Definition of Research Infrastructure Accessibility and Proposal for New Specific Facilities

1. Introduction

This report provides an overview of the accessibility of research infrastructures within **COST Action CA20101 – PRIORITY**, assessing both declared hosting capacities and actual mobility patterns established through Short-Term Scientific Missions (STSMs). The aim is to map the current landscape of available facilities, evaluate how they have been used by Action participants, and identify potential needs for new or enhanced infrastructures to support future research on micro- and nanoplastics (M/NPs).

Two primary sources of information were used:

1. **Institutions expressing interest in hosting researchers** via STSMs, available at: *STSM Host Expression of Interest*: https://ca-priority.eu/grants/stsm-host-expression-of-interest/
2. **Recorded STSMs completed within the Action**, available at: *Previous STSMs*: https://ca-priority.eu/grants/previous-stsms/

These resources provide complementary insights: the first describes the *potential* research infrastructures open to PRIORITY members, and the second documents the *actual* use and accessibility of these facilities during the four years of the Action.

2. Current Research Infrastructure Availability

2.1 Institutions Willing to Host Researchers

The "Host Expression of Interest" platform lists a diverse set of institutions across Europe and beyond that made their research infrastructures available for STSMs. These infrastructures include:

- **Advanced analytical laboratories** for micro- and nanoplastic detection (e.g., FTIR, Raman, Py-GC/MS, LDIR chemical imaging).
- **Toxicology and ecotoxicology facilities**, including in vivo and in vitro exposure platforms.
- **Environmental monitoring and field sampling units**.

- **Modelling, data analysis, and chemometrics environments**.
- **Polymer characterization and materials science laboratories**.

The institutions cover Working Groups WG1–WG7 and represent a geographically broad distribution, including Austria, Belgium, Denmark, France, Italy, Portugal, Spain, and others. This platform demonstrates strong willingness across the network to facilitate mobility and provide hands-on access to specialized equipment.

2.2 Types of Accessible Facilities

A synthesis of the hosting offers reveals that PRIORITY members had access to:

- State-of-the-art **spectroscopic instruments**
- **Electron and atomic force microscopy** platforms
- **Environmental chambers** for weathering and degradation studies
- **Biology and bioassay laboratories** for hazard assessment
- **Computational and modelling infrastructures**
- **Pilot-scale recycling and remediation technologies**

This diversity reflects the multidisciplinary nature of the Action and supports research needs across the entire M/NP lifecycle.

3. Evidence from STSM Mobility Patterns

The “Previous STSMs” database (77 missions completed from 2022 to 2025) provides concrete evidence of how infrastructures were accessed.

3.1 Geographic Distribution

The STSMs involved a network of institutions spanning:

- **Most European COST countries**, including ITCs
- **North America (Canada, USA)**
- **Asia (South Korea, India)**

The majority of missions took place in Europe, reflecting geographical proximity and COST funding rules, but the presence of extra-European missions demonstrates global connectivity.

3.2 Patterns of Use

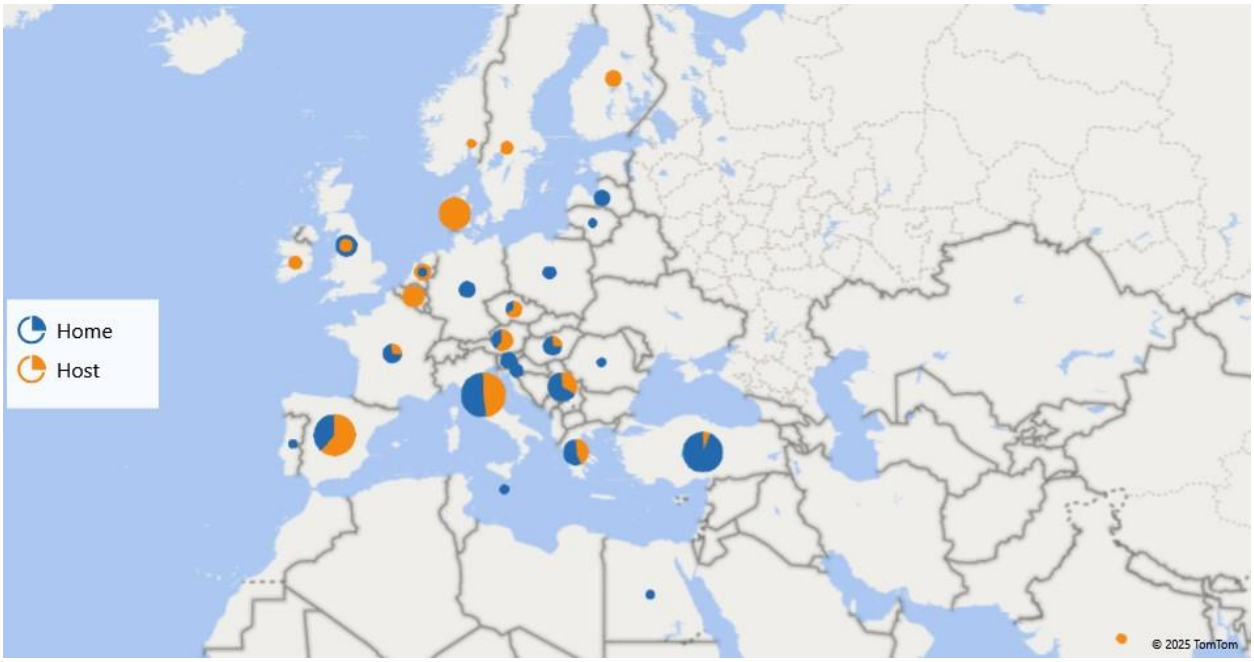
Analysis of mission topics and host institutions shows:

- High demand for **advanced analytical facilities** (WG2–WG4)
- Steady use of **toxicology and exposure laboratories** (WG1)
- Emerging use of infrastructures for **remediation and recycling research** (WG5)
- Increasing interest in **data modelling and harmonization tools** (WG3, WG6)

The frequent recurrence of certain hosting institutions indicates strong expertise clusters within the network, while under-represented regions signal potential gaps in accessibility.

3.3 Inclusiveness

Many missions originated from Inclusiveness Target Countries (ITCs), demonstrating that the current environment has successfully supported equitable access, although some countries remain underrepresented both as home and host institutions. The bubble map below shows the geographical distribution of all 77 STSMs. For visualization purposes, the map focuses where the majority of missions took place. However, the network also extended beyond Europe, with additional STSMs involving institutions in Canada, the United States, India, and South Korea. Each bubble represents a home or host country, with its size proportional to the number of missions, highlighting the breadth of scientific exchange and collaboration fostered by the Action.



4. Assessment of Infrastructure Accessibility

Combining both sources reveals:

- **High overall accessibility**, with many laboratories voluntarily opening their facilities for mobility and collaboration.
- **Strong alignment** between available facilities and the scientific needs of PRIORITY.
- **Good coverage in central and western Europe**, with growing engagement from southern and eastern regions.
- **Limited availability** of specialized infrastructures for:
    - True nanoplastics detection (<100 nm)
    - High-throughput automated particle imaging
    - Long-term environmental exposure systems
    - Advanced in situ polymer ageing facilities
- **Few dedicated hubs** for model integration, large database management, and harmonized data storage.

These gaps suggest strategic areas for investment.

5. Proposal for New Specific Facilities

Based on the accessibility assessment, the following priorities are recommended:

5.1 Create Specialized Nanoplastics Detection Facilities

To address the scarcity of high-resolution, high-sensitivity equipment (e.g., AFM-IR, nano-Raman, single-particle ICP-MS), it is recommended to establish or strengthen facilities dedicated to nanoplastics research.

5.2 Develop Regional Hubs in Under-Served Areas

ITCs and southern/eastern Europe would benefit from:

- Distributed analytical hubs
- Shared sample-preparation and long-term storage facilities
- Joint training programs

5.3 Strengthen Infrastructure for Environmental Fate and Weathering

Few centres currently offer controlled environments for long-term weathering and ageing simulations.
Dedicated facilities could support WGs working on degradation, transformation, and lifecycle analysis.

5.4 Establish a Data Integration and Modelling Facility (Virtual or Physical)

To support WG3 and WG6:

- A central environment for data curation, FAIR storage, modelling, and digital twins
- A virtual research infrastructure accessible across Europe

5.5 Promote Shared Access Policies and a Permanent Infrastructure Network

Building from existing STSM hosts, PRIORITY could define:

- A unified access framework
- Accreditation of shared facilities
- A long-term, open-access research infrastructure catalogue

6. Conclusions

The combined analysis of **declared hosting capacities** and **actual STSM mobility patterns** provides a comprehensive overview of current research infrastructure accessibility within PRIORITY.
The network already benefits from a rich and diverse set of facilities, distributed across many countries and scientific domains. The 77 STSMs completed during the Action demonstrate strong engagement, efficient use of available infrastructures, and active participation from ITCs.

Nonetheless, gaps remain in geographic distribution, nanoplastics-specific analytical capabilities, environmental simulation infrastructures, and data-model integration facilities. The proposals outlined in this report provide a strategic pathway toward reinforcing accessibility, fostering equitable participation, and supporting future large-scale European initiatives.

These findings also serve as evidence for future COST Actions, Horizon Europe proposals, or the development of a dedicated research infrastructure roadmap.