Developing metrics and instruments to evaluate citizen science impacts on the environment and society

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Abstract (for dissemination)	This deliverable includes a set of indicators to facilitate the project follow-up, encompassing all MICS areas. These indicators refer to the assessment of project performance, progress and risks.
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Contents

1 Executive summary

This deliverable includes a set of key performance indicators to facilitate the project follow-up, encompassing all MICS areas. These indicators refer to the assessment of project performance, progress and risks. These indicators are summarized in a scoreboard (or scorecard) as a way to monitor project progress. This model is a way of monitoring the project progress monthly.

2 Introduction

Progress monitoring is a requirement in most projects. The MICS project will use a scoreboard to help understand project progress. A scoreboard (or scorecard) is made up of a series of graphs, summarising progress towards a set of key indicators. Presenting information in a graphical format makes it easier to digest numerical data and allows users to quickly gauge the project's overall performance across each of the indicators. A scoreboard is therefore a useful tool for the internal management and monitoring of the MICS project. MICS's scoreboard will also be used by the Consortium when it communicates with the European Commission.

The items included on MICS's scoreboard are the things that matter to the project and its stakeholders, and that will continue to be relevant throughout the life of the project. The key performance indicators used for the MICS project have been grouped into categories:

- innovation;
- management;
- dissemination;
- social impact and social return of investment;
- risk.

Each category will be represented in the scoreboard. This will help the management of MICS to balance performance across the different indicators. For example, it is no good having an amazing number of dissemination activities if project staff costs are spiralling out of control.

The Consortium can easily measure each of the MICS project indicators and will update the scoreboard monthly. The scoreboard will be a spreadsheet, which makes it easy to populate and regularly update. The spreadsheet will also be used to generate the graphs, bar charts and tables that make up the scoreboard.

3 Indicators

To facilitate EC's evaluation of MICS's contribution, a set of *key performance indicators* (KPIs) have been developed (see Table 1). The listed KPIs will be used for project internal management and monitoring, and for reporting to the EC. Periodic activity reports will give an account on these indicators: (1) to provide evidence that activities in the project are being performed effectively and

delivered to the highest standard, and (2), where necessary, to implement corrective actions. The MICS scoreboard may not directly address each of these indicators but will offer a quick visual summary across them all.

Table 1. Key performance indicators (KPIs)

Description
Innovation
1. **Number** of civic educators directly using MICS tools
2. Direct communication with **existing data portals**
Management
3. Deviation from original resources assignment (including staff costs) at partner level
4. Number of deliverables submitted on time and delayed. (deliverable schedule0
Dissemination
5. Number of dissemination actions (abstracts, papers or presentations) in highly-regarded (international and peer-reviewed) conferences
6. Number of project publications in highly-regarded (ranked in the JCR) journals
7. Number of workshops showing MICS technology, methodology and impact
Social impact and social return of investment
8. Citizen communities interested in using MICS results (excluding MICS pilot sites) [verification: requests for information on MICS services
Risk
9. A score given to the **level of risk** in the MICS project.

For each category identified, a series of KPIs that are measurable, actionable and visually understandable have been selected. For the first period, only the ones that can be quantified with the data available will be used to represent each category in the scoreboard. Additional indicators will be included as the project progresses and the functionality of each indicator will be assessed.

4 Scoreboard

The MICS project scoreboard will be a dynamic resource, which can be adapted as the needs of the project change. For example, in the initial phase of the project, the MICS toolbox will be in development. During this period, it would make little sense to display "**Number** of civic educators directly using MICS tools" on the scoreboard.

Other indicators, such as "Direct communication with **existing data portals"**, will remain largely unchanged. These static indicators are perhaps less suited to the dynamic and visual display of the scoreboard and other progress monitoring processes will capture them better.

An initial scoreboard display has been developed for the first phase of the MICS project (see Figure 1). This initial scoreboard is based on four main indicators: resource use, deliverable submission, dissemination outputs and project risk. These indicators are described in the next sections.

A drop down list on the left of the scoreboard allows the user to select a specific project month. The data displayed in the graphs then automatically updates to reflect the change in month. This allows

the user not only to examine the project progress for the current month, but also to revisit scoreboards from previous project months. In the scoreboard spreadsheet, for each graph there is a corresponding sheet where users can input indicator measures. For instance, Figure 2 shows the "Resources" sheet where each Consortium partner's monthly spending can be recorded.

4.1 Resources

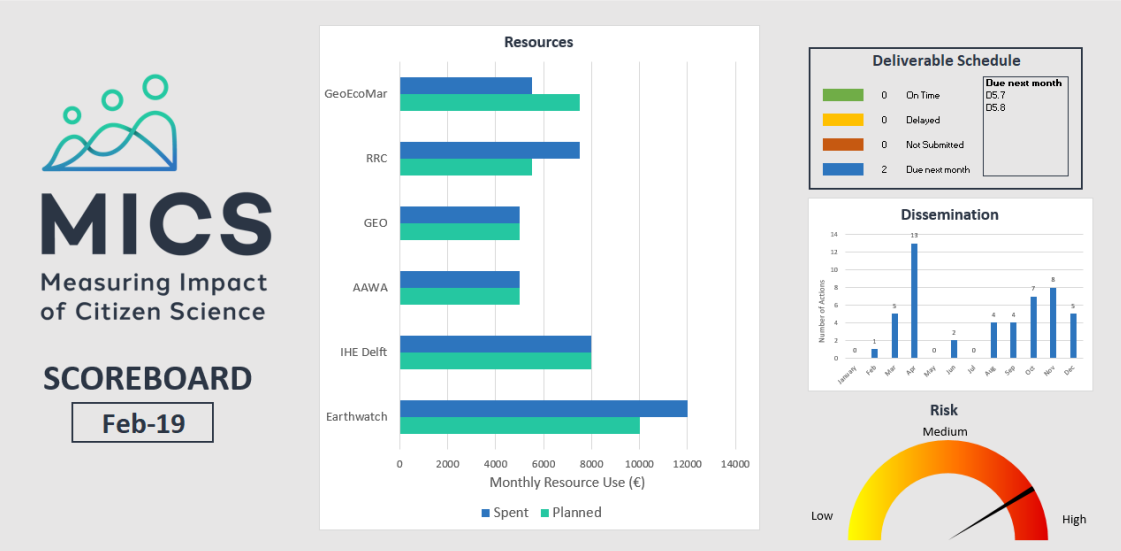
This indicator is found under the management category and refers to the budget used in the project. It compares the planned and the spent cumulative budget per partner from the beginning of the project until the selected month.

4.2 Deliverable schedule

This indicator is also included in the management category. It accounts for the deliverables and milestones submitted on time or delayed. It also informs about the deliverables due in the following month. This indicator is displayed on a table that summarises the number of deliverables submitted on time, delayed, not submitted and due that month.

4.3 Dissemination

This indicator provides input on the progress of the project regarding the number of presentations in conferences, publications in peer-reviewed journals and workshops. These metrics (which are displayed separately on the "Dissemination" sheet) are aggregated into one indicator in the scoreboard: number of dissemination actions.



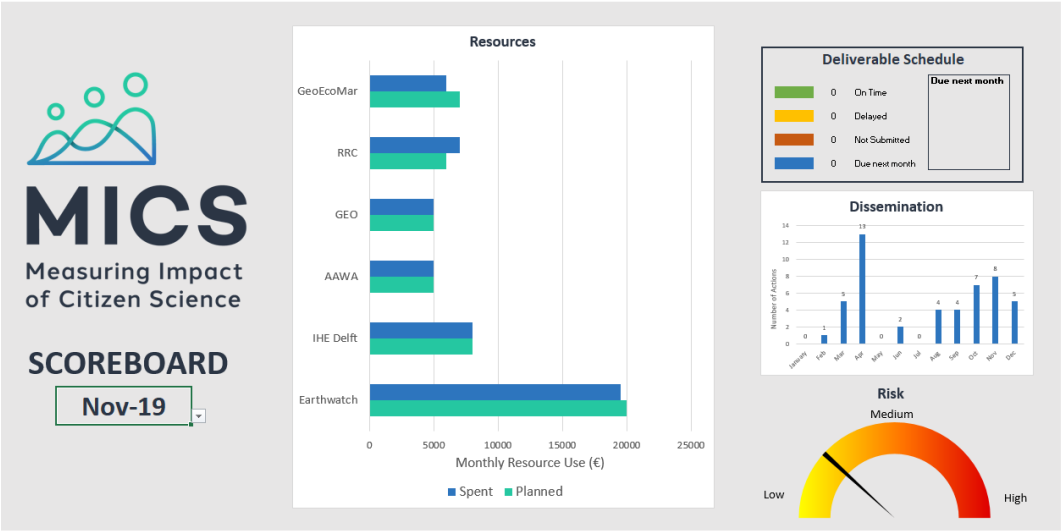


Figure 1. Examples of the MICS project scoreboard

4.4 Risk

The management of MICS will devote great attention to the early identification of risks at all project levels, either being these of technical or organisational nature, or being their implications on the ethical or IPR aspects of the project. Project risks are not easily quantified as indicators. Options to measure them will be discussed by the Consortium throughout the project. A list of critical project risks has been identified and will form the basis of this assessment (see Table 2). One option would be to allocate each risk to a "risk owner" who will monitor change in risk and the effectiveness of risk mitigation measures. Each month, the risk owners could then give a score for their allocated risk. This would give a quick quantitative indicator of risk and an indication of whether the high risks were concentrated in particular work packages. The Scoreboard shown above includes a risk meter, which indicates overall project risk as a weighted average of each identified risk.

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
21																	
22	Resources																
23			Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
24	Project	Planned	53000	41000	44000	44000	44000	47000	42000	46000	46000	41000	51000	41000			
25		Spent	54000	43000	45000	44500	44000	45500	41500	44000	45000	41000	50500	126000			
26	Earthwatch	Planned	20000	10000	10000	10000	10000	10000	8000	12000	12000	10000	20000	10000			
27		Spent	21000	12000	11000	10500	10000	8500	7500	10000	11000	10000	19500	95000			
28	IHE Delft	Planned	10000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000			
29		Spent	10000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000			
30	AAWA	Planned	5000	5000	5000	5000	5000	8000	8000	8000	8000	5000	5000	5000			
31		Spent	5000	5000	8000	8000	8000	8000	5000	5000	5000	5000	5000	5000			
32	GEO	Planned	5000	5000	8000	8000	8000	8000	5000	5000	5000	5000	5000	5000			
33		Spent	5000	5000	5000	5000	5000	8000	8000	8000	8000	5000	5000	5000			
34	RRC	Planned	5000	5500	6000	6500	7000	7500	8000	7500	7000	6500	6000	5500			
35		Spent	8000	7500	7000	6500	6000	5500	5000	5500	6000	6500	7000	7500			
36	GeoEcoMar	Planned	8000	7500	7000	6500	6000	5500	5000	5500	6000	6500	7000	7500			
37		Spent	5000	5500	6000	6500	7000	7500	8000	7500	7000	6500	6000	5500			
38																	

Figure 2. Resources data sheet in the MICS scoreboard spreadsheet

Table 2. Critical risks identification and mitigation (impact (imp.): H (high), M (medium), and L (low))

Risk description (likelihood)		WPs	Risk mitigation and contingency plan	Imp.
R01	Project start-up slower than expected due to delays in staff recruitment, resource or communication problems	WP1	Some potential staff has already been identified in most partners. The consortium has strong experience getting projects started quickly. Recruitment efforts would be increased, personnel transferred from other projects, and miscommunication avoided.	L
R02	Delay in the implementation or deployment of the necessary technologies emerging from WP3	WP3	A strong communication infrastructure, including in-person and online meetings as needed, reduces this risk. WP leaders and the Project Coordinator will address this problem and reduce damage from delays; they may shift personnel or tasks to fix the problem. The Project coordinator increases support to GeoEcoMar.	H
R03	Consortium conflicts	All	Part of the consortium has worked together before. The Consortium Agreement and other measures further reduce likelihood of risk. Contingency measures are implemented in the Grant Agreement and Consortium Agreement.	M
R04	Degraded data delivery by communities, or no data due to insufficient community activity	WP4	The mobilisation efforts would be increased. The use of existing non—citizen-science data, would compensate this risk in the initial part of the project.	M
R05	Integration failure: different components cannot be integrated because of a problem that was not anticipated	WP2 WP3	Technical issues would be prominent in meetings. Technical integration meetings would be organised to clarify technical diagrams that include interconnectivity issues, file formats, and other details to anticipate further problems.	L
R06	Pitfalls in quality control	WP2 WP3	Quality control procedures are well documented in the literature and have received a lot of attention in the development of citizen-science platforms.	M
R07	Reluctance of citizens in monitoring and other activities due to technological barriers or perceived scientific gaps in education	WP4	Technologies will be pre-tested by volunteers of different educational level. Analysis and evaluation will provide feedback on possible barriers and gaps. The results will be utilized to improve the communication material and scientific mentorship will be increased.	H
R08	Insufficient activation of communities due to untrained personnel	WP4	The mentorship by MICS personnel would be increased. Training material for communities would be reworked based on the experience gathered and intensified training would be offered to new communities to be included in MICS.	H
R09	Data collected have high quality, but insufficiently cover the target area or have temporal gaps	WP4	The situation would be carefully documented and a realistic scenario of “complete data collection and monitoring” would be developed to demonstrate the potential of the proposed activities.	H
R10	The system data storage and the software platform components have some incompatibility	WP3	Early communication with system platform designers would ensure compatibility for all proposed functionality.	L
R11	Copyright issues surrounding the hosting of (derived products of)	WP3	Troublesome datasets would be removed from the project’s hosting system.	L

	external data / reference layers in the MICS system			
R12	Failure to agree on a business model for commercial exploitation	WP5	The early identification of potential commercial opportunities is important. This will be facilitated within the first months of the project, and regularly updated. As opportunities emerge, the expectations of the relevant partners will be identified and documented. Any potential conflicts in expectations will be flagged. Meetings will be arranged between the partners in order to clarify the issues and seek resolution. Dialog will be the main tool for identifying each partner's views and then facilitating compromise and resolution. If necessary, resources will be reallocated to enable arbitration to take place.	M
R13	Project partners retain the know-how developed/acquired in the scope of the project, in order to protect their individual IPR	WP5	The consortium will pay strong attention to all legal/IPR implications emerging from the developments of MICS. It is therefore foreseen that these issues would be tackled in the periodic reporting at WP level and as a constant point for review in the Steering Committees meetings.	M
R14	Failure to identify a suitable test and validation site	WP4	Efforts to identify it would be increased. If no site is clearly identified and activated by Month 06, the full WP4 budget of the responsible partner will be transferred to another partner able to identify and activate an additional site.	H

5 Final considerations

The KPIs selected and their display on the scoreboard will be evaluated during the first year of the project as the functionality of this first version is tested. This will lead to adjustments that will result in an improved fully functional scoreboard before the end of the first period of the project.

6 List of abbreviations

KPI Key Performance Indicators