects such as MediaFuture²⁶ and the S+T+ART prize²⁷, draws attention to the fact that receiving an award from the European Commission increases the credibility and recognition of wider initiatives that find themselves better positioned in their dialogue with different stakeholders, including policy and decision makers. Moreover, the prize money could be invested in lobbying and awareness raising activities that might lead to positive results at the policy level.

Environmental impact

For environmental impact, we will investigate if the prize money is invested in making the CSIs more sustainable from an environmental point of view. The prize money might also be used to carry out activities that could benefit the environment at different levels, for example multiplying the activities in an ocean clean-up project resulting in a positive impact on water pollution; this could be particularly interesting to explore with a prize winning conservation project.

The figure below shows the areas of impact and dimensions that will be considered in the assessment of the prize. We use the same labels as those in the impact assessment framework developed for the CSIs in the Accelerator but, as said, the actual meaning of these labels could be different in this case.

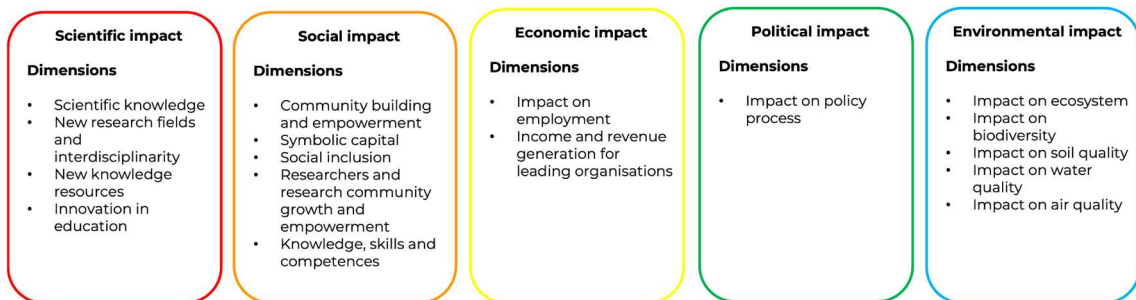


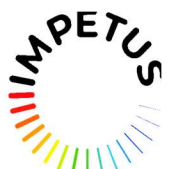
Fig. 7 - Areas of impact and dimensions for the impact assessment of the European Citizen Science Prize

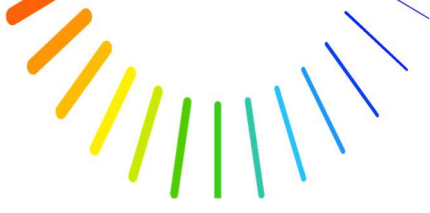
5.1 Data gathering and analysis

We will carry out one in-depth online semi-structured interview with each of the awarded teams reflecting the areas and dimensions described in the previous

²⁶ www.mediafuture.eu Passani, A., Carradore, R., De Rosa, S., (2022), MediaFutures Impact Assessment Framework deliverable of the project. The final impact assessment report will be available in the next few months.

²⁷ <https://starts.eu/what-we-do/starts-prize/> The analysis of the impact of the S+T+ARS prize is ongoing. We can anticipate the mentioned results as T6 is leading the impact assessment analysis also in this project.



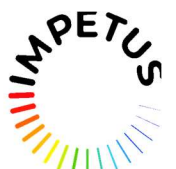


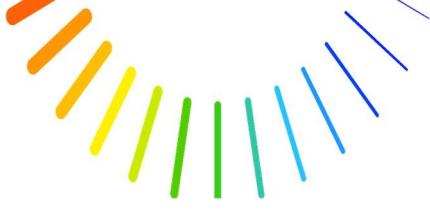
subsection. This will enable us to collect rich information that will be used, on the one hand to populate the European Citizen Science Prize dashboard (see D5.2) that will be included on the IMPETUS website and, on the other hand, to develop case studies. Case studies will be informative in nature but also very communicative in style, using a story-telling approach to support the dissemination activities of the project. Collected data will also be included in the final impact assessment report (D5.3, due at M48).

It is important to highlight that we will only focus on the CSIs that actually receive the prize money²⁸ (so not the projects that receive honorary mentions). In terms of timing, we will interview the prize winners 6 to 8 months after they have been awarded the prize. From previous experience with the S+T+Arts prize (for which T6 is carrying out the impact assessment) and from the experiences of other prizes that Ars Electronica manages, it is recommended to wait a few months before the assessment to ensure that the effects of the prize are evident.

For the first edition of the Prize, we will run the interviews with the three winning projects in February 2024 and the related dashboard will go live in March 2024. The winners of the first edition of the prize were announced in May 2023, but the award ceremony will take place in September 2023 at the Ars Electronica Festival. Since the award ceremony will be a crucial moment to give visibility to the Prize and the winning projects, it is worth waiting a few more months before interviewing them so as to be able to capture the effects of the prize in a better way.

²⁸ Due to lack of resources, we are not able to investigate the impact of the Prize to the CSIs awarded with the honorary mentions. Some information will be collected about them too and will be displayed in the European Citizen Science Prize Dashboard (see D5.2) but it will be only information describing the CSIs and not the impacts of the prize on them (this is aligned with what is defined in the IMPETUS DoA).





6. Assessing the impact of IMPETUS and stimulate reflexivity

This section presents the last “duty” of our impact assessment journey. Once we assess the impacts of the CSIs participating in the IMPETUS Accelerator and the impact of the Prize on the awarded CSIs, what is left to be considered is the impact of IMPETUS as a project in itself.

We will assess the overall impact of the IMPETUS project as a whole following the same approach as was used in the ACTION project: by adapting the methodology applied to the CSIs to the specifics of IMPETUS as a whole.

We expect the impact of IMPETUS to be more than the sum of the impacts of the supported CSIs. The project carries out specific activities and develops outputs that, while supporting CSIs, also impact other stakeholders such as the scientific community, the CS community as a whole and policy and decision makers. Examples of such outputs are scientific publications, policy briefs and the training materials developed for the Accelerator. The IMPETUS open call methodology and the Accelerator process as a model are additional relevant outputs to be considered in analysing the project impacts.

There will also be an impact on the organisations belonging to the IMPETUS consortium.

The figure below (Fig. 8) visualises the areas of impact and dimensions that will be taken in consideration in the assessment.

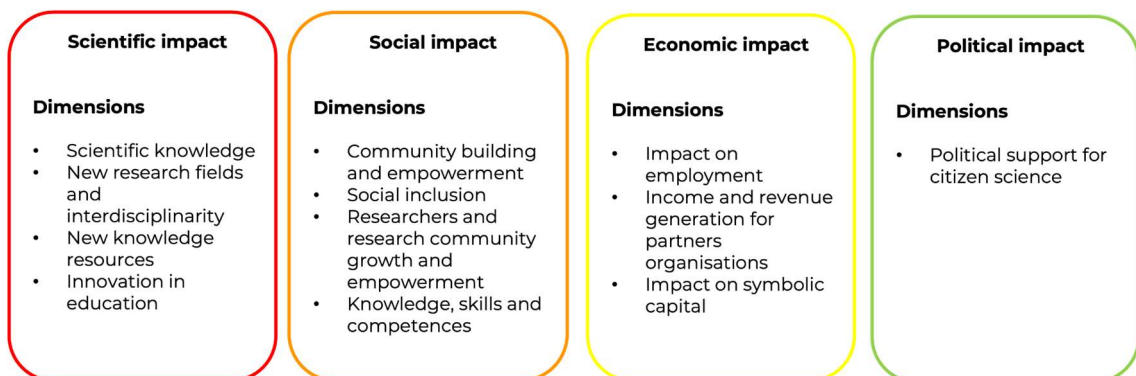
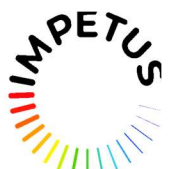
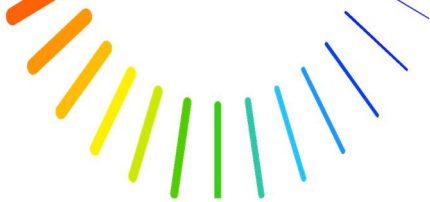


Fig. 8 - Areas of impact and dimensions considered for assessing the impacts of IMPETUS project





All the dimensions of the *scientific impact* that are considered for the CSIs are also relevant for IMPETUS. Indeed, the IMPETUS consortium is expected to deliver several scientific outputs (articles in scientific journals, learning resources for the Accelerator, datasets, etc.) (*Relevant dimension: Scientific knowledge*). The IMPETUS consortium team is made up of individuals including researchers from different disciplines and it will be important to reflect on our capacity to work in an interdisciplinary way and to advance an understanding of citizen science as a subject in itself (*Relevant dimension: new research field and interdisciplinary*).

Additionally, it could be interesting to analyse if the training materials developed for the Accelerator could be seen as an innovation in how training on CS is carried out and if this will have an impact on the higher educational sector (*Relevant dimension: innovation in education*).

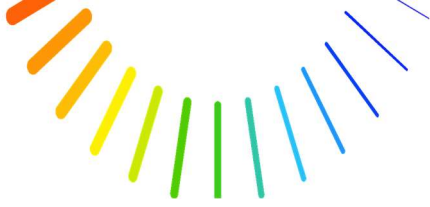
With reference to *social impact*, we want to assess if, and to what extent, IMPETUS is able to create a rich and diverse community around the project, and if it will facilitate networking and collaboration within this community and with external factors such as funders, decision makers and actors in the communication domain. One of the expected impacts of IMPETUS is to improve CS recognition among quadruplex-helix stakeholders (*Relevant dimensions: Community building and empowerment and Research and research community empowerment*). Under this dimension we will also investigate to what extent IMPETUS impacts on the consortium partners' ability to enlarge their networks and develop new partnerships.

We will monitor the type of actors engaged and reached (researchers from within and outside the academia, NGOs and grassroots organisations, etc), disciplines represented, nationalities and genders to ensure that our way of proceeding is an inclusive one (*Relevant dimension: social inclusion*).

We also expect the Accelerator to substantially increase the skills and competences of the supported CSIs (*Relevant dimension: knowledge skills and competences*). To this end we developed a set of surveys that we use to analyse the journey of all the participants in the Accelerator to monitor their learning progress (see annex 5).

We will consider, as we did in ACTION, the *economic impact* of IMPETUS on the partner organisations. We will analyse if IMPETUS allows partners to enlarge their teams (*Relevant dimension: Impact on employment*), to increase or differentiate their revenues (for example by developing new services) and to attract additional funding (*Relevant dimensions: Income and revenue generation for partner organisations*).

We also added the dimension "impact on symbolic capital", i.e. the benefits, the non-material richness that come with recognition, prestige and reputation (Bourdieu, 1989). This immaterial "capital" is important at a social level and opens up to further economic opportunities. Participating in IMPETUS can be an opportunity to improve visibility and recognition and also to increase the trustworthiness of partner organisations. This can facilitate connections and collaborations with new stakeholders and institutions.



The last area of impact, *political impact*, will mainly focus on the project's ability to impact local, but especially national and international, decision makers and funding bodies. We expect this to happen in two ways: firstly, by promoting the value that CS can bring to policy making, policy implementation and evaluation and, secondly, by fostering sustainable ways of supporting CSIs initiatives via dedicated policies and funding opportunities. This will mainly be achieved through the project advocacy and awareness raising work carried out in WP4.

We do not expect the project to have an environmental impact and for this reason the corresponding impact area is not included in the methodology.

6.1 Data gathering and analysis

The analysis of the impact of the IMPETUS project as a whole will be done in the last six months of the project but the related data gathering started already. There are three main data streams supporting this assessment:

- Information extracted from project reporting and deliverables
- Monitoring tools which have been developed and are being used, especially for the assessment of the Accelerator's impact on CSIs teams' skills and competences
- Information gathered on a yearly basis from project partners via specific templates. A dedicated survey will be developed towards the end of the project for collecting additional information as needed.

In addition to this, it is important to mention that the impact assessment team is also supporting the overall monitoring of the project, and this will provide access to additional relevant information. More specifically, we carry out regular Reflexivity Workshops. These consist of online or face to face meetings in which we guide the consortium to collaboratively reflect on the activities carried out and how to improve them. Topics such as interdisciplinarity, engagement with quadruplex helix stakeholders and policy impact will be also discussed in these workshops.

The data collected will be analysed at the aggregated, consortium level and will be included in the final impact assessment report (D.5.3, due at M48). Whilst the report is due only at the end of the project, the analysis will be carried out on a yearly basis (and more regularly with reference to the evaluation of the impact of the Accelerator). This will enable us to provide intermediate results and use them to facilitate the maximum positive impact possible and the adjustment of activities if needed.



7. Conclusions and next steps

This document presented the IMPETUS approach to impact assessment by describing the methodologies that will be used for assessing the impact of the CSIs participating in the IMPETUS Accelerator, the methodology for assessing the impacts of the European Citizen Science Prize on the awarded CSIs and the methodology for assessing the impacts of IMPETUS as a whole.

It is important to underline once more that we do not consider the approach presented in this document as final. Indeed, in the next months we will monitor how CSIs use the methodology, the difficulties they might encounter and the alignment of the methodology with the training and mentoring support their might needs. This will give us the possibility to understand if and to what extent improvements are needed both at methodological level and with reference to the data gathering tools we are providing them.

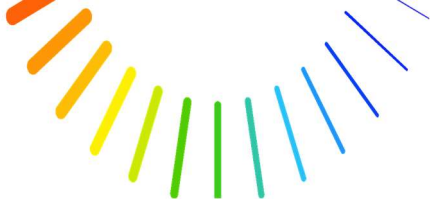
Another alignment that will be constantly monitored is the one between the training and mentoring carried out in the Accelerator and the impact assessment methodology. Indeed, it is important, on the one hand to monitor if our training influences the CSIs in their activities and outputs and, on the other hand, to assure that the terminology used in the training is the same of the impact assessment. This will ease the data gathering process for us and give a sense of coherence to the CSIs. Another element that will need attention in the next update of the methodology is the assessment of CSI impact on Green Deal targets that is not yet fully explored in this version of the methodology.

The methodology for CSIs impact assessment will be updated before the beginning of each of Accelerator circle and by the end of the project. The methodology for the assessing the Prize' impacts, similarly, will be updated before the award ceremony²⁹ of each edition of the Prize.

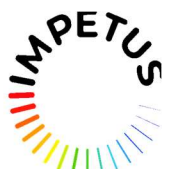
This deliverable is complementary with D5.2 that describes the IMPACT dashboard. The IMPACT dashboard, a series of infographics, will visualise the results of the impact assessment activities related to the Accelerator's CSIs and the Prize. It will be available on the IMPETUS website and will provide updates on the impacts achieved during the project lifetime. A final impact assessment report (D5.3) will be released by the end of the IMPETUS project (June 2025) and will include the results of all the impact assessment activities.

Finally, it is worth mentioning that the impact assessment activities are accompanied by monitoring activities. Impact and monitoring activities will support the IMPETUS consortium in improving its work and will provide useful information on the overall

²⁹ This because the data gathering for this assessment happens only some months after the award ceremony and the methodology might be influenced by the typology and topic of the awarded CSIs.



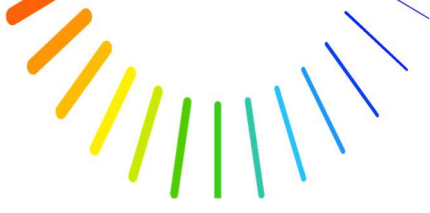
project achievements. Additionally, they will also serve as an input to the project dissemination work and to inform the exploitation activities.





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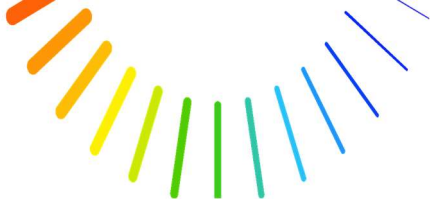
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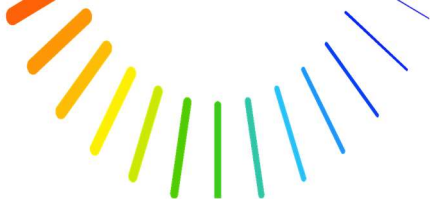
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Annex 1 – IMPETUS impact assessment canvas



IMPETUS citizen science impact assessment canvas

<p style="text-align: center;">Key problem you want to address</p> <p>What social, economic, environmental problem are you trying to (contribute to) solve?</p> <p><i>Example: Air pollution, especially that generated by private vehicles, in Turin (Italy)</i></p>	<p style="text-align: center;">Key research question</p> <p>What is the main research question addressed by your CS project?</p> <p><i>Example: how does private mobility traffic impact on air quality in specific areas of the city and in specific moments of the day?</i></p>
<p style="text-align: center;">Key stakeholders</p> <ul style="list-style-type: none"> • Researchers <i>Representing which disciplines? Junior or senior?</i> • Citizen scientists <i>Do you foresee engaging any specific social group? Is your project working towards inclusiveness? What is the gender distribution in your group of citizens: female/male/not disclosed/other?</i> • Policy/decision makers <i>Are you targeting local/national or international policy/decision makers?</i> • Business actors <i>Will your project provide input to business actors? Are you collaborating with business actors as part of your project?</i> • Other organisations <i>Will you collaborate with other organisations? What kinds of organisations can benefit from the project's activities/results?</i> • General public <i>Do you foresee reaching local, national or international audiences?</i> 	



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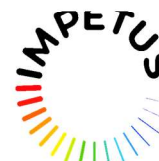
<p>Input</p> <ul style="list-style-type: none"> • Where are you starting from? • What was there before the beginning of the project? • What are the economic/technical and human resources you will use? How much do they cost? <p><i>Example: this project is the continuation of a previous one, we already have 200 CS engaged and 5 lead researchers</i></p>	<p>Activities</p> <ul style="list-style-type: none"> • What will you do? • What do you do to engage your stakeholders? <p><i>Example: Air quality monitoring with low-cost DIY sensors. 5 events. 3 training workshops</i></p>
<p>Outputs</p> <ul style="list-style-type: none"> • What are the tangible results you expect to deliver? • How many people do you aim to engage? • How many people do you aim to reach through communication? • How many policymakers do you expect to contact? <p><i>Example: a new version of our air quality measurement sensor; a curated dataset; 3 publications. 500 CS engaged. 1k citizens reached.</i></p>	<p>Short-terms and long-term impacts</p> <ul style="list-style-type: none"> • What positive changes do you expect for your stakeholders? • Which areas of impact are more relevant? (see IMPETUS impact assessment framework in the next page) • Which dimensions are more relevant? (see IMPETUS impact assessment framework in the next page) <p><i>Example: citizens will be more aware of air quality, better informed on how to reduce their exposure, 10% will change their mobility behaviours. Policy makers will change mobility policies. Papers deeply up taken by researchers in the field.</i></p>



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Assign a value from 1 to 5 to each areas of impact and to the related dimensions
(1 is not relevant/we do not aspect impacts. - 5 is very relevant/will be a crucial impact)



Scientific impact	Value
Scientific knowledge	
New research fields and interdisciplinarity	
New knowledge resources	
Innovation in education	

Political impact	Value
Impact on policies	
Political participation	
Self-governance	
Political support for citizen science	

Social impact	Value
Community building and empowerment	
Social inclusion	
Researchers and research community's growth and empowerment	
Knowledge, skills and competences	
Changes in way of thinking, attitude and values	
Behavioural change	
Impact on health and wellbeing	



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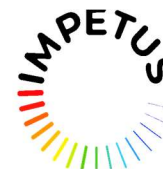


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Economic impact	Value
Impact on employment	
Cost saving	
Income and revenue generation for leading organisations	
Economic impact on the local communities	

Other impacts	Value
Please specify.....	
Please specify.....	

Environmental Impact	Value
Impact on ecosystem	
Impact on biodiversity	
Impact on soil quality	
Impact on water quality	
Impact on air quality	
Impact on environmental awareness	



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Indicate the SDGs your project can potentially have an impact on, and how this may happen

Link to the SDGs, targets, and indicators: <https://sdgs.un.org/goals>



SDG	Target	Indicator	How				
			Data provision	Policy impact	Behavioural change	Development of new indicators	Other
<i>Example: SDG 6 - Ensure availability and sustainable management of water and sanitation for all.</i>	<i>6.3. By 2030, improve water quality by reducing pollution, eliminating dumping and minimising release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.</i>	<i>6.3.2. Proportion of bodies of water with good ambient water quality.</i>	X	X			



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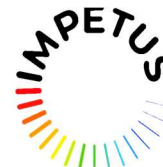


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Annex 2 - Gap analysis and definition of RRI indicators for the IMPETUS methodology

The MoRRI Framework (Meijer and van de Klippe, 2020) identifies six key pillars of RRI: public engagement, science literacy and education, gender equality, open access, ethics, and governance. In what follows, we provide a brief description of each area.

Based on the definition of **public engagement** provided by the European Commission (i.e., “co-creating the future with citizens and civil society organisations, and also bringing on board the widest possible diversity of actors that would not normally interact with each other, on matters of science and technology”), five different dimensions of public engagement are pointed out:

- Public communication: scientific communication and dissemination activities to the general public.
- Public activism: advocacy and policy dialogue with decision-makers in the form of a call for action following public needs.
- Public consultation: interacting with decision-makers in the form of an informative dialogue.
- Public deliberation: proposing venues to encourage group deliberation regarding policy-related scientific works.
- Public participation: offering occasions for the public to co-design and co-develop scientific work.

The second pillar is related to the previous one, but focuses on **science literacy and education**, i.e. the understanding and capability to discuss science. In this vein, three key dimensions are highlighted:

- Science education: presenting scientific works, as well as introducing norms and values of science, especially to the young public.
- Science communication (1/2): bridging the gap between citizens and science by creating awareness among them.
- Science communication (2/2): developing new forms of collaboration with citizens aimed to co-design and co-produce scientific work.

Within the MoRRI project, **gender equality** is recognised as a social construct, thus structurally related to social practices. Three different dimensions are distinguished:

- Gender balance in research teams: addressing gender gaps in the composition of research teams, by considering different stages of the research process.

- Gender balance in decision-making environments: ensuring an even composition of juries, panels, and any other decision-making body, in terms of gender.
- Gender dimension in the R&I context: shedding light on gender-specific concerns during the knowledge creation process.

The concept of **open access** refers to policies and conditions aimed at opening research processes, data, and outputs to all. Two different dimensions of open access are considered:

- Instrument for publications: monitoring and improving open access publication practices in scientific journals and repositories.
- Research data: making data available and replicable in accordance with the FAIR (findable, accessible, interoperable, and reusable) principles of open science.

The **ethics** pillar is built on the concepts of openness, transparency, and involvement of diverse and marginalised groups. Based on that, three dimensions are defined:

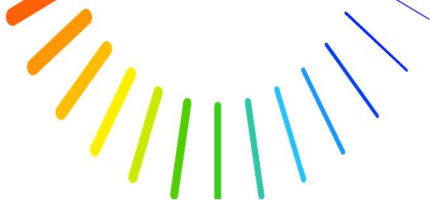
- Ethical governance: establishing ethical commissions and codes of conduct in R&I activities to ensure a process of institutionalisation of ethics.
- Ethical deliberation: encouraging the discussion on scientific aspects between diverse and multidisciplinary groups, possibly in advisory bodies.
- Ethical reflection: creating opportunities to facilitate ethical reflections among social and academic groups.

Finally, the **governance** pillar is related to the establishment of goals, and forms of monitoring and management. Thus, most of the associated dimensions are not relevant for the CSIs as they originally related to funding bodies mainly and not to research organisations. More specifically, the first three dimensions presented below will be excluded from the IA Framework, while the last dimension (i.e., multidisciplinary collaboration) will be assessed at the CSI level.

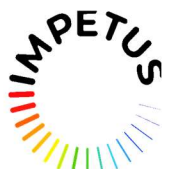
- Public deliberation: ensuring discussion and decisions-making processes to be compliant with criteria of transparency and democracy .
- Lay membership: encouraging the presence of external members in decision-making environments .
- Transparency guides: providing clear indications about data policies, as well as making people aware of the research objectives.
- Multidisciplinary collaboration: facilitating collaborations among multidisciplinary groups.

RRI dimensions and ACTION indicators

The mapping results and the linking between the RRI pillars and dimensions to the ACTION indicators is reported in Tab. 7. In particular, all the six RRI pillars have been divided into the related dimensions introduced above, as in Meijer and van de Klippe (2020). Then, each dimension has been divided in turn into sub-dimensions, which we



have proposed based on the description of the corresponding category provided in Meijer and van de Klippe (2020) or drawn from NEWSERA. The sub-dimensions are associated with specific indicators, many of which are already included in the ACTION methodology (shown in the fourth column of Tab. 7), or can be added by moving from NEWSERA indicators, or from our proposals (shown in the fifth column of Tab. 7). All indicators (both existing and new ones), are coloured according to the area of impact they fall in. The full legend is as follows: indicators are written in colours corresponding to the colours of the areas in the IMPETUS impact methodology, i.e., **red = scientific impact**; **orange = social impact**, **green = political impact**.





Tab. 7 - Linking RRI pillars and impact assessment indicators

RRI pillar	Dimension	Sub-dimension	ACTION indicators	External or new indicators
Public engagement	Public communication	Public meetings	N. of awareness level/dissemination events organised	
			N. of participants to organised events	
		Traditional social media and	N. of non-scientific publications	
			N. of persons/organisations reached through social media	
	Public Activism	Policy-oriented events	N. of meetings/conferences organised/attended for influencing policy makers.	
		Dialogue with policy-makers	Self-reported contribution to policy implementation and enforcement	
			Self-reported contribution to monitoring and evaluation of policy implementation	
	Public consultation	Round tables	Number of political events (e.g. rallies) organised/attended for involving wider actors	
	Public participation	Creative group formation	Facilitate knowledge creation among societal actors and groups	

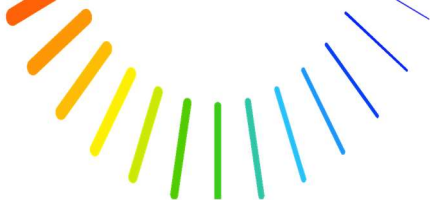
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		Financial support	Change in policy support and funding for citizen science	
		Citizen Scientist contribution	N. of citizens scientists engaged in project activities	
			Role of the citizen scientists in the participatory research process	
			Citizen scientists' participation and recognition in the scientific output	
Science literacy and scientific education	Science education	Educational innovation	Innovation in academic or school curricula	
				Innovation in (other) educational/training methods
	Science communication	Awareness of CS participants	Improvement in the self-perceived efficacy of citizen scientists	
		Interest and competence in science and technology among CS participants	N. of CS projects in which participants have been enrolled/are enrolled	
			Changes in the interest in science related topics and activities	
			Changes in the understanding of the scientific process	
Gender equality	Gender balance within research teams	Project's gender balance		Ratio of female researchers within the project (NEWSERA)



		Participant gender balance	Male/female share among participants	
	Gender balance in decision-making environments	Leadership		Presence of female leaders. (NEWSERA)
	Gender dimension in R&I content	Gender data gap		Sex- and/or gender disaggregated data collected. (NEWSERA)
		Scientific outputs' gender balance		Ratio of female co-authors of scientific outputs. (new)
Open access	Instrument publications for	Open access publications		N. of published articles/books/book chapters available in Open Access (new)
	Research data	Data policies	Research outputs' compliance with FAIR principles of open data.	
Ethics	Ethical reflection	Changing attitudes in ethical themes	Changes in way of thinking on environmental issues/concerns (NEPS scale)	
Governance	Transparency guides	Objectives of data collection		Level of participants' awareness about the objectives of their research. (Proposal)
	Multidisciplinary collaboration	Participant background	Self-reported level of interdisciplinarity.	N. of disciplines represented in the project team (new)



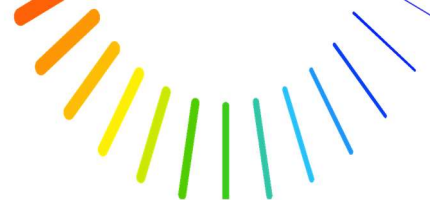
Annex 3 – IMPETUS impact assessment matrix

The figure in the next page is the IMPETUS impact assessment matrix. It guides the CSIs team in planning their impact assessment activities by indicating:

- Who will provide the data for the assessment?
- When the data gathering should (ideally) take place?

The answer to the first question is visualised with two icons, one representing the CSI team and one the volunteers. The second question is answered via the green and red icons in the right column. A green sign in the Ex-ante column means that the data should be gathered at the beginning of the engagement of the volunteers or before they start an activity the project wants to evaluate in terms of impact (for example a training workshop). A green sign in the ex-post column means that the CSI should gather the data at the end of their activities.

This visualisation is part of a bigger ones - developed using Mirò online platform for collaborative work - that provides IMPETUS CSIs will the information provided during the Impact assessment training at the bootcamp and will be kept updated by T6 so to provide the CSIs team any additional material we might develop.

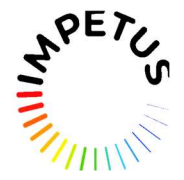


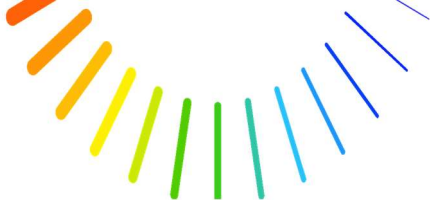
	Ex-ante?	Ex-post?
Scientific impact •Scientific knowledge •New research fields and interdisciplinarity •New knowledge resources •Innovation in education	 	✗ ✓ ✓ ✓
Social impact •Community building and empowerment •Social inclusion •Researchers and research community growth and empowerment •Knowledge, skills and competences •Changes in way of thinking, attitude and values •Behavioural change •Impact on health and wellbeing	 	✗ ✗ ✗ ✓ ✓ ✓ ✓
Economic impact •Impact on employment •Cost saving •Income and revenue generation for leading organisations •Economic impact on the local communities	 	✗ ✗ ✗ ✗
Political impact •Impact on policy process •Political participation •Self-governance •Political support for citizen science	 	✗ ✗ ✗ ✗
Environmental impact •Impact on ecosystem •Impact on biodiversity •Impact on soil quality •Impact on water quality •Impact on air quality •Impact on environmental awareness		✗ ✗ ✗ ✗ ✗ ✗



miro

Fig. 9 – IMPETUS impact assessment matrix



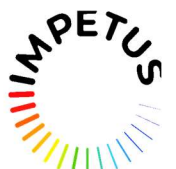


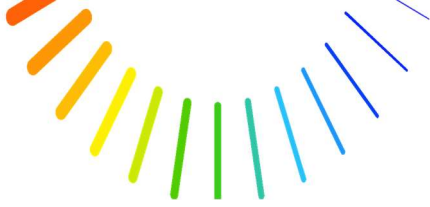
Annex 4 – IMPETUS impact assessment questionnaires

The link below opens a shared folder with the questionnaires developed for supporting IMPETUS CSIs in assessing their impacts. They are updates of the ones developed in the ACTION project³⁰.

<https://drive.google.com/drive/folders/1cM9biL4dSE2d3EfRWRv0aSwL2L5cCphY?usp=sharing>

³⁰ <https://www.zenodo.org/record/5938332>





Annex 5 – Accelerator monitoring surveys

In this annex we report 4 questionnaires that we used so far for monitoring the Accelerator activities. They are:

1. A questionnaire sent before the starting of the bootcamp for mapping training needs
2. A questionnaire sent after the bootcamp for evaluating it
3. A questionnaire to be sent after each of the training sessions that are following the Accelerator
4. A questionnaire to be sent after each Aperitive (networking and peer-learning event organised within the Accelerator)

At least one additional survey will be developed at the end of the Accelerator for assessing the overall opinion of participants on the training and the mentoring program. We report here the text of the surveys, they are not properly formatted, since we use Microsoft Form for distributing them to respondents.

1 - Mapping knowledge gaps and needs

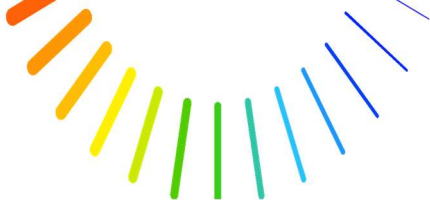
In order to better plan our training and mentoring activities, we need to know you a bit better. Please dedicate a few minutes to fill in this short survey. It aims to map your current knowledge about the topics we are planning to explore during the IMPETUS Accelerator Program and your expectations in terms of training and mentoring. Your answers will help us customise it.

We want the data collected to be anonymous, but at the same time we want to evaluate the Accelerator program for improving it. In order to do so we need to map your journey. We kindly ask you to pick a nickname that is not easy to link with you and your project. Note it down and don't lose it: you will need it again in the next few months.

Thank you for your time and support!

For information and questions about this questionnaire you can contact the responsible of this survey, Dr. Antonella Passani, at the following email address a.passani@t-6.it

1. Your nickname



2. Please read the following statement and tell us to what extent you agree or disagree with each of them. *Please assign a value from 1 to 5, where 1 is "Totally disagree" and 5 is "Totally agree".*

- I know how to set up a communication plan.
- I know how to engage media practitioners (journalists and alike).
- I know how to turn project activities/results into appealing stories.
- I know the principles and the good practices of Open Science.
- I know how to set-up and implement a data management plan.
- I know what data justice is and how to implement it.
- I know the principles and the good practices of citizen engagement in Citizen Science (CS) activities.
- I know how to facilitate social inclusion and diversity in CS activities.
- I know how to map, analyse and engage different stakeholders
- I know how to engage with policy-makers and influence policies and strategies related to our project.
- I know how to assess the different impacts of a CS project (scientific, political, economic, social,...).
- I am familiar with the Sustainable Development Goals and related targets and indicators.
- I am familiar with the European New Green Deal policy.
- I know how to ensure that our project tackles ethical aspects related to research and engagement processes appropriately.
- I know how to make a CS project scalable.
- I know how to make a project financially sustainable in the long run.

3. What would you like to learn during the IMPETUS Acceleration Program? What skills would you like to acquire or further develop?

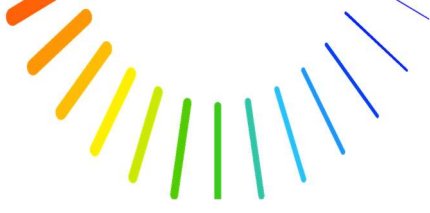
[Open question]

4. Beside the training, IMPETUS will support your project also via a mentoring program (you will regularly interact with an assigned expert). What do you expect from it? Are there specific topics you know you will need advice on?

[Open question]

5. For organisational reasons we would like to have all the training and online networking activities on a set day/time slot. Please select what options best fit with your agenda.

(multiple choices, possibility to select more than one option)



Thank you for your time!

For information and questions about this questionnaire you can contact the responsible of this survey, Dr. Antonella Passani, at the following email address: a.passani@t-6.it

2 - Bootcamp monitoring and evaluation

Now that the bootcamp is over, it is time to evaluate it and assess its impact on you!

Please dedicate a few minutes to fill in this short survey. Your feedback will help us better develop future training sessions and the next versions of the bootcamp.

We want the data collected to be anonymous, but at the same time we want to evaluate the Accelerator program for improving it. In order to do so we need to map your personal journey. We kindly ask you to use the nickname that you created for the first survey we send you before the bootcamp. However, since it is very important that the nickname is not easy to link with you and your project, please change the previous one if it is too obvious. Note it down and don't lose it: you will need it again in the next few months.

Thank you for your time and support!

For information and questions about this questionnaire you can contact the responsible of this survey, Dr. Antonella Passani, at the following email address a.passani@t-6.it

1. Your nickname

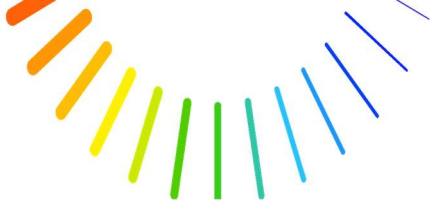
.....

2. How would you describe your disciplinary background?

.....

3. Considering the project you are developing as part of the Impetus accelerator, is this your first Citizen Science project?

- Yes - No

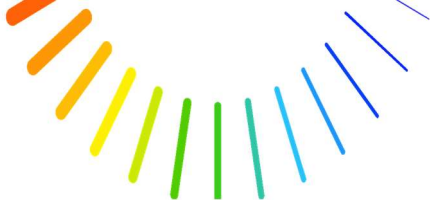


4. Please read the following statement and tell us to what extent you agree or disagree with each of them. *Please assign a value from 1 to 5, where 1 is "Totally disagree" and 5 is "Totally agree"*. If you didn't participate in the session related to the topic mentioned in a statement, please select the option "not applicable".

- Bootcamp trainings increased my knowledge on how to set up a communication plan.
- Bootcamp trainings increased my knowledge on how to engage media practitioners (journalists and alike).
- Bootcamp trainings increased my knowledge on how to turn project activities into appealing stories.
- Bootcamp trainings increased my knowledge on principles and practices of open science.
- Bootcamp trainings increased my knowledge on how to set-up a data management plan.
- Bootcamp trainings increased my knowledge on what data justice is and how to implement it.
- Bootcamp trainings increased my knowledge on principles and practices of citizen engagement.
- Bootcamp trainings increased my knowledge on how to guarantee social inclusion and diversity.
- Bootcamp trainings increased my knowledge on how to engage stakeholders from civil and scientific society.
- Bootcamp trainings increased my knowledge on how to engage policy-makers and influence their strategies.
- Bootcamp trainings increased my knowledge on how to assess the impact of the project.
- Bootcamp trainings increased my knowledge on the SDG framework and the New Green Deal policies.
- Bootcamp trainings increased my knowledge on how to comply with the ethical aspects of research and CS.

5. Please read the following statement and tell us to what extent you agree or disagree with each of them. *Please assign a value from 1 to 5, where 1 is "Totally disagree" and 5 is "Totally agree"*. If you didn't participate in the session related to the topic mentioned in a statement, please select the option "not applicable".

- Bootcamp trainings increased my interest in communication and dissemination practices.
- Bootcamp trainings increased my interest in open science.
- Bootcamp trainings increased my interest in data justice.
- Bootcamp trainings increased my interest in citizen engagement practices
- Bootcamp trainings increased my interest in practices for inclusivity and diversity management.
- Bootcamp trainings increased my interest in stakeholder engagement practices
- Bootcamp trainings increased my interest in advocacy and policy dialogue.
- Bootcamp trainings increased my interest in impact assessment.
- Bootcamp trainings increased my interest in SDGs and Green Deal policies.
- Bootcamp trainings increased my interest in ethics of research.



6. Please rate the quality of the sessions you participated in by assigning a value from 1 to 5. If you didn't participate in the session mentioned in a specific statement, please select the option "not applicable".

- Impact Assessment theoretical session
- Impact Assessment practical exercise
- EDI - Equity, Diversity, Inclusivity theoretical session
- EDI - Equity, Diversity, Inclusivity practical exercise
- Citizen engagement strategies theoretical session
- Citizen engagement strategies practical exercise
- Policy theoretical session
- Communication strategies theoretical session
- Communication strategies practical exercise
- Open science, Data Management Plan, Ethics theoretical session
- Open science, Data Management Plan, Ethics practical exercise

7. What did you like about the bootcamp?

.....

8. What can be improved?

.....

9. Thinking at the next steps in the Accelerator, what are the topics you would like to have training on?

.....

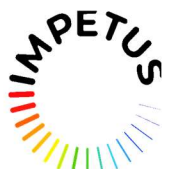
Thank you for your time!

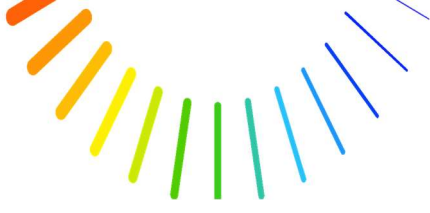
For information and questions about this questionnaire you can contact the responsible of this survey, Dr. Antonella Passani, at the following email address: a.passani@t-6.it

3 - Training session evaluation

Please dedicate a few minutes to fill in this short survey. Your feedback will help us better develop future training sessions and the next versions of the bootcamp.

We want the data collected to be anonymous, but at the same time we want to evaluate the Accelerator program for improving it. In order to do so we need to map your personal journey. We kindly ask you to use the nickname that you used in previous surveys.





Thank you for your time and support!

For information and questions about this questionnaire you can contact the responsible of this survey, Dr. Antonella Passani, at the following email address a.passani@t-6.it

1. Your nickname

.....

2. How would you describe your disciplinary background?

.....

3. Considering the project you are developing as part of the Impetus accelerator, is this your first Citizen Science project?

- Yes - No

4. Which training session have you just attended?

.....

5. What did you like about the specific training session you have just attended?

.....

6. What can be improved?

.....

7. Please read the following statement and tell us to what extent you agree or disagree with each of them. Please assign a value from 1 to 5, where 1 is "Totally disagree" and 5 is "Totally agree". If you didn't participate in the specific training session, please select the option "Not applicable".

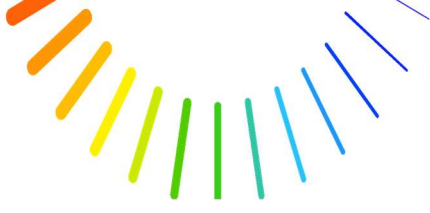
- The training session was very useful
- I learned something new
- The training session increased my interest for the subject proposed

8. Do you think you would need additional training on the topic of this specific session?

- Yes - No – Maybe

Thank you for your time!

For information and questions about this questionnaire you can contact the responsible of this survey, Dr. Antonella Passani, at the following email address: a.passani@t-6.it



4 - Aperitive evaluation

We value your opinion!

Please dedicate a few minutes to fill in this short survey. Your feedback will help us better develop future aperitives and the next versions of the bootcamp. We want the data collected to be anonymous, but at the same time we want to evaluate the Accelerator program for improving it. In order to do so we need to map your personal journey. We kindly ask you to use the nickname that you created for the previous surveys. Thank you for your time and support! For information and questions about this questionnaire

For information and questions about this questionnaire you can contact the responsible of this survey, Dr. Antonella Passani, at the following email address: a.passani@t-6.it

- 1 Your nickname
- 2
- How would you describe your disciplinary background?
- 3

- 4 Considering the project you are developing as part of the Impetus accelerator, is this your first Citizen Science project?
- 5 Yes - No
- 6 Please rate the organizational aspects of the Aperitive. Please attribute 1 star if you didn't appreciate it at all and 5 stars if you really liked it
- 7 How interesting was it? Please attribute 1 star if you think it was not interesting at all and 5 stars if it was very interesting
- 8 Please read the following statements and tell us to what extent you agree or disagree with each of them. Please assign a value from 1 to 5, where 1 is "Totally disagree" and 5 is "Totally agree"
 - The Aperitive was an occasion for learning something new to me
 - The Aperitive provided me with new ideas for improving my project
 - The Aperitive was a good networking opportunity
 - The Aperitive was a good peer-learning opportunity
 - The Aperitive was a good peer-learning opportunity
- 9 What did you like?
- 10 What can be improved?

Thank you for your time!

For information and questions about this questionnaire you can contact the responsible of this survey, Dr. Antonella Passani, at the following email address: a.passani@t-6.it

