# Splinter 1: The European EO Ecosystem in 2040+ System-of-Systems View Splinter Summary

D. Gillieron, J. Lambin, P. Martin-Iglesias, A. Löscher
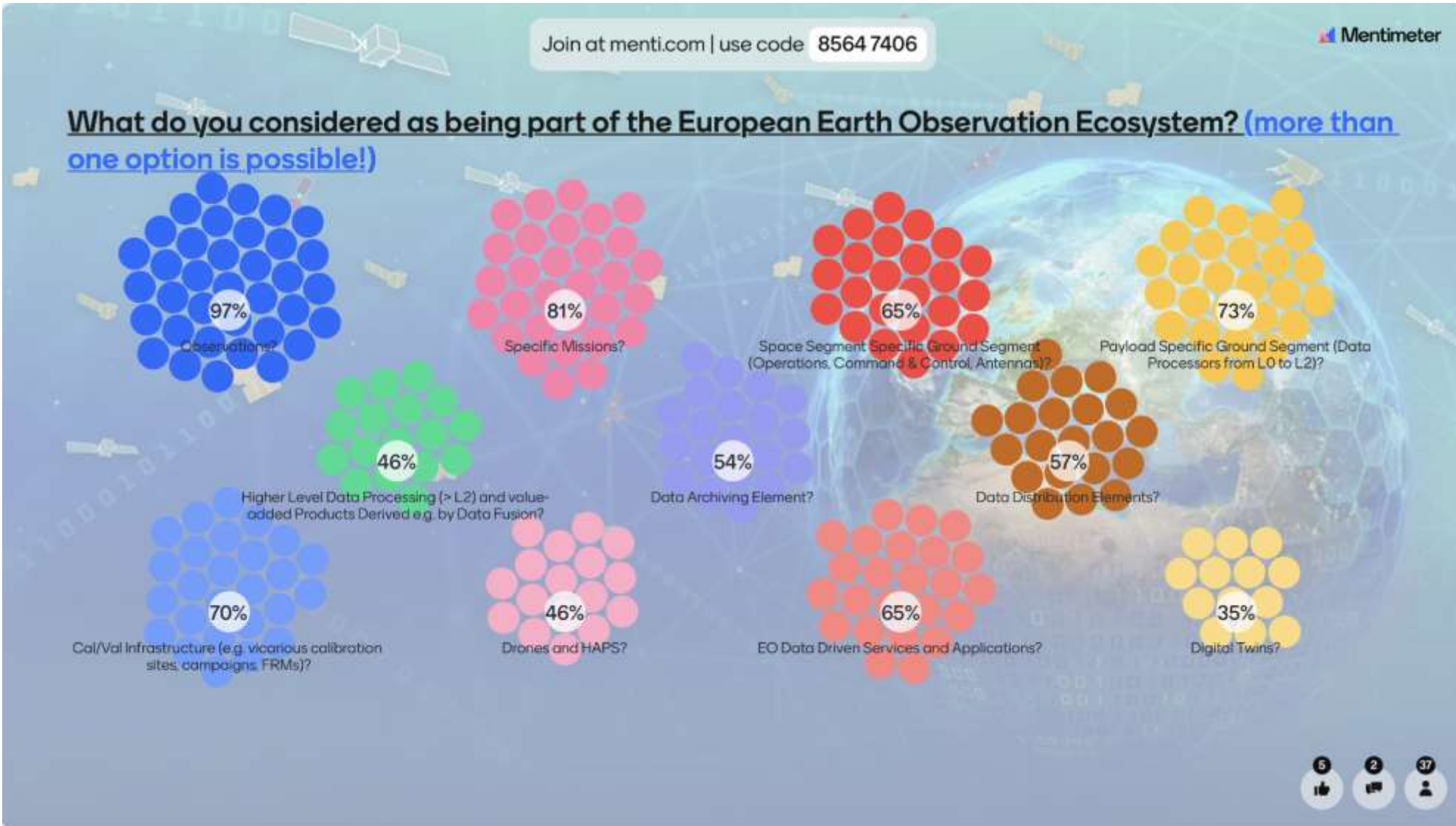
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**Three topics where addressed:**

- **Topic 1: What must be considered as being part of the European Earth Observation Ecosystem?**

- **Topic 2: Time travel: You are now in 2040+ what has changed, what has stayed and what has transformed in the area of EO and the overall ecosystem?**

- **Topic 3: The EO Ecosystem Blueprint and beyond, what to include what to link too?**

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**What do you considered as being part of the European Earth Observation Ecosystem?** (more than one option is possible!)

- 97% Observations?
- 81% Specific Missions?
- 65% Space Segment Specific Ground Segment (Operations, Command & Control, Antennas)?
- 73% Payload Specific Ground Segment (Data Processors from L0 to L2)?
- 46% Higher Level Data Processing (> L2) and value-added Products Derived e.g. by Data Fusion?
- 54% Data Archiving Element?
- 57% Data Distribution Elements?
- 70% Cal/Val Infrastructure (e.g. vicarious calibration sites, campaigns, FRMs)?
- 46% Drones and HAPS?
- 65% EO Data Driven Services and Applications?
- 35% Digital Twins?

**What are the transversal analysis needed to link the different elements in a coherent "big picture" of the EO Ecosystem?**

- **Users:** Experience, prioritizing user stories, policy needs, and feedback for quality.
- **Integration:** Federated systems and non-space tech. Interoperability and standards are crucial.
- **Data:** AI-driven data insights and accelerated value creation. Identify promising applications and address observation gaps.
- **Sustainability:** Economic viability for commercial uses, diverse data policies, and inclusive governance.
- **Holistic Approach:** EO as part of problem-driven ecosystems, with global partnerships and Earth system data assimilation.
- **Quality:** Maintaining high data quality, fidelity, and authentication.

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**Can you identify your hope and fears?**

**Hopes:**

- **Global Cooperation:** A unified international approach to addressing the climate crisis through EO, with open data policies and collaboration between nations.
- **Technological Advancement:** Rapid innovation in EO technology, including faster satellite launches, more agile and integrated systems, and improved data utilization.
- **Strong Partnerships:** Effective collaboration between institutional and commercial sectors, leading to seamless integration of EO data into daily life.
- **Trustworthy Data & Ecosystem:** Reliable, transparent, and accessible data within a cohesive EO ecosystem, supporting informed decision-making and action on global challenges.
- **European Leadership:** Europe playing a leading role in EO development, promoting open data, and fostering international cooperation.

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## Can you identify your hope and fears?

**Fears:**

- **Commercial Dominance & Fragmentation:**  Private companies controlling access to data through paywalls, leading to a fragmented landscape that hinders scientific progress.
- **Slow Adaptation:**  Inability to adapt quickly enough to the evolving landscape, with bureaucratic processes hindering innovation and progress.
- **Geopolitical Risks:**  Nationalism, isolationism, and global block formation disrupting international collaboration and open data policies.
- **Climate Impacts & Conflict:**  Severe climate change impacts leading to global conflicts over resources, despite the availability of EO data.
- **Lack of Accountability & Investment:**  Insufficient global accountability for environmental protection, coupled with declining investment in EO due to short-term thinking and competing priorities.

**What should the ESA EO Architecture Blueprint provide to be useful for you?**

- **Strategic Vision & Roadmap:** Clear strategic direction, long-term vision, and implementation roadmaps for science, operational, and commercial strategies, grounded in future scenario assessments.
- **Ecosystem Framework & Roles:** A comprehensive framework of EO ecosystem elements, defining roles, ownership, and how ESA missions can support a hybrid space environment, including commercial sector engagement.
- **Capability Mapping & Gap Analysis:** Mapping of current and planned European EO missions, identifying duplications and gaps in observations and sensor capabilities to inform future development.
- **Technology & Innovation Guidance:** Definition of future enabling technologies, guidance on best practices, and support for industrial technology roadmaps.
- **Resource Federation & Collaboration:** Clear guidance on federating resources (EU/national/private), fostering collaboration, and navigating diverse national agendas.
- **Implementation Support:** Clear articulation of how ESA will support implementation, including addressing uncertainties and adapting to evolving needs. A focus on open data and sustainability is crucial.

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## What elements of today's EO ecosystem will lose priority and could be removed or addressed differently?

- **Standalone, Duplicative Missions:** Isolated, individual missions, especially those duplicating existing capabilities or lacking clear unique selling points (USPs), will likely decrease in priority. The emphasis will shift towards interconnected, collaborative systems.
- **Traditional Data Products & Ground Segments:** Pre-defined, mono-products and dedicated ground stations will be less important as user-driven, on-demand data products and cloud-based infrastructure become more prevalent.
- **Basic, Unfocused Missions:** Simple missions with basic imaging capabilities and overly scientific missions without clear applications will require stronger justification. The focus will be on multi-purpose, application-driven missions.
- **Unsustainable Practices:** Unsustainable mission planning and a lack of focus on long-term strategies will need to be addressed. Sustainability in space (e.g., debris management) and on Earth will be prioritized.
- **Lack of Coordination:** Duplication of effort, especially between space agencies and commercial entities, needs to be minimized through better role definition and coordination.

**What are the emerging priorities from your point of view?**

- **Climate Action & ECV Continuity:** Increased focus on climate change, tipping points monitoring, requiring higher temporal sampling for key ECVs and ensuring long-term, continuous observation of these variables.
- **Resilience & Sustainability:** Building resilient and sustainable EO infrastructure, including well-characterized anchor point missions and sustainable space practices.
- **Data Accessibility & Usability:** Improving data accessibility and usability, including making data analysis-ready and fostering sensor-agnostic interoperability.
- **AI Integration & Automation:** Effective integration of AI and machine learning across the EO value chain, moving from data to actionable information for decision-makers.
- **User Focus & Engagement:** Adopting a more user-centric approach, including better understanding user needs, engaging with non-space sectors, and improving public awareness of EO.
- **Agility & Responsiveness:** Developing more agile and responsive systems capable of rapid deployment to address emerging needs and critical questions.
- **Funding & Collaboration:** Securing multi-year funding for core infrastructure and fostering stronger commercial/institutional partnerships.

**Can you name the other "Blueprints" or similar frameworks you would, see the ESA "Blueprint" liked to in future?**
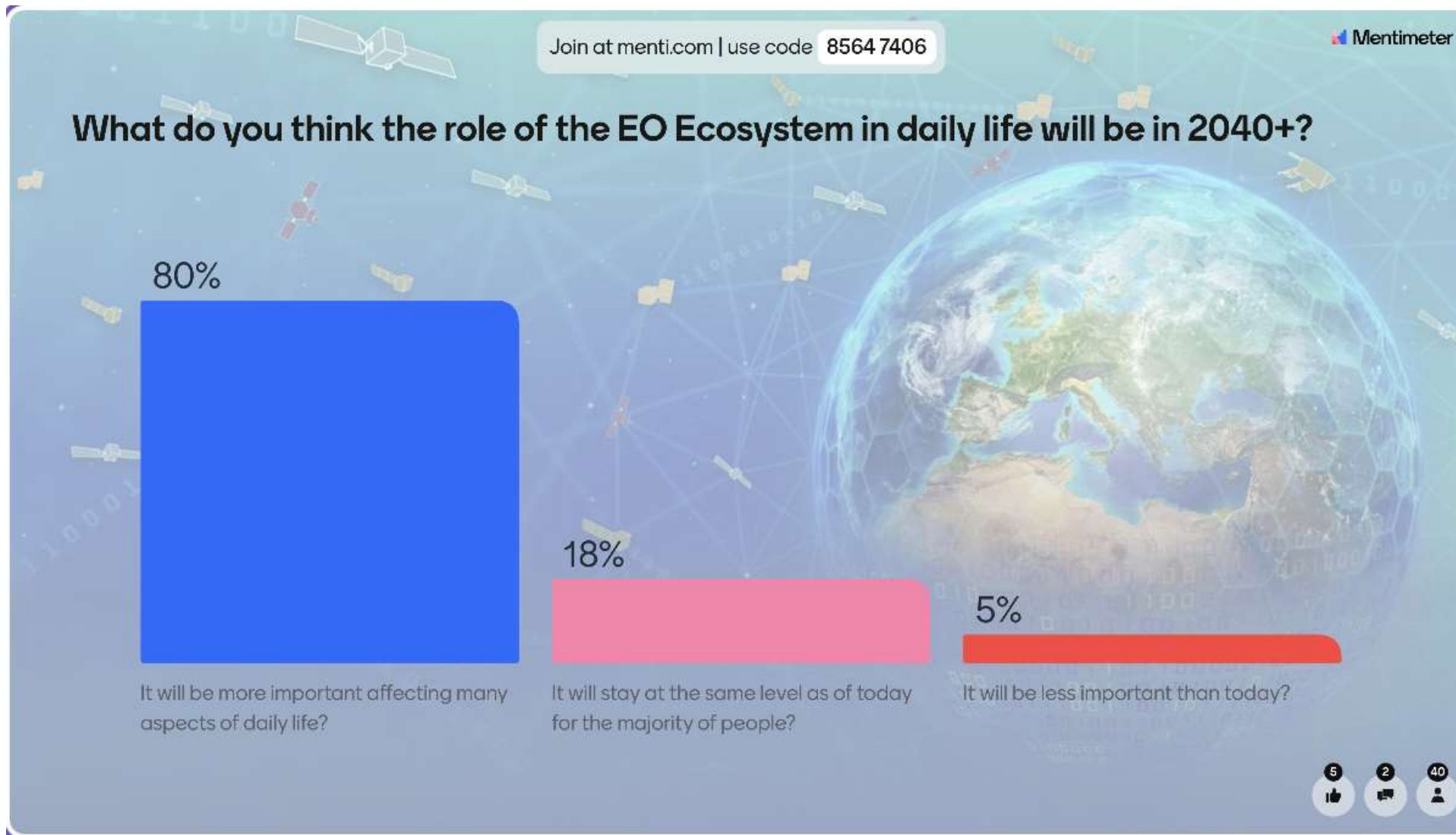
- **International Frameworks:** The UN Sustainable Development Goals (SDGs), the Paris Agreement, the Sendai Framework, and potentially a future international EO blueprint.
- **Other Space Agency Strategies:** NASA's strategies (e.g., decadal survey) and national space agency plans (e.g., CNES, DLR, ASI, UKSA).
- **European Strategies:** The EU Space Strategy and the Copernicus Long-Term Strategy.
- **Intergovernmental Organizations:** Plans and visions from EUMETSAT, ECMWF, CGMS, and WMO.
- **Global Coordination Bodies:** GEO and CEOS strategies and activities.
- **Thematic Blueprints:** Frameworks related to specific areas like resilience, security, AI, and defence.
- **Research Programs:** Strategies from programs like Destination 2030 and WCRP.
- **Sustainability Frameworks:** Concepts like "Earth boundaries" and links to initiatives like the Green Deal.

## Open Floor Discussion and Wrap Up.

- **Blueprint Purpose & Scope:** Why is a blueprint needed? Can it serve as a tool for cooperation, competitiveness (including defence), and addressing ecosystem limitations (institutional, financial, technological)?  Is ESA the right body to lead this effort?  Should developers of EO-based solutions (e.g., services) be included in the ecosystem?

- **Implementation & Progress:** How can short-term progress be made given uncertainties? How can "last mile" efforts be captured and fed back into the blueprint? How can we improve the "time to field" and responsiveness of EO development?  Can existing models (e.g., UN Global Platform) be leveraged?

- **Stakeholder Engagement & Buy-in:** How can we ensure buy-in from all relevant actors (civil society, companies, institutions)?

- **Public Awareness & Education:** How can we educate the public about EO's impact and importance, including at schools (future users)?

- **International Cooperation:** Should we consider new partnerships (e.g., a joint Europe-China polar EO system), building on past successes (e.g., Europe-North America)?

- **Efficiency & Sustainability:** How can we be more efficient with fewer resources?  Does this include streamlining decision-making and potentially unifying space agencies?  How can we prioritize space sustainability?

Do you think the ESA EO Architecture Blueprint will be a useful compass for you?

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63% Yes

49% No

Responding is off