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JUNE 2026

Disruptive Technologies for EO Data Provenance Community Development Report

ID: GT-TRACE4EO-CDR-0001
Version: 2.1
Status: Released
Date of Issue: 01/06/2026
Classification: ESA UNCLASSIFIED – For Official Use Only

Contents

Document versioning

Date (MM.YYYY)	Version	Author	Changes
11.2025	0.1	Patryk Grzybowski (Cloudferro)	Initial draft.
12.2025	1.0	Patryk Grzybowski (Cloudferro)	First release.
05.2026	2.0	Patryk Grzybowski (Cloudferro)	Draft of the second release.
06.2026	2.1	Patryk Grzybowski (Cloudferro)	Second release.

1. Introduction

1.1. Purpose and scope

The purpose of this document is to present an overview of the community outreach and engagement activities carried out so far within the project. It outlines how the project team has been ensuring continuous interaction with key user groups, increasing the visibility of ongoing results, and disseminating knowledge across relevant communities. The report describes the progress made toward the objectives related to publicity, communication, and user engagement, including promotion through digital channels, participation in scientific events, preparation of publications, and the organisation of community-focused activities. It also provides insight into how these efforts are contributing to building awareness, gathering user feedback, and supporting the progressive validation and uptake of the traceability solution.

The scope of this document covers the set of activities planned and implemented to date under the community development and engagement task, with further actions continuing throughout the remaining project lifecycle. It includes the strategy and measures adopted to reach current users of the traceability feature, policy makers, EO practitioners, and the broader scientific and technological community. The report summarises the communication channels used to date, the events and conferences attended, the publications in preparation, and the collaborative activities organised to involve stakeholders. It reflects the ongoing nature of outreach efforts, showing how engagement activities continue to support the definition of use cases, refinement of software functionality, and dissemination of project outcomes as the project progresses.

1.2. Structure of the document

The document consists of the following chapters:

1. Introduction
2. Background
3. Project Webpage

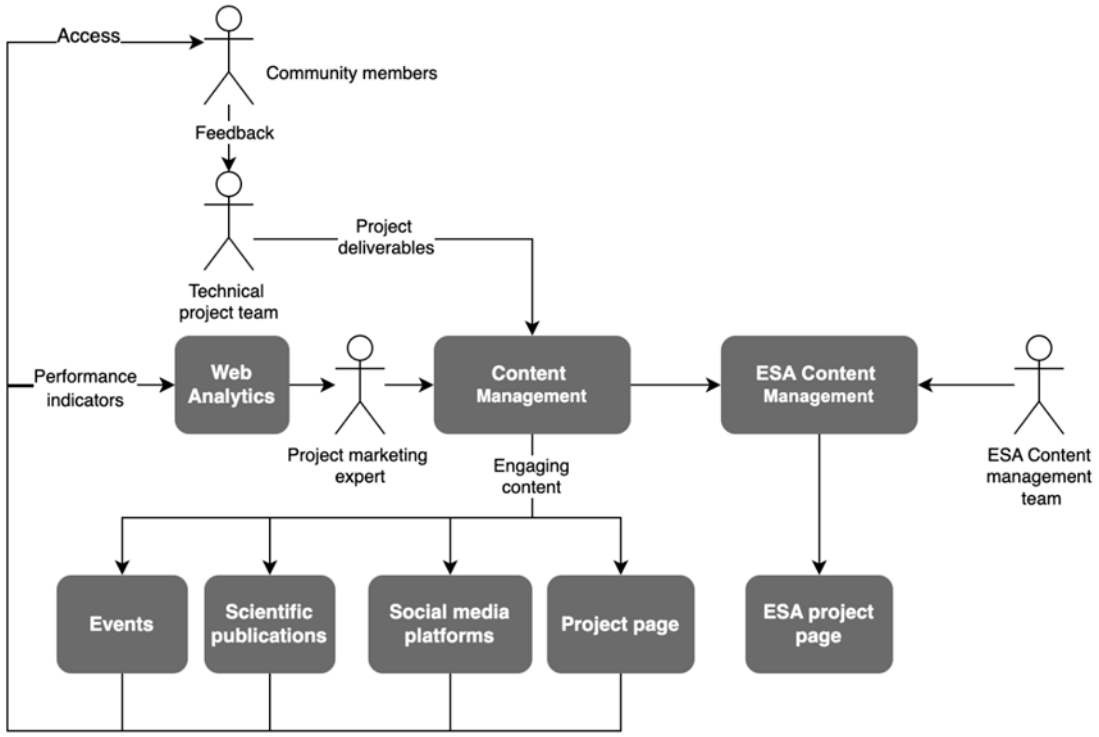
4. Social Media Activities
5. Conferences and Events
6. Research Community Engagement
7. Other Activities
8. Summary

1.3. Acronyms

Term	Definition
AI	Artificial Intelligence
EO	Earth Observation
JRC	Joint Research Centre
POLSA	Polish Space Agency

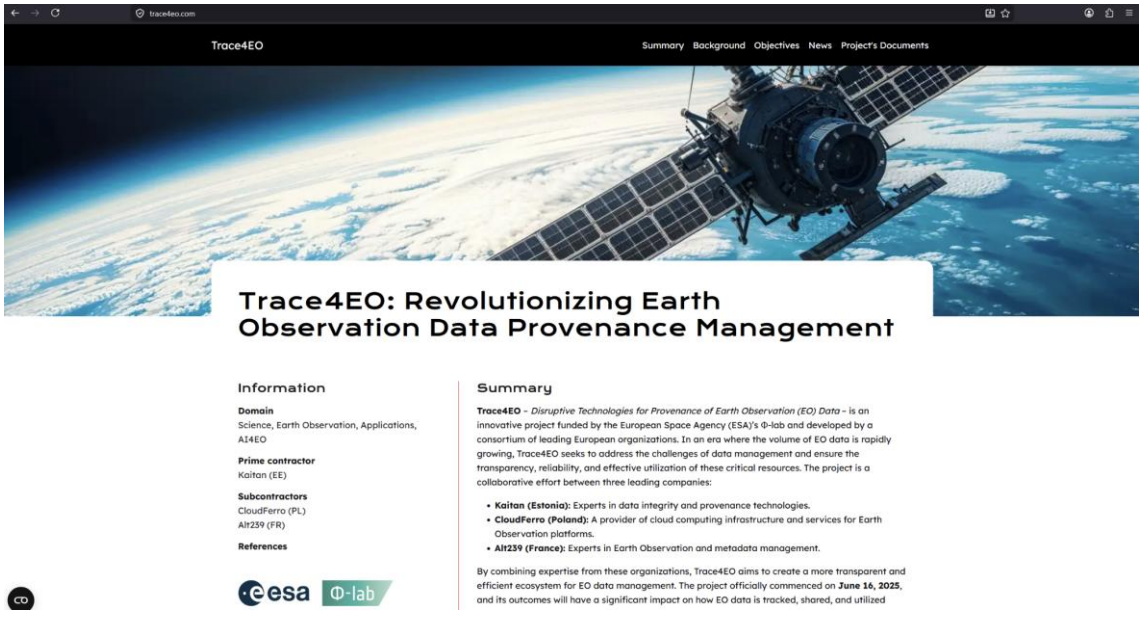
2. Background

Engaging the community is a critical component in the development and adoption of new technologies, as it enables direct interaction with users, strengthens trust, and accelerates the validation of innovative solutions. Meaningful engagement provides opportunities to promote project outcomes, gather practical feedback, and ensure that the proposed approaches address real operational needs. By leveraging social media channels, scientific conferences, industry events, and direct communication with stakeholders, the project can reach diverse audiences and create a continuous feedback loop. Personal interactions remain particularly important, as they foster deeper understanding, facilitate open discussion, and support long-term relationships that help shape the evolution and practical relevance of emerging technological solutions. The activities carried out in this project follow a high-level engagement and communication flow, illustrated in the project diagram, where community feedback, project deliverables, content creation, and dissemination channels are interconnected through a structured loop involving analytics, content management, and collaboration with ESA. This framework ensures that outreach efforts are coherent, coordinated, and consistently aligned with the needs of the target community.



3. Project webpage

The project webpage, available at *https://trace4eo.com/*, serves as the central public access point for information related to the Trace4EO activity. It provides a clear and structured presentation of the project, its objectives, and its consortium, ensuring transparency and accessibility for all interested stakeholders. The page contains several key sections, including a summary describing the overall purpose of the project and the organisations involved, a background section outlining the context and motivation behind the work, and an objectives section presenting the main goals and expected outcomes. A dedicated news area is used to publish updates and announcements, allowing the community to follow progress throughout the project lifecycle. The webpage also hosts a documents section, where publicly accessible project materials and deliverables can be made available, supporting open dissemination of knowledge and ensuring that results can be reused by the EO community and other interested groups. Altogether, the webpage functions as an essential element of the communication and outreach strategy, providing authoritative and regularly updated information in a single, easily accessible location.



4. Social Media Activities

Social media presence plays an important role in illustrating the activity and continuity of the project, demonstrating ongoing progress, refinement of the solution, and regular engagement with the wider community. To ensure consistent visibility, posts are published on LinkedIn in accordance with the project's communication and editorial plan. So far, seven posts have been published, shared both by the consortium partners and within the ESA Φ-lab Community LinkedIn group. These posts generated interest and further resharing, significantly extending their reach and increasing awareness of the project among Earth Observation professionals and related communities.

Additional posts are planned throughout the project lifecycle, aligned with upcoming technical achievements, events, and engagement activities. These continued updates will support project visibility, highlight key milestones, and help maintain an active connection with the audience.

5. Conferences and Events

Participation in conferences and public events is one of the most effective ways to promote the project, identify potential users, collect direct feedback, and progressively build an engaged community around the developed solution. Public events provide an excellent opportunity to interact with the community through one-to-one discussions with stakeholders, to present project achievements, and to communicate expected outcomes. These interactions support both the validation of the technical approach and the identification of user needs, contributing directly to the refinement and usability of the traceability solution.

Since the submission of the original proposal, Trace4EO was presented at the 5th ECMWF–ESA Workshop on Machine Learning for Earth System Observation and Prediction in Bologna. The event was highly relevant to the project, bringing together experts working at the intersection of Earth Observation, modelling, and artificial intelligence. The presentation focused on the need for greater transparency, traceability, and trust in AI-driven EO workflows. Trace4EO was introduced as an approach for establishing a verifiable chain of trust across EO data processing pipelines, using identity-based signing, immutable transparency logging, and cryptographic asset-level fingerprints to track datasets, models, processing steps, and outputs. Participation in the workshop supported the project's community development objectives by increasing visibility among relevant scientific and technical stakeholders and contributing to ongoing discussions on trustworthy, reproducible, and regulation-ready AI for Earth Observation.

Following a review of dissemination priorities and available opportunities, the consortium decided not to focus on FOSS4G Europe 2025 and EGU26, and instead to prioritise events more closely connected to ESA and the ESA Earth Observation innovation community. In this context, the Φnnovation Summit, organised by ESA Φ-lab at ESA-ESRIN in Frascati, was identified as a more strategic venue for the project. The event brings together researchers, entrepreneurs, and technology innovators working on disruptive approaches for the future of Earth Observation, including artificial intelligence, machine learning, edge computing, and other emerging technologies. The consortium will participate in two formats: through a poster presentation and a workshop. The workshop will also address related activities

from another project focused on distributed technologies, creating an opportunity to present Trace4EO within a broader context of trustworthy and innovative EO data processing.

Together, these activities provide a more focused dissemination path within the ESA Earth Observation innovation ecosystem. The ESA–ECMWF workshop enabled engagement with communities working on machine learning, EO data, and modelling, while the Φnnovation Summit will offer targeted visibility among stakeholders interested in disruptive EO technologies, trustworthy AI, and distributed data processing. This combination ensures engagement with highly relevant audiences and supports more meaningful feedback on the project's technical and community-oriented outcomes.

In any case, the project team continues to monitor the evolving landscape of relevant scientific and technical events. New conferences and workshops may emerge that align closely with the project's objectives, and adjustments to the participation plan may be made accordingly. This flexible approach ensures that dissemination and community engagement activities remain timely, effective, and well-targeted beyond the already identified events.

6. Research Community Engagement

While communication activities, media presence, and participation in conferences serve as effective tools for increasing visibility and reaching potential users, their primary purpose is to support a broader strategic objective: building a community of users who will ultimately adopt and rely on the developed traceability solution. Establishing relationships with stakeholders and cultivating trust within the research and operational communities are essential for ensuring that the final system reflects real user needs and can be successfully integrated into existing workflows.

From the very beginning of the project, the team has been actively engaged in consultations with key institutions, including the Joint Research Centre (JRC) and the Polish Space Agency (POLSA). These interactions have provided valuable early insights into the expectations and requirements of potential users. As summarised in the Use Case Definition document, JRC emphasised the importance of robust metadata traceability for maintaining reproducibility in the context of frequently changing EO processing baselines, while POLSA highlighted the need for practical tools enabling verification of product quality and input data credibility. These discussions helped validate the relevance of the selected use cases and ensured that the solution is aligned with the operational realities of the EO sector. High-level outcomes of these meetings include a clearer understanding of the most critical traceability elements for end users, confirmation of the transferability of the methodology beyond agriculture, and the identification of requirements related to auditing and reproducibility.

Following suggestions raised during discussions with JRC, the project team also plans to establish contact with representatives of national payment agencies, who may constitute a potential user group for the developed traceability solution. At the same time, it is important to acknowledge the structural challenges associated with this type of institution. Payment agencies typically operate within formal administrative procedures and rely on long-established tools and workflows, making the adoption of innovative solutions potentially slow and dependent on regulatory frameworks. Nevertheless, the project recognises the long-term relevance of this group and intends to explore opportunities for engagement while managing expectations related to the pace of uptake.

For the second use case, focusing on traceability in AI modelling, the project has succeeded in establishing direct connections within ESA with individuals and teams whose work naturally aligns with the proposed approach. With the increasing importance of AI in Earth Observation, this environment represents a highly relevant and dynamic community of potential adopters. The interest expressed during these exchanges confirms that the project's focus on tracking data lineage and model metadata addresses a real and growing need, particularly in the context of regulatory developments such as the AI Act. These engagements complement feedback collected during conferences and workshops, reinforcing the direction and scope of the use case.

Overall, the project's strategy for research community engagement combines structured outreach through events with targeted, domain-specific consultations. This approach ensures that the solution evolves based on real user feedback, supports operational relevance, and strengthens connections across the EO–AI ecosystem, increasing the likelihood of long-term adoption and impact.

In addition to formal consultations, the ESA–ECMWF conference and the online workshop provided further opportunities for direct engagement with potential users and stakeholders. Several contacts established during these activities raised relevant questions concerning the positioning of the proposed solution, including its added value compared with existing traceability approaches, its relationship to widely used machine-learning lifecycle tools such as MLflow, and the practical definition of the target use case. This feedback was valuable for validating the project assumptions and served as input for further refinement of the system. It also supported minor adjustments to the technical approach and helped prepare the consortium for a more focused and informed discussion during the online workshop.

7. Other Activities

In addition to the activities described above, work is ongoing on two scientific publications. The first paper is planned to address traceability more broadly in the context of AI and Earth Observation workflows, presenting the methodological foundations and wider relevance of the proposed approach. The second paper is expected to focus on the agriculture use case, demonstrating how the developed traceability solution can be applied in a practical EO-based scenario.

The currently considered target journals are *Remote Sensing Applications: Society and Environment* (IF 4.5) and *Earth Science Informatics (IF: 3.0)*. However, these publication venues remain preliminary and may be adjusted as the scope and maturity of the manuscripts develop. The planned papers are expected to play an important role in demonstrating both the scientific credibility and the methodological innovation of the traceability approach, thereby strengthening its recognition within the research community and supporting future adoption by operational and administrative stakeholders.

An online workshop was also organised to present the first publicly available version of Trace4EO. The event gathered participants from private companies, ESA, public institutions, and the consortium partners, creating a valuable opportunity to demonstrate the current functionality of the system to a broader audience. The discussions confirmed that traceability in EO and AI-driven workflows is regarded as an important and timely topic by potential users and stakeholders. The workshop generated valuable feedback on possible improvements, user expectations, and the future development roadmap, providing useful input for further refinement of the solution and prioritisation of next steps.

8. Summary

The activities carried out so far have strengthened the visibility of Trace4EO and supported the gradual development of a relevant user and stakeholder community around the project. The project webpage, LinkedIn communication, conference participation, institutional consultations, and the online workshop have created multiple channels for presenting the solution, collecting feedback, and validating its relevance. Engagement with organisations such as JRC, POLSA, ESA representatives, public institutions, private companies, and the wider EO–AI community confirmed that traceability, reproducibility, and trust in data- and AI-driven Earth Observation workflows are considered important and timely challenges.

The feedback collected through these activities has directly supported the refinement of the system, including clearer positioning of Trace4EO against existing traceability and machine-learning lifecycle tools, improved understanding of user expectations, and further definition of practical use cases. Ongoing work on scientific publications and the planned participation in ESA-focused innovation events will further reinforce the credibility, visibility, and long-term adoption potential of the solution. Overall, the community development activities have demonstrated strong alignment between the project's objectives and the needs of relevant scientific, operational, and institutional stakeholders.