CISAMS: Integrated Circularity and Sustainability Assessment of Manufacturing Systems

Deliverable 9: Project Workshop

Greece 2.0
Basic Research Financing Action
(Horizontal support of all Sciences)
Sub-action 1
Funding New Researchers
M22

H.F.R.I. Hellenic Foundation for Research & Innovation
Greece 2.0 NATIONAL RECOVERY AND RESILIENCE PLAN
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Authors	Eleni Aretoulaki
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REVISION HISTORY			
Version	**Date**	**Author(s)**	**Changes made**
0.1	18/12/2025	Eleni Aretoulaki	Initial draft submitted for review
1.0	22/12/2025	Athanasios Rentizelas, Eleni Aretoulaki	Report reviewed, finalised and ready for submission

Contents

1 EXECUTIVE SUMMARY

This deliverable documents the CISAMS Project Workshop, implemented as Deliverable D9 under WP5 (Dissemination and Communication Management). The workshop constituted a key public dissemination and stakeholder engagement activity near the end of the project, while also contributing directly to the validation of the CISAMS integrated assessment framework, in alignment with the objectives of WP4.

The workshop was organised as an online event on 17 December 2025, from 11:00 to 13:00 (EET, Greece), using Microsoft Teams. Registration was managed through Eventbrite, ensuring transparent tracking of interest and attendance. A total of 34 registrations were recorded, with 28 participants joining the live session, indicating a high engagement rate. The working language of the workshop was English. Dissemination and outreach were carried out through a combination of LinkedIn posts and direct email invitations to relevant academic and industrial stakeholders.

The audience consisted primarily of academics and researchers, complemented by manufacturing-sector representation, which is consistent with the intended stakeholder mix of the project. Participants reported moderate to high familiarity with sustainability assessment frameworks such as LCA, ESG and circularity metrics, indicating that the feedback collected during the workshop was informed and relevant for methodological validation.

Overall, the workshop confirmed the clarity, relevance and innovation of the CISAMS framework and provided structured feedback to inform its refinement and future development.

CISAMS WORKSHOP Snapshot:

- Format: Online (Microsoft Teams)
- Date: 17/12/2025
- Time: 11:00–13:00 EET (Greece)
- Registration platform: Eventbrite (https://www.eventbrite.com/e/cisams-tickets-1975995198832)
- Registrations (orders): 34
- Attendees (joiners): 28
- Language: English
- Keynote speaker (invited): **George Mavraganis** (Strategic Planning & Sustainability Director, Copper Segment, ELVAL HALCOR S.A.)
- Validation poll tool: Administered using the online tool Wayground (https://wayground.com/join)

2 WORKSHOP STRUCTURE, CONTENT & AGENDA

The workshop followed a structured two-hour agenda designed to guide participants from contextual framing to detailed methodological presentation and interactive validation.

The session opened with welcome remarks by **Assoc. Prof. Athanasios Rentizelas (Principal Investigator, NTUA)**, who introduced the CISAMS project, its objectives and the rationale for integrating circularity with environmental and social sustainability assessment.

A keynote presentation was delivered by **George Mavraganis**, Strategic Planning and Sustainability Director (Copper Segment) at **ELVAL HALCOR S.A.**, entitled *"Sustainability and circularity in the metals industry: Key challenges and trends"*. The keynote provided an industry-based perspective on current sustainability challenges, reinforcing the relevance of integrated assessment approaches such as CISAMS for strategic decision-making in manufacturing.

The core part of the workshop focused on presenting the **CISAMS project outcomes**. **Dr. Eleni Aretoulaki** introduced the overall methodology and integrated framework, explaining the conceptual structure of the three assessment pillars and their role in decision support. **Dr. Kostas Florios** then presented the internal structure and logic of the integrated assessment method, clarifying how pillar-level scores are combined and how rankings are generated. **Efthymis Simos** concluded the technical presentations with a **case study demonstration**, illustrating the application of CISAMS in practice and supporting interpretation of the results.

An open **Q&A and discussion session**, moderated by Assoc. Prof. Athanasios Rentizelas, allowed participants to raise questions focusing on clarity, applicability and potential use cases of the framework.

The workshop concluded with an **interactive validation session** using **Wayground live polls**, facilitated by Dr. Eleni Aretoulaki. This segment captured structured feedback on multiple aspects of the CISAMS framework, including clarity, usefulness, flexibility, interpretability and perceived innovation. The workshop's high-level agenda is provided as follows:

Duration: ~2h00 min, Times (EET)

- **11:00 – 11:15 | Welcome & Opening (15 min)**

Assoc. Prof. Athanasios Rentizelas (PI) – Welcome, CISAMS overview and workshop objectives

- **11:15 – 11:40 | Keynote / Scene Setting (25 min)**

George Mavraganis, Strategic Planning and Sustainability Director - Copper Segment, ELVAL HALCOR S.A.

"Sustainability and circularity in the metals industry: Key challenges and trends"

- **11:40 – 12:30 | CISAMS Project outcomes (50 min)**

Eleni Aretoulaki – Methodology and integrated framework (20 min)

Kostas Florios – Internal structure and logic of the integrated method (10 min)

Efthymis Simos – Case study demo and results (20 min)

- **12:30 – 12:40 | Q&A and Discussion (10 min)**

Moderated by **Prof. Athanasios Rentizelas** – Participants raise questions followed by a focused discussion on clarity, practical relevance and applications of CISAMS

- **12:40 - 12:55 | Audience Reaction & Method Validation Polls (15 min)**

Wayground – 15 short polls **– Eleni Aretoulaki**

- **12:55 – 13:00 | Closing Remarks (5 min)**

Prof. Athanasios Rentizelas – Closing reflections and next steps

3 PARTICIPATION, VALIDATION APPROACH & WORKSHOP IMPLEMENTATION

Participation in the CISAMS Project Workshop was open to academic, research and industrial stakeholders with an interest in circular economy and sustainability assessment in manufacturing systems. Registration was managed through the Eventbrite platform, enabling transparent tracking of interest and attendance. Examples of dissemination materials and registration statistics are provided in Appendix A. The dissemination campaign of the event was performed primarily through Linkedin, where it was posted under the accounts of 1. The CISAMS project, 2. The ORLOG laboratory of NTUA, 3. The official social media of the Mechanical School of the NTUA (Linkedin and Facebook) 4. The PI Linkedin profile (Athanasios Rentizelas), and 5. The researcher profiles. Additionally, some personal invitations were sent by the PI via email.

The workshop attracted a total of 34 registrations, with 28 participants joining the live session, indicating a high engagement rate. Participants primarily represented academic and research institutions, complemented by targeted participation from the manufacturing sector, in line with the intended stakeholder mix of the project.

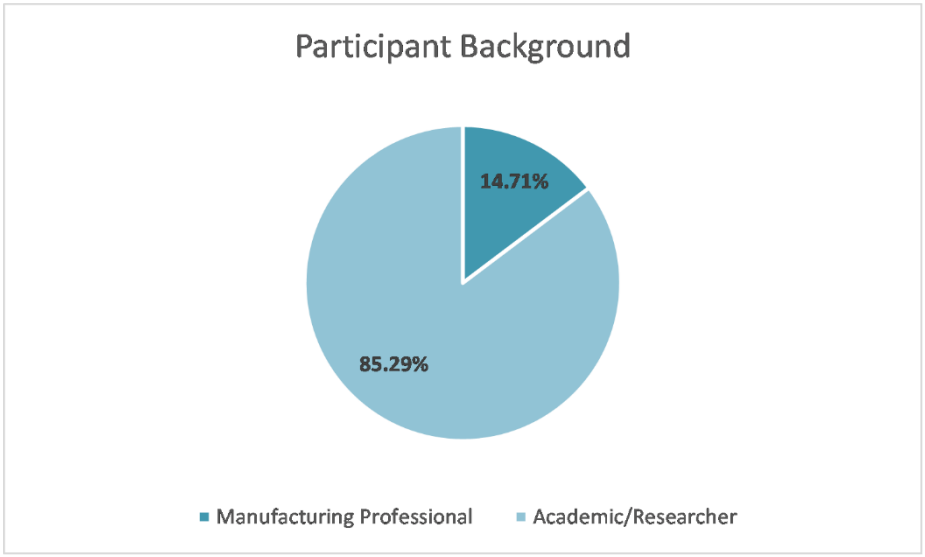
Validation of the CISAMS framework was conducted through a structured, interactive approach embedded within the workshop. Following the presentation of the methodology and case study demonstration, participants were invited to provide feedback via live validation polls implemented using the Wayground platform. The polls covered clarity of explanation, integration of sustainability dimensions, usefulness, relevance, interpretability, flexibility, innovation and perceived barriers to application. This approach enabled immediate, structured collection of stakeholder feedback.

In addition to the keynote contribution, an industry representative from the plastics manufacturing sector, who was directly involved in the CISAMS case study development, actively participated in the discussion and validation segments, providing practitioner-oriented feedback during the Q&A and poll-based validation process.

4 OUTCOMES & VALIDATION RESULTS

The validation results presented in this section are based on structured participant feedback collected via live Wayground polls. The full set of validation questions is provided in Appendix B.

Participant background was assessed to contextualise the feedback received. The majority of participants identified as academics or researchers, with targeted representation from the manufacturing sector. Participants also reported moderate to high familiarity with sustainability assessment frameworks such as LCA, ESG and circularity metrics, indicating that the validation feedback was provided by an informed audience (Figure 1).



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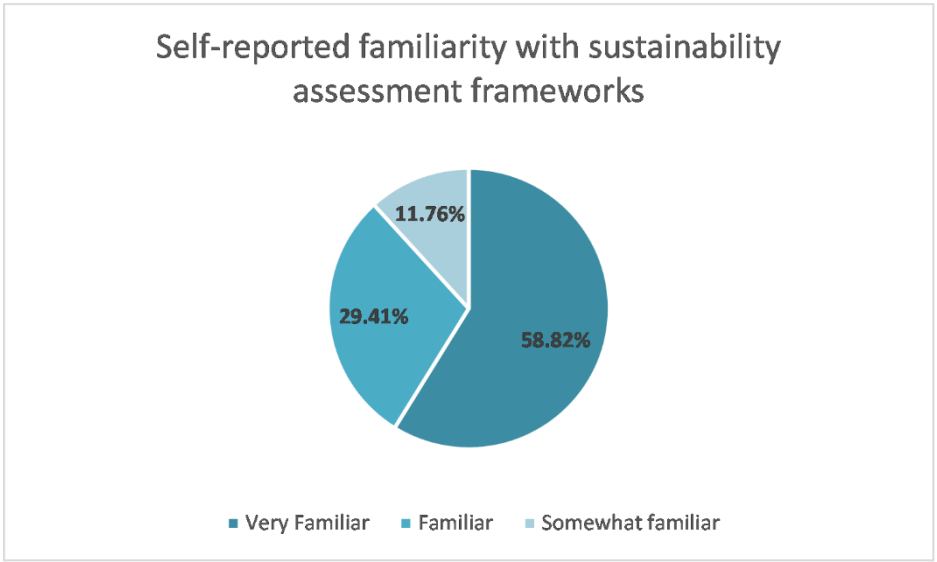

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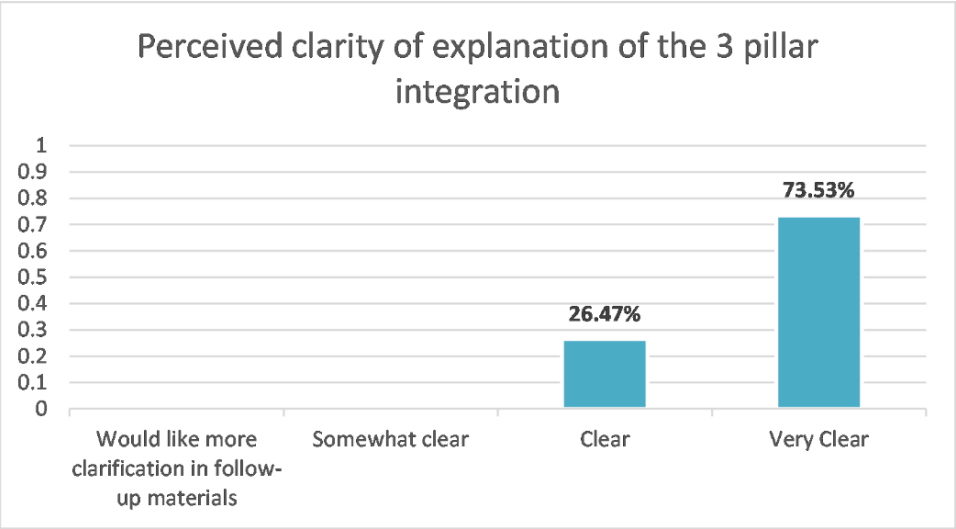
Figure 1. Participant background, showing (a) professional role and (b) self-reported familiarity with sustainability assessment frameworks

Overall, the CISAMS framework was received very positively by workshop participants. Responses to the validation polls indicate a high degree of clarity and coherence in the presentation of the framework. A very large majority of participants rated the explanation of the CISAMS framework as clear or very clear, while the integration of circularity, environmental sustainability and social sustainability was rated as effective or very effective by almost all respondents. This provides strong validation of the conceptual structure and methodological logic of the framework (Figure 2).



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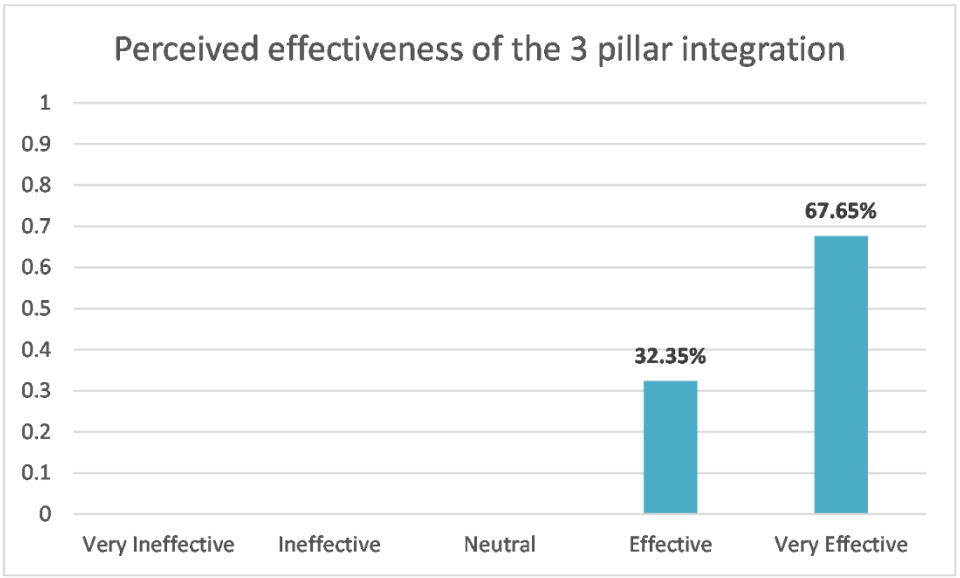

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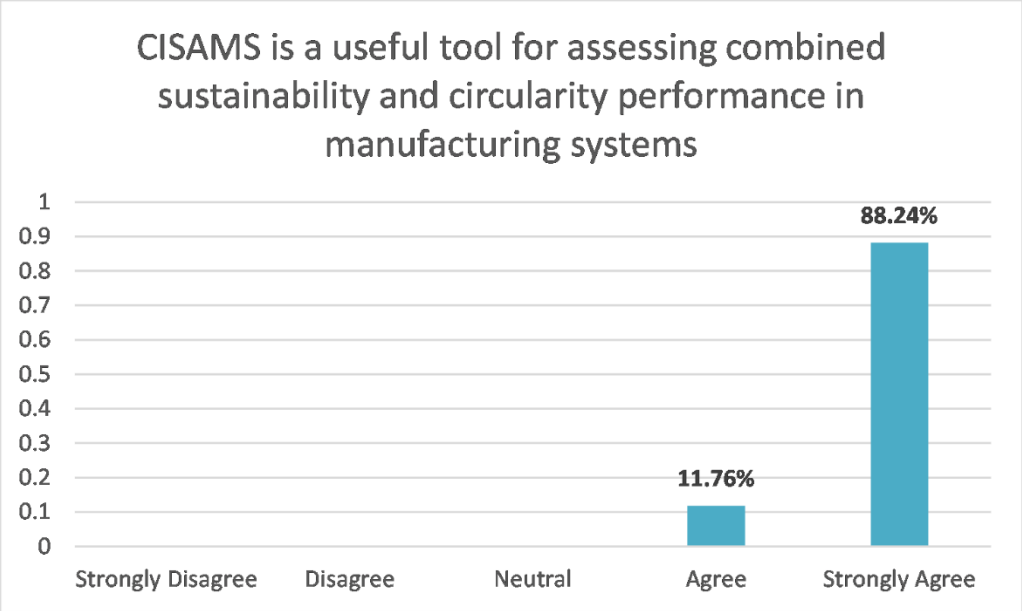
Figure 2. Participant ratings of clarity of explanation (a) and effectiveness (b) of integrating circularity, environmental and social sustainability dimensions

The framework was also widely perceived as a useful tool for assessing combined sustainability and circularity performance in manufacturing systems. A substantial majority of participants agreed or strongly agreed with this statement. In terms of relevance to decision-making in the participants' line of work, responses were more

differentiated, reflecting their diverse professional backgrounds. Higher relevance ratings were predominantly associated with manufacturing-oriented backgrounds, while researchers' responses were more varied. This pattern suggests natural boundaries of application rather than methodological shortcomings (Figure 3).



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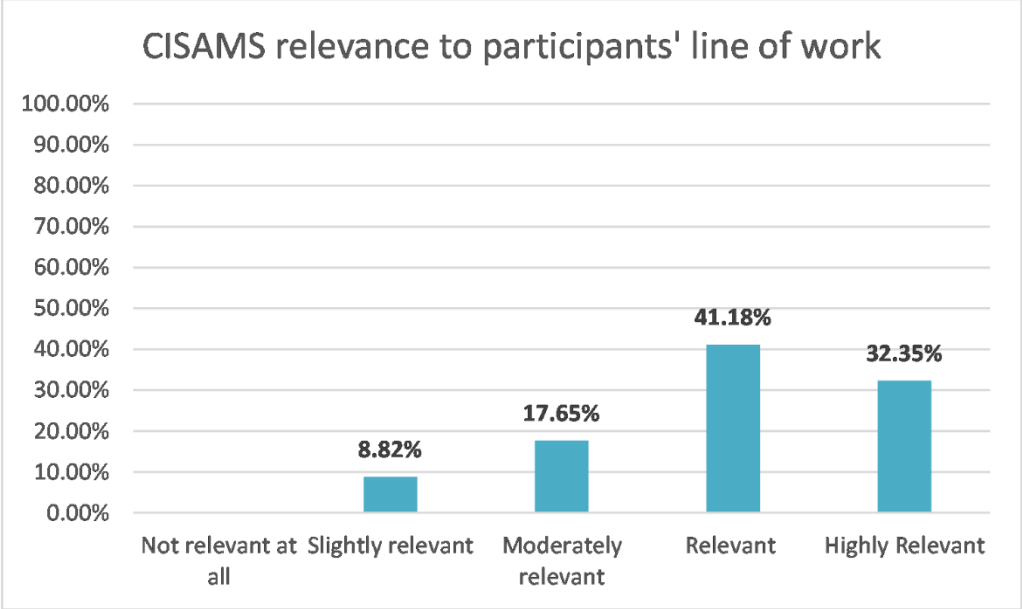


(b)

Figure 3. Perceived usefulness of the CISAMS framework (a) and relevance to participants' decision-making in their line of work (b)

With respect to alignment with modern sustainability assessment needs, most participants indicated that CISAMS largely meets current regulatory, industrial and research expectations (Figure 4). Qualitative feedback indicates that this perception is primarily related to challenges in data availability and the absence of an explicit economic

sustainability dimension, both of which are consistent with the project's defined scope and risk analysis.

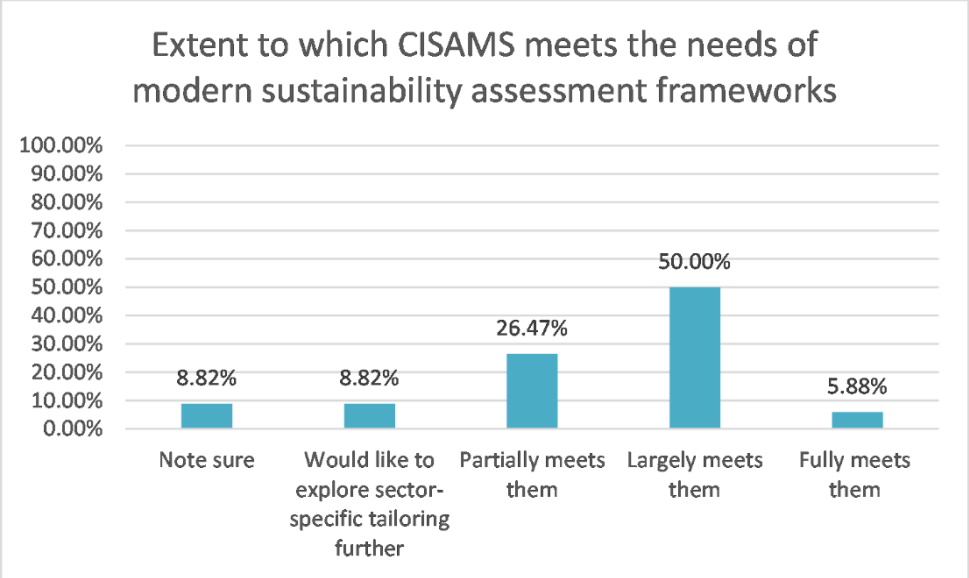
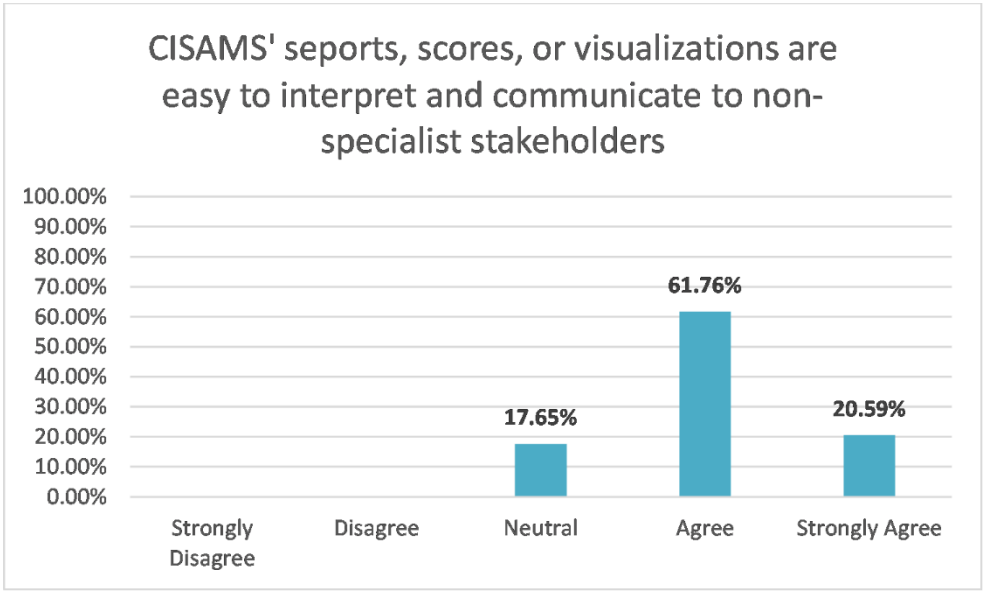


Figure 4. Extent to which CISAMS meets the needs of modern sustainability assessment frameworks

The interpretability of CISAMS outputs was rated positively overall. A strong majority of participants agreed or strongly agreed that the framework's reports, scores and visualisations can be interpreted and communicated to non-specialist stakeholders (Figure 5). At the same time, responses concerning the level of specialised expertise required to apply the framework were more mixed, indicating that while CISAMS is broadly accessible, supporting documentation and guidance materials are important to facilitate uptake beyond expert users.



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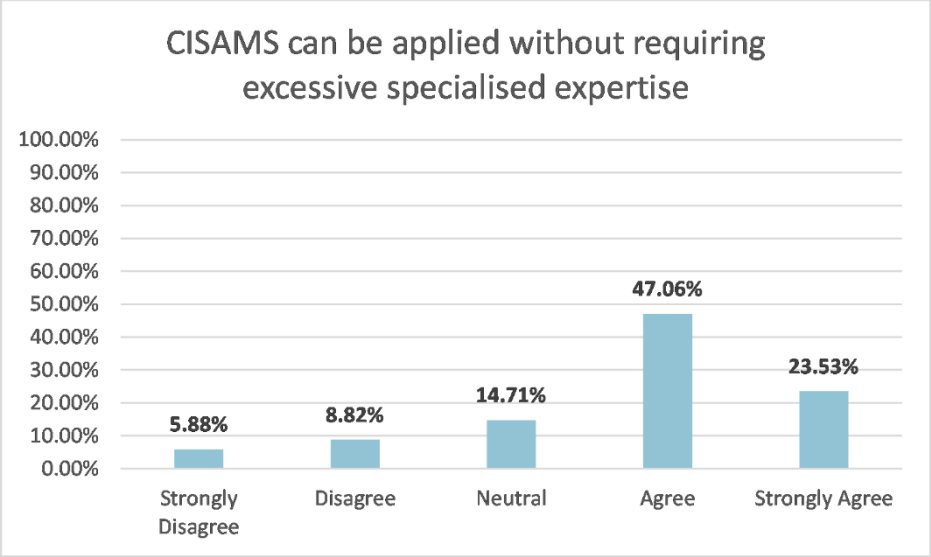

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Figure 5. Perceived interpretability of CISAMS outputs and required level of specialised expertise

Flexibility emerged as a clear strength of the framework. Most participants agreed or strongly agreed that CISAMS can be applied across different types of manufacturing processes and product lines, confirming its transferable design (Figure 6).

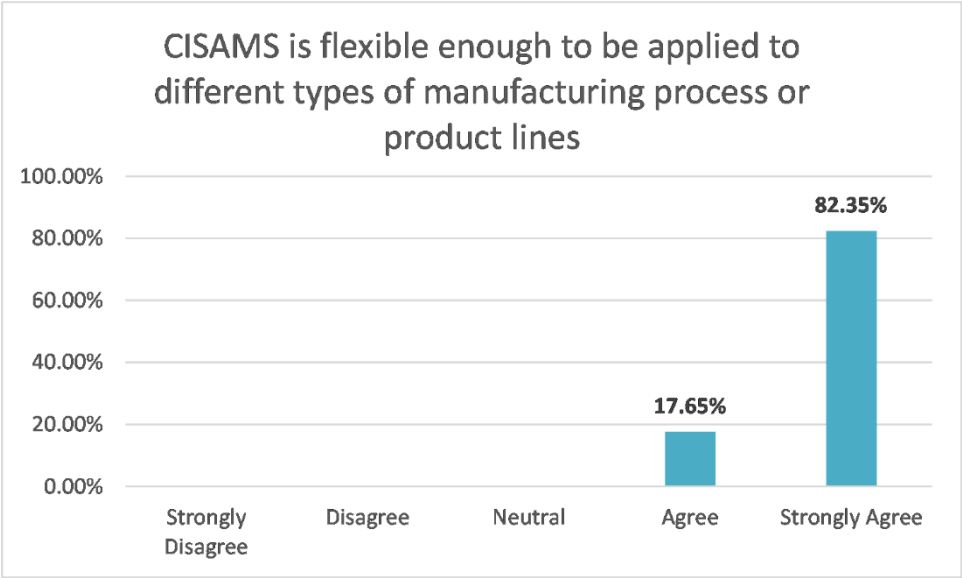

Figure 6. Perceived flexibility of CISAMS across manufacturing processes and product lines

The case study demonstration played a key role in supporting understanding and validation. All respondents rated the case study as useful or very useful, underlining the importance of applied examples in communicating the value and practical implications of integrated sustainability assessment frameworks (Figure 7).

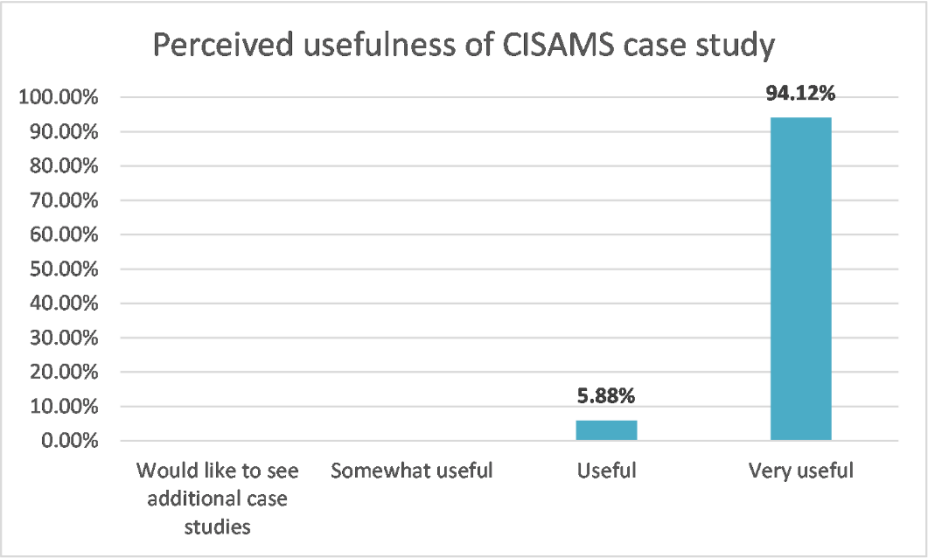

Figure 7. Usefulness of the CISAMS case study demonstration

In terms of innovation, participants most frequently identified the trade-off analysis across sustainability dimensions as the most innovative aspect of CISAMS. This was followed by expert-driven weighting within each assessment pillar and the integration of circularity with environmental and social sustainability. These responses support the originality and scientific contribution of the CISAMS framework as articulated in the project proposal (Figure 8).

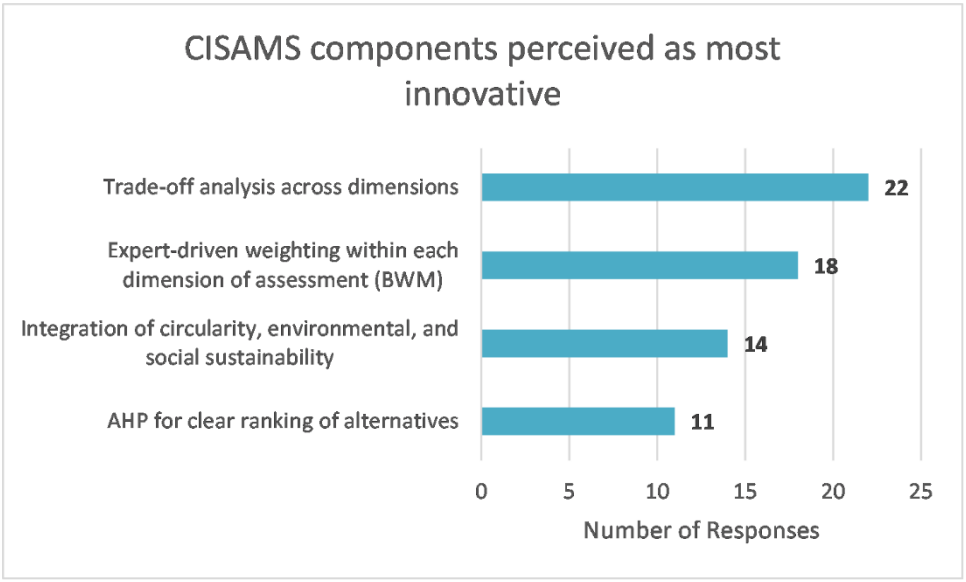

Figure 8. CISAMS components perceived as most innovative by participants. Respondents were allowed to select more than one option; values therefore represent the number of responses per component.

Finally, open-ended responses highlighted several perceived barriers to application. The most frequently mentioned themes were data availability and quality, methodological

complexity and effort requirements, subjectivity associated with expert-based weighting, and the lack of an economic sustainability dimension. These insights are fully consistent with the predefined scope and limitations of the project and provide clear guidance for future methodological extensions. Given that responses to this question were provided in open-ended form, individual answers were normalised and categorised into five thematic groups to enable consistent aggregation and comparison (Figure 9).

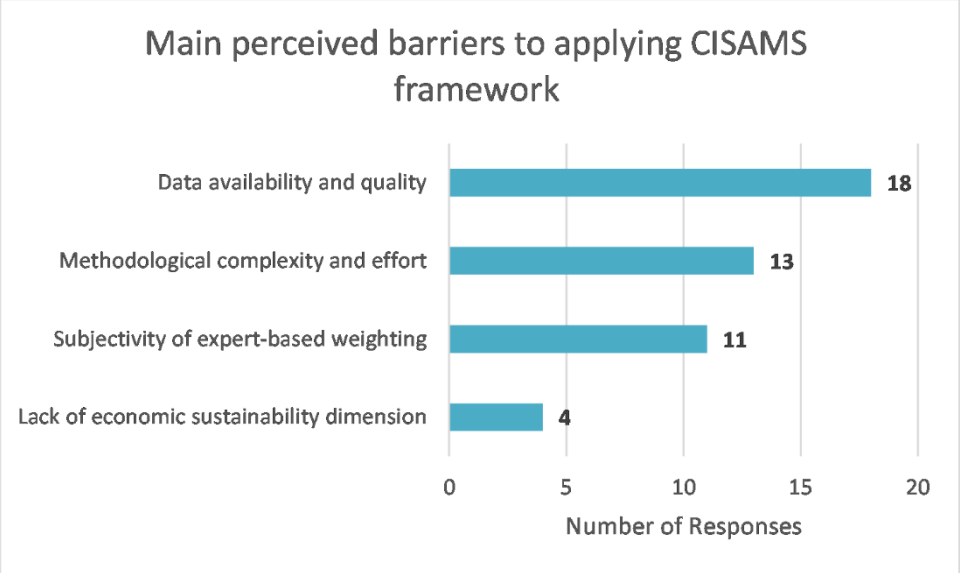

Figure 9. Main perceived barriers to applying the CISAMS framework, based on thematic analysis of open-ended responses. Values represent the number of responses per theme and do not sum to the total number of participants.

5 CONCLUSIONS & FOLLOW-UP ACTIONS

The CISAMS Project Workshop successfully fulfilled its role as both a dissemination and validation activity. It attracted strong interest from relevant stakeholders, confirmed the clarity, relevance and innovation of the CISAMS framework, and generated high-quality feedback supporting refinement and future development.

In the future, additional guidance material will be developed to support interpretation and application, and further case studies will be explored to strengthen practical relevance. Future research will also investigate the integration of economic sustainability as a complementary assessment dimension.

Overall, the workshop provided robust evidence of the scientific validity, practical relevance and policy potential of the CISAMS framework.

6 APPENDIX A

Appendix A presents supporting dissemination and participation material for the CISAMS Project Workshop, including the official LinkedIn invitation post and the Eventbrite registration dashboard used to manage and monitor attendance.

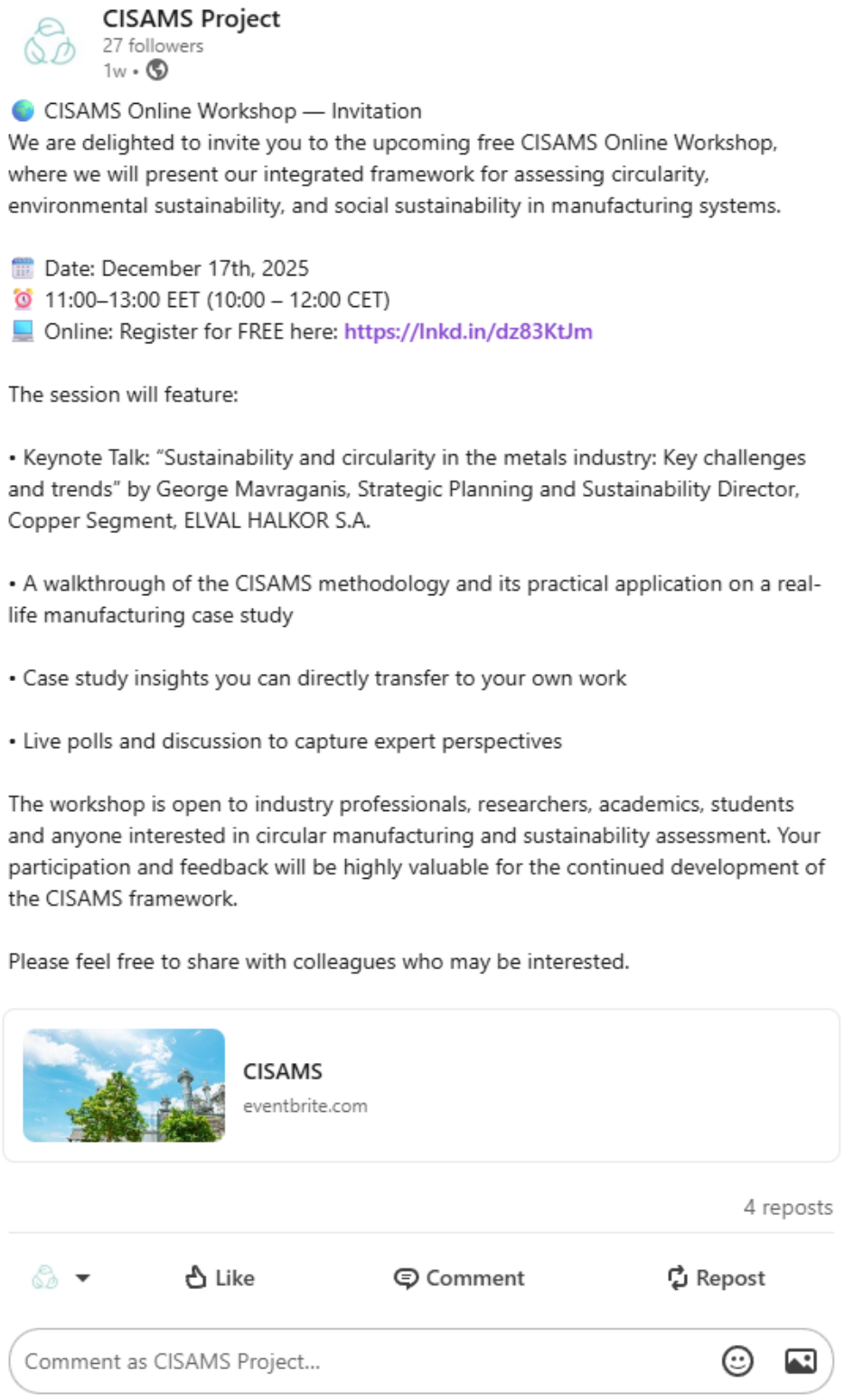

Figure A1. LinkedIn Post – CISAMS Workshop Invitation

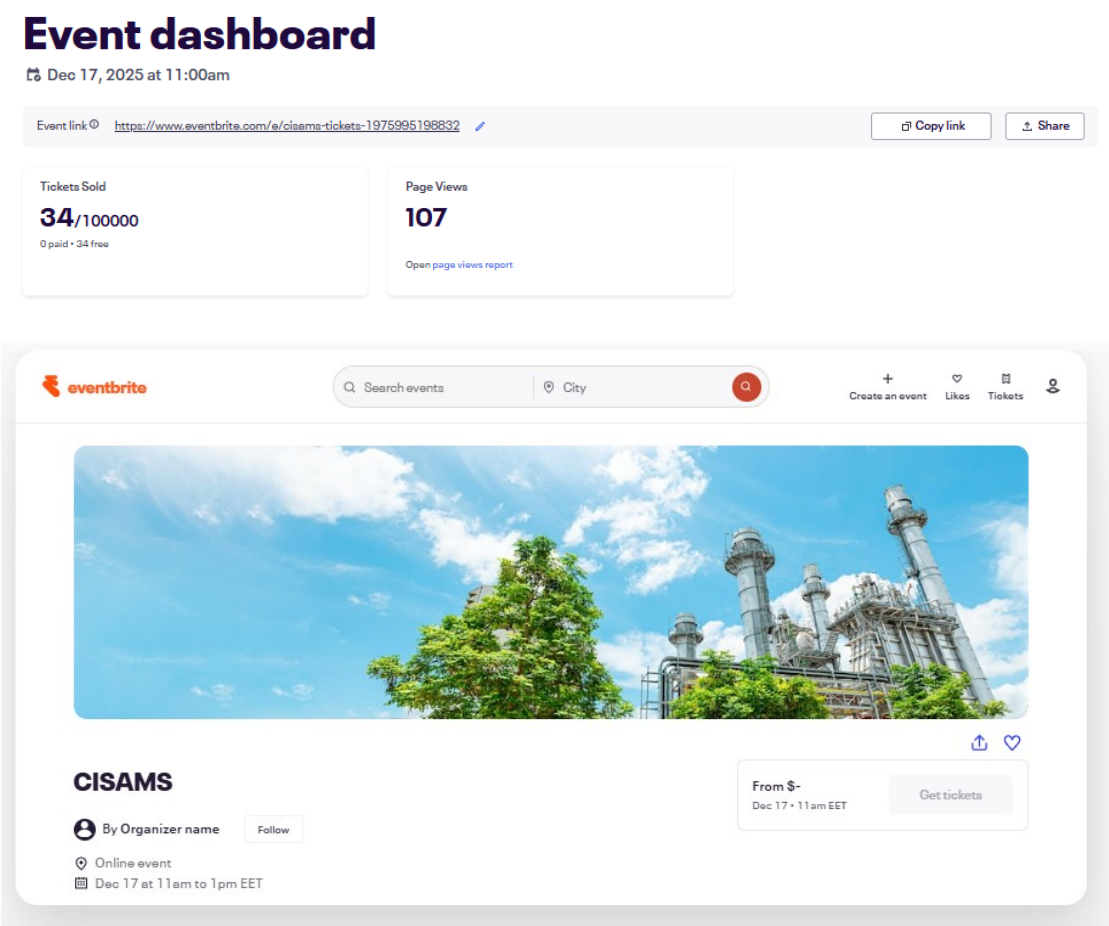

Figure A2. Eventbrite – CISAMS's Event Dashboard

7 APPENDIX B

Appendix B provides the full set of validation questions used during the CISAMS Project Workshop, as implemented through the Wayground live polling platform (https://wayground.com/join) to collect structured participant feedback.

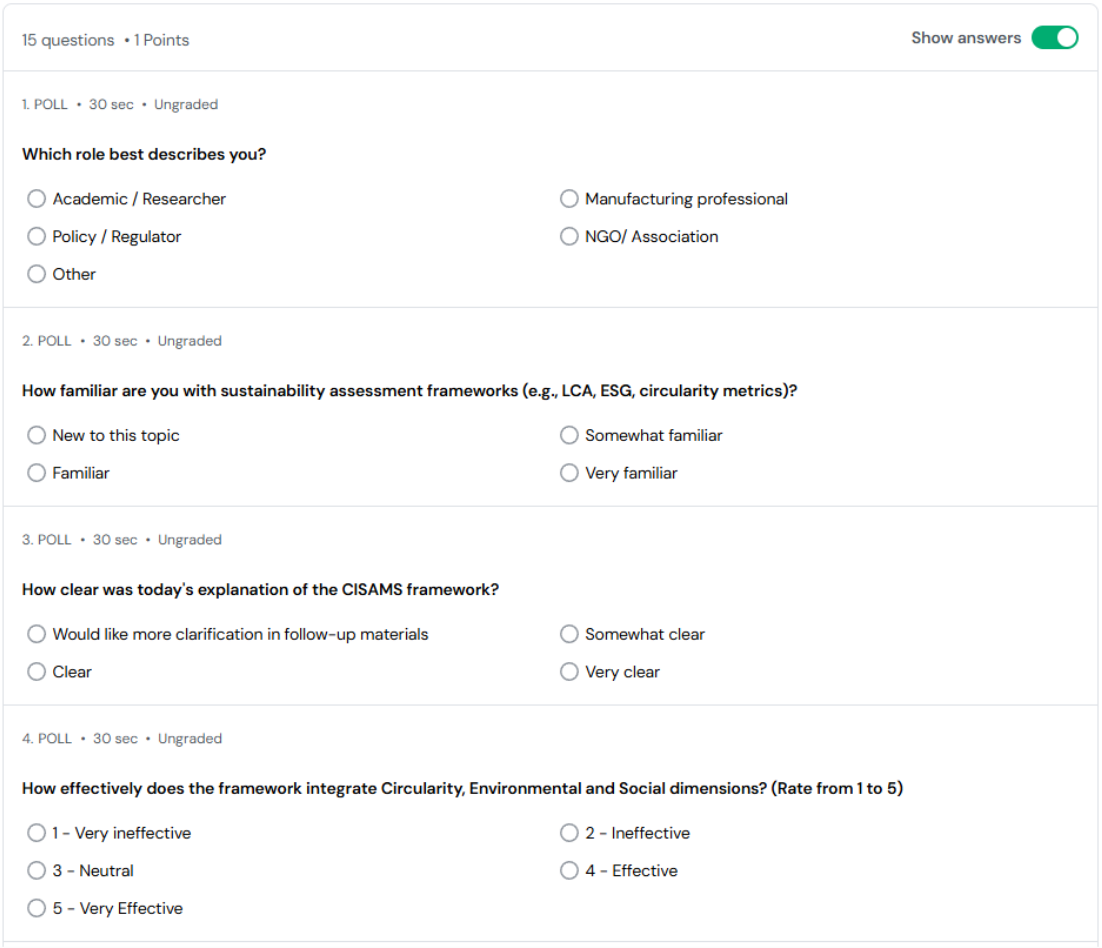

Figure B1. Wayground Poll Validation Questions – Part 1/4

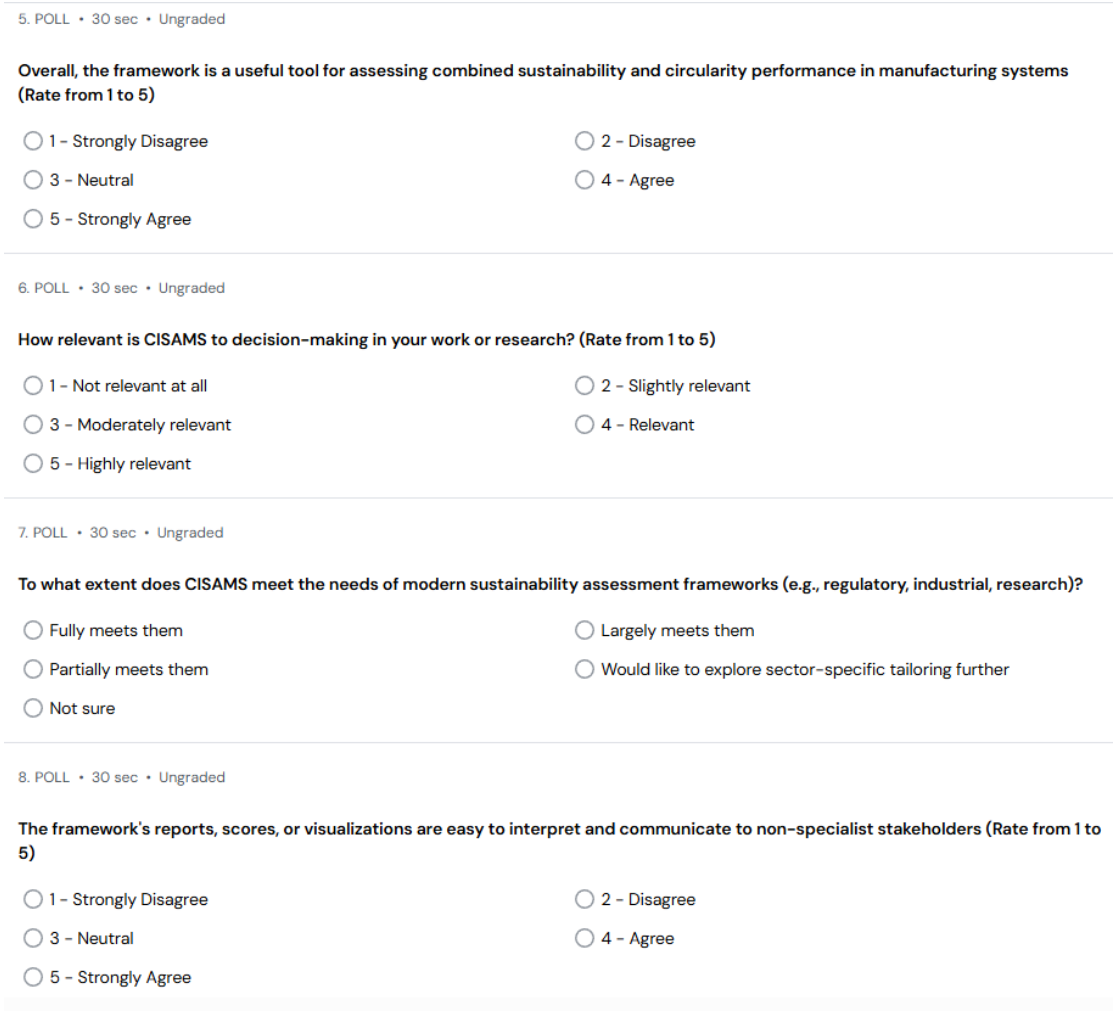

Figure B2. Wayground Poll Validation Questions – Part 2/4

9. POLL • 30 sec • Ungraded

The framework is flexible enough to be applied to different types of manufacturing processes or product lines (Rate from 1 to 5)

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

10. POLL • 30 sec • Ungraded

The framework can be applied without requiring excessive specialized expertise (Rate from 1 to 5)

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

11. POLL • 30 sec • Ungraded

How useful did you find the case study illustrating CISAMS in practice?

- ◯ Would like to see additional case studies
- ◯ Somewhat useful
- ◯ Useful
- ◯ Very useful

12. POLL • 30 sec • Ungraded

Which CISAMS component is the most innovative in your view?

- ◯ Integration of circularity, environmental, and social sustainability
- ◯ AHP for clear ranking of alternatives
- ◯ Expert-driven weighting within each dimension of assessment (BWM)
- ◯ Trade-off analysis across dimensions

Figure B3. Wayground Poll Validation Questions – Part 3/4

13. OPEN ENDED • 3 mins • 1 pt

If you could apply CISAMS to your own field, which product or process would you choose?

Evaluate responses using AI: **OFF**

14. OPEN ENDED • 3 mins • Ungraded

Where do you see the biggest barrier to applying this method?

Evaluate responses using AI: **OFF**

15. POLL • 30 sec • Ungraded

Which area of CISAMS would you be most interested in receiving further materials on?

- ◯ Circularity indicators
- ◯ Environmental sustainability indicators
- ◯ Social sustainability indicators
- ◯ Criteria weighting and Ranking methods (BWM & PROMETHEE)
- ◯ Integrated assessment (AHP, AUGMECON2 & Pareto)

Figure B4. Wayground Poll Validation Questions – Part 4/4