The MICS Platform: Measuring the impact of citizen science

MICS
Measuring Impact of Citizen Science

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Background

Citizen science has the potential to impact across a range of different domains, including the areas of science, the economy, the environment, governance and society. However, whilst the potential impact of citizen science is well documented, limitations exist when attempting to measure it in a quantifiable way. Whilst attempts have been made, there remains no singular process to assess a citizen science project's impact, and to make comparisons with other projects, traditional science or the status quo. In response, we present **MICS: Measuring the Impact of Citizen Science**, an online platform and impact framework. MICS takes existing impact approaches and builds on them, providing an intuitive, quantitative method of measuring the impact of a project, highlighting both strengths to exploit and potential unexplored impacts yet to be realised.

The MICS project specifically aims to:

- Provide **comprehensive, participatory** and **inclusive** metrics and instruments to evaluate citizen science impacts;
- Implement an impact assessment knowledge-base through toolboxes for methods application, information visualisation, and delivery to **decision makers, citizens** and **researchers**;
- Improve the **effectiveness** of nature-based solutions through test-site development and citizen science tool validation;
- Generate new approaches that **strengthen** the role of citizen science in supporting research and development;
- Foster a citizen science approach to **increase** the extent to which policy makers take up scientific evidence through recommendations and guidelines.

The result is an integrated platform where these **metrics** and **instruments** are available for use by anyone involved in a citizen-science project wanting to understand its impact, whether at the planning stage or several years after the project's conclusion.

The MICS project adopts and adapts the **best practice** generated by the Ground Truth 2.0 project in the co-creation of hands-on citizen science validated in five case-study sites across Europe, resulting in a **comprehensive** conceptual framework and clear recommendations for those involved in citizen-science projects. The five sites (in the UK, Italy, Hungary and Romania) explore the co-creation of citizen science in regions with differing **needs, contexts**, and **approaches** to environment management (for example, river restoration and nature-based solutions), and with various levels of citizen-science application. For instance, in Western Europe, river restoration is increasingly carried out within an ecosystem-based management framework at river or catchment scale; in Southern Europe, river restoration tends to be issue-specific with some ecosystem relevance; in Central and Eastern Europe, river restoration is about ecosystem protection and related to existing infrastructure.

1. A repository of citizen science projects

The MICS platform will act as a **repository** for citizen science projects, representing the range of different examples that exist in terms of the **disciplines involved** and the **types of participation** possible.

Informed by the the ECSA characteristics of citizen science and following the COST action citizen science ontology, the platform will adhere to FAIR principles, allowing citizen science coordinators to both **share** their own activities and resulting impact and also **learn** from the actions and experiences of others.

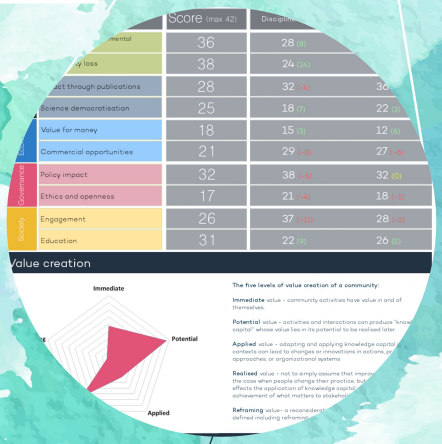
Users will be able to sort and compare projects and their impact based on the scientific discipline the research involves, the geographical area they represent, and other queryable characteristics. Examples of **best practice** will be available for all stages of the project, from design to completion.

2. A bespoke, configurable space to promote citizen science activities

Users of the MICS platform will be able to create a unique space for their citizen science project, **customisible** with branding and imagery, sharing a range of characteristic and descriptive data with other citizen science practitioners. A **novel** feature of the platform is its handling of location in the CS context. While existing platforms treat this as a singular field, MICS will recognise that location can have different meanings for different projects. To capture this, coordinators will be able to enter location in terms of management (partners, coordinator etc.), participants, or the data collected.

As part of the project space, progress towards measuring the impact of activities across different **societal** and **scientific** domains can be monitored and shared with other users. Gamification and completionist techniques (badges, levelling etc.) will be incorporated into the platform to encourage users to regularly update the measurement of impact throughout the project lifetime.

3. MICS impact assessment process



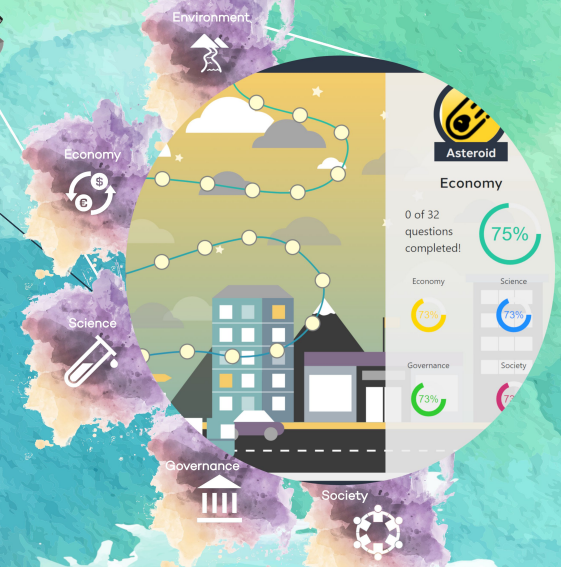
On completing the assessment process, the MICS platform will allow users to share their impact through tailored **visualisations** and **outputs**. Through the MICS algorithms (named *Alquimics*), impact is quantified acrossed the five domains (economy, environment, science, goverance, and society), allowing coordinators, decision-makers, citizens and other stakeholders to compare and contrast the results.

Two processes take place:

Rules-based: Created through hand-crafting (a labour-intensive technique for programming involving explicit rules and templates), in which MICS scientists wrote an extensive set of rules to guide artificial intelligence (AI) understanding. Assessment-guiding rules were written for subsets of each domain.

Machine-learning: For measuring impact across the domains more broadly, MICS uses a statistically-driven maching-learning approach (a type of AI that learns to perform a task by pattern-recognition in data), where the algorithm code teaches itself to asses impact through learning from the data. Machine learning is a superior method for tackling so-called classification problems, in which neural networks find unifying patterns in noisy data.

4. Quantifying and sharing impact



In order to capture and assess the impact of citizen science activities, the MICS platform uses over **200 specially curated questions** posed to the user (the project coordinator, owner or principle scientist). They are derived from a range of impact indicators drawn from a systematic and thorough review of existing impact literature (Wehn et al., 2021). The questions are sub-divided into 5 domains: **Environment, Economy, Science, Governance and Society**.

To ensure the questions are understandable and cover all scenarios, a **rigorous** and **iterative** user-testing process was conducted. Semi-structured interviews and workshops were performed with a number of coordinators of existing citizen science activities (Sprinks et al., 2021), gathering feedback and points of view to inform subsequent design decisions.

Answering over 200 questions can be a tiring task, so the MICS platform presents them in an **attractive** and **animated** interface, again utilising **gamification** and collectable mechanisms to encourage engagement. No question is compulsory, and the process is designed to combat any possible fatigue, allowing users to leave and return to the process as desired, and update previous inputs to reflect changes over time.

References:

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