Action title:

FAIR NEtwork of micrometeorological measurements

Action No.: **CA20108**
Acronym: **FAIRNESS**
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WP No: **4**
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Deliverable: **D4.3 – Report on Micromet_KSP analytics (M39)**

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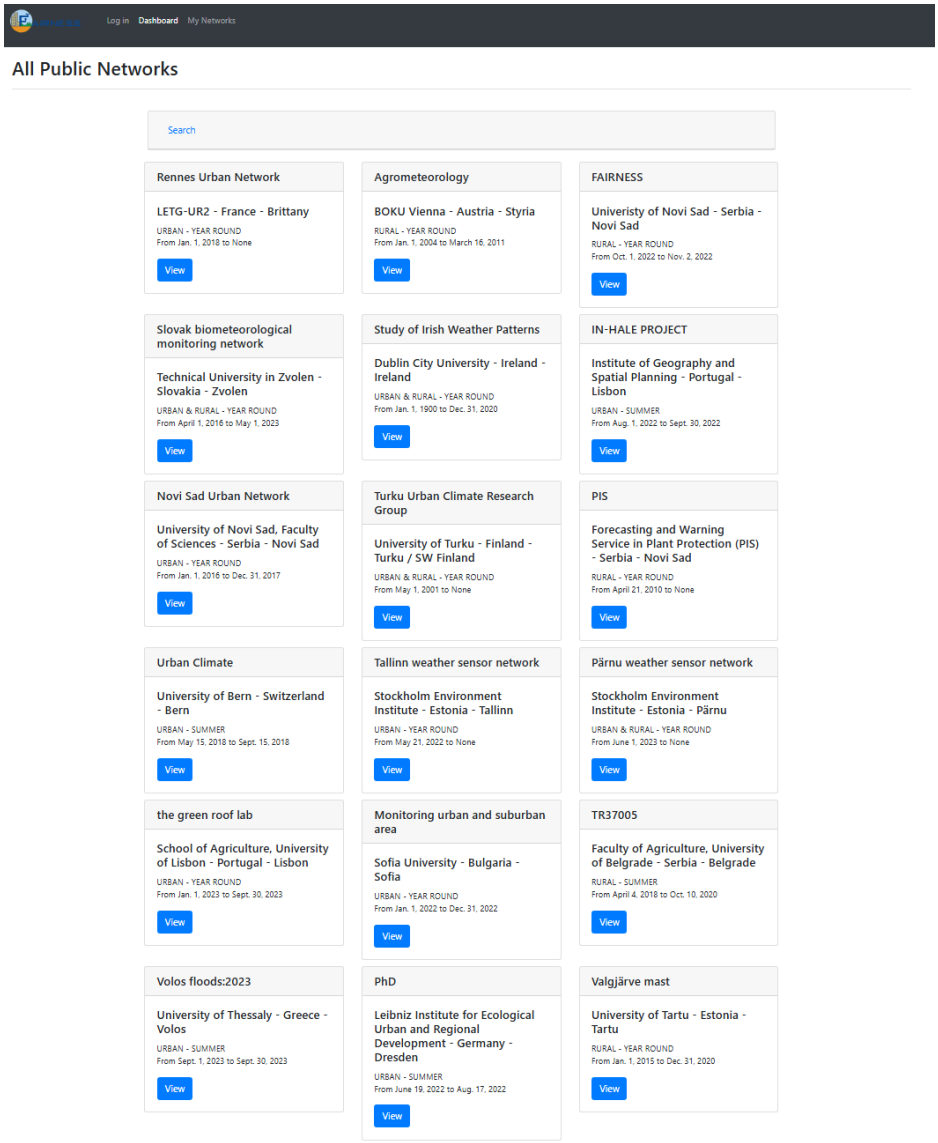
Executive Summary

This deliverable (D4.3 – Report on Micromet_KSP Analytics) summarises the usage, structure, and impact of the **FAIR Micromet Platform (FMP)**, a digital output of the **FAIRNESS COST Action (CA20108 – FAIR Network of Micrometeorological Measurements)**.

The report provides quantitative and qualitative insights into platform activity since its deployment in 2022, documenting user-generated network records, metadata completeness, and integration with open repositories such as **Zenodo**.

By enabling users to register, describe, and interlink micrometeorological measurement networks across Europe, the FMP operationalises the **Findable, Accessible, Interoperable, and Reusable (FAIR)** principles. It provides a foundation for future FAIR data services and supports the long-term sustainability objectives of FAIRNESS Working Group 4.



1. Introduction

The FAIR Micromet Platform (FMP), formerly known as Micromet_KSP, was developed to collect, describe, and visualise micrometeorological measurement networks in alignment with FAIR data principles. It serves as both a knowledge-sharing hub and a metadata registry, enabling the integration of site-level observations with larger European research infrastructures.

Since its public deployment in 2022, the FMP has attracted contributions from researchers across 16 countries, covering diverse environmental settings (urban, rural, and mixed) and temporal scopes (seasonal and year-round networks).

The analytics presented in this report were compiled to monitor the platform's adoption, assess the quality of contributed metadata, and evaluate the platform's effectiveness in supporting FAIR data principles.

2. Search and Findability Functionality

The FMP's Search option is an important aspect of the Findable Accessible (F and A properties) part of FAIR. In figure, we can see the search options (country, city, local environment, seasonality, date range) which on this occasion locates the University of Bern Network. Only 1 network was located as the search specified 4 search parameters for matching.

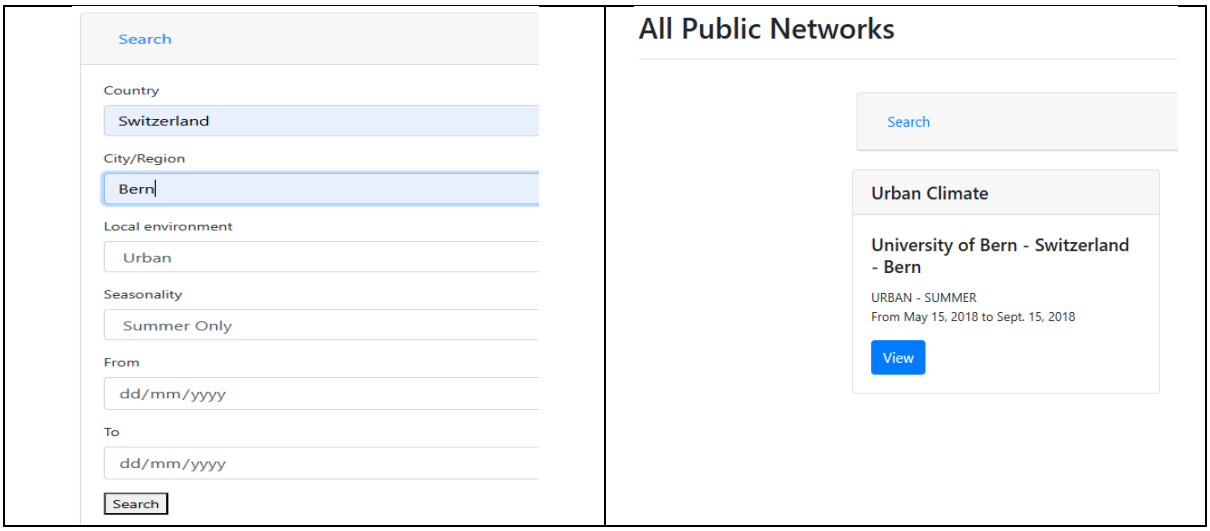


Figure 1: FMP Search Service

3. Network Distribution

3.1 Geographic Coverage

Since the FMP was deployed in 2022, a total of 23 networks have been created by researchers based in 16 different countries, with 3 of those countries contributing more than 1 network.

Table 1: Network Distribution by Country

Country	TOTAL
Serbia	5
Estonia	3
Portugal	2
Austria	1
Bulgaria	1
Czech Republic	1
Finland	1
France	1
Germany	1
Greece	1
Ireland	1
Israel	1
Slovakia	1
Switzerland	1
Turkey	1
United Kingdom	1

3.2 Local Environment

Apart from a country based distribution, we can also examine distributions across Local Environment (table 2) and seasonality (table 3). If the Search facility from table 1 contained only 1 search parameter, Local Environment = URBAN, the results would contain 12 networks. If only Seasonality were used, then either 17 or 6 networks would be returned, according to the choice of the user.

Table 2: Network Distribution by Local Environment

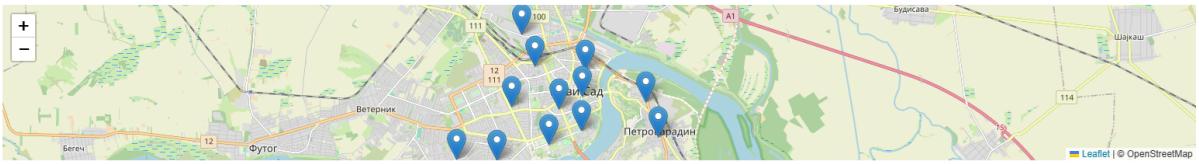
Local Environment	TOTAL
URBAN	12
RURAL	7
URBAN & RURAL	4

3.3 Seasonality

Regarding temporal coverage, 17 networks provide year-round observations, while 6 networks are seasonal (summer only). This diversity supports both long-term monitoring efforts and short-term experimental campaigns.

Table 3: Network Distribution by Seasonality

Seasonality	TOTAL
YEAR ROUND	17
SUMMER	6



Name	Latitude	Longitude	Altitude (M)	Time Zone	Macroscale Environment	
s2-3	45.261388	19.848888	78.00000	UTC	Residential Area (Multi-Story Buildings)	View
s3-2	45.233333	19.809722	79.00000	UTC	Residential Area (Houses)	View
s5-2	45.25	19.816111	75.00000	UTC	Boulevard	View
s5-3	45.2625	19.826388	78.00000	UTC	Residential Area (Multi-Story Buildings)	View
s5-4	45.238055	19.832777	81.00000	UTC	Residential Area (Multi-Story Buildings)	View
s5-5	45.253055	19.8475	80.00000	UTC	Residential Area (Multi-Story Buildings)	View
s5-6	45.2425	19.847222	78.00000	UTC	Residential Area (Multi-Story Buildings)	View
s6-4	45.233611	19.791944	76.00000	UTC	Residential Area (Houses)	View
s6-8	45.251388	19.875555	76.00000	UTC	Residential Area (Houses)	View

Figure 2: Distribution of NSUNET Sites in Urban Setting

4. Network Composition and Metadata Quality

The majority of registered networks represent single-site deployments, while three networks include multi-site configurations, ranging from 4 to 12 locations. The largest network, NSUNET (Novi Sad Urban Network), includes 12 sites across an urban area, demonstrating the platform's capability to represent complex, spatially distributed measurement systems.

Each network entry includes a metadata record describing:

- Site location (latitude, longitude, elevation);
- Sensor specifications (type, principle of operation, response time);
- Data availability period and temporal resolution;
- Data access link (where applicable, e.g. Zenodo DOI).

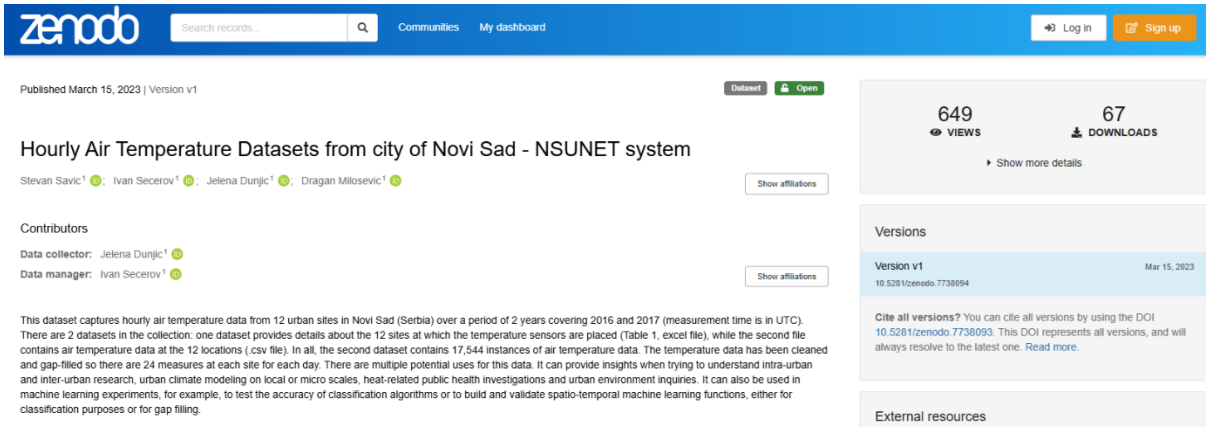


Figure 3: NSUNET Network Data in Zenodo's Open Repository

These metadata attributes were harmonised following WMO standards, supporting interoperability (I) and reusability (R). Figure 3 illustrates a linked Zenodo dataset for NSUNET, which at the time of reporting recorded 649 views and 67 downloads, demonstrating active data reuse (Figure 2).

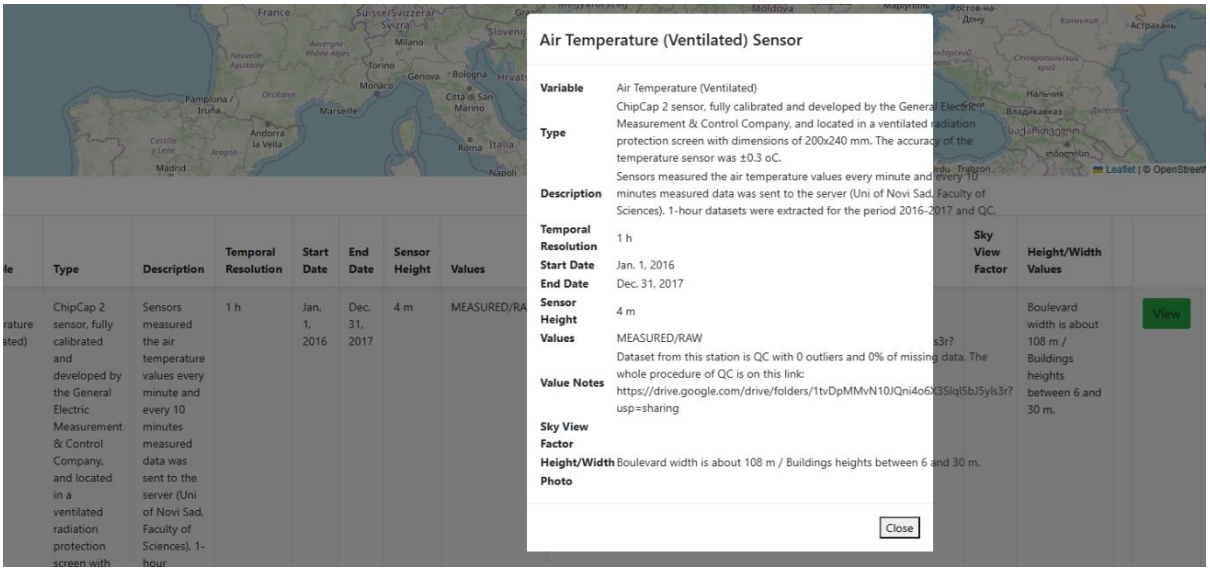


Figure 4: Sensor Metadata and Descriptions

5. FAIR Implementation Highlights

The FMP's design ensures alignment with all four FAIR principles:

FAIR Principle	Implementation Example
Findable	Multi-parameter search (country, environment, seasonality, etc.)
Accessible	Direct link to open repositories (e.g. Zenodo DOI)
Interoperable	Metadata harmonised with WMO standards
Reusable	Detailed sensor metadata, data quality indicators, and temporal coverage

By providing both human-readable and machine-actionable metadata, the FMP improves discoverability and usability of small-scale meteorological datasets, which are often inaccessible in conventional databases.

6. Platform Usage and Analytics Summary

- Total Networks Registered: 23
- Countries Represented: 16
- Local Environments: Urban (12), Rural (7), Mixed (4)
- Observation Types: Year-round (17), Seasonal (6)
- Average Metadata Completeness: >85% of mandatory fields filled
- Total Records Linked to Zenodo: 9
- Most Active Network: NSUNET (Serbia) – 649 dataset views, 67 downloads

These statistics demonstrate strong early engagement of the FAIRNESS community and clear evidence of platform use for research data sharing and FAIR-compliant documentation.

7. Outlook and Recommendations

To maintain and expand the FMP's role as a living infrastructure, the following steps are recommended:

- Continuous onboarding of new networks and integration of external metadata (ICOS, Copernicus, and national services).
- Implementation of FAIRness maturity scoring for datasets.
- Establishment of an automated metadata validation tool to ensure consistency.
- Continued dissemination through FAIRNESS community channels (LinkedIn, ISB Newsletter, EOSC partnerships).
- Integration of analytical modules for visualising network distribution and temporal coverage over time.

8. Conclusion

The FAIR Micromet Platform (FMP) has proven to be a valuable and functional instrument for consolidating micrometeorological observations and promoting FAIR data principles. Its continued development and usage analytics demonstrate the effectiveness of the FAIRNESS COST Action in building a European framework for open, interoperable, and reusable environmental data. The FMP stands as both a scientific and operational legacy of FAIRNESS, supporting long-term sustainability of micrometeorological knowledge exchange.