EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

Brussels, 25 May 2021

COST 048/21

**DECISION**

Subject: Memorandum of Understanding for the implementation of the COST Action "FAIR NEtwork of micrometeorological measurements" (FAIRNESS) CA20108

The COST Member Countries will find attached the Memorandum of Understanding for the COST Action FAIR NEtwork of micrometeorological measurements approved by the Committee of Senior Officials through written procedure on 25 May 2021.

**MEMORANDUM OF UNDERSTANDING**

For the implementation of a COST Action designated as

**COST Action CA20108**
**FAIR NETWORK OF MICROMETEOROLOGICAL MEASUREMENTS (FAIRNESS)**

The COST Members through the present Memorandum of Understanding (MoU) wish to undertake joint activities of mutual interest and declare their common intention to participate in the COST Action, referred to above and described in the Technical Annex of this MoU.

The Action will be carried out in accordance with the set of COST Implementation Rules approved by the Committee of Senior Officials (CSO), or any document amending or replacing them.

The main aim and objective of the Action is to The main aim and objective of the Action are to establish, implement and disseminate micrometeorological knowledge share platform (Micromet_KSP) across Europe and beyond. The strategy is to build Micromet_KSP on existing micrometeorological sources – data and methodologies and permanently integrate new members from Full Members States, IPCs, NNCs, and Specific Organizations.. This will be achieved through the specific objectives detailed in the Technical Annex.

The present MoU enters into force on the date of the approval of the COST Action by the CSO.

## OVERVIEW

**Summary**
The current state of weather-induced agricultural losses, water use for irrigation, the appearance of new invasive species and disease vectors (strongly depending on micrometeorological conditions), new environmental zoning of plant diseases and pests, deforestation, increased urbanization, rural-to-urban migration and increased urban energy consumption for cooling/heating impose scientific and societal request to provide **micrometeorological knowledge share platform** (**Micromet_KSP**) in order to communicate: a) compiled an inventory of available and quality proven micrometeorological in situ data sets on the European level and beyond, b) measurement and data management recommendations designed in order to meet FAIR principles and avoid temporal and spatial gaps, c) examples of rural and urban FAIR data sets and d) Q&A exchanged between Action members, stakeholders, specialized user groups and the general public.

The FAIRNESS action intends to improve standardization and integration between databases/sets of micrometeorological measurements that are part of research projects or local/regional observational networks established for special purposes (agrometeorology, urban microclimate monitoring).

Addressing identified challenges requires an effective transboundary network of researchers, stakeholders (extension services and environmental agencies, local authorities and ministries, SME) and civil society (specialized and general public) from Europe and beyond to identify and fill knowledge gaps, standardize, optimize and promote new environmental-tailored measurement and control procedures, enhance research effectiveness and improve dissemination.

| **Areas of Expertise Relevant for the Action** | **Keywords** |
|---|---|
| ● Earth and related Environmental sciences: Meteorology, atmospheric physics and dynamics<br>● Earth and related Environmental sciences: Climatology and climate change | ● rural micrometeorology<br>● urban micrometeorology<br>● climate change<br>● measurement network<br>● knowledge share platform |

**Specific Objectives**
To achieve the main objective described in this MoU, the following specific objectives shall be accomplished:

Research Coordination
● Establish a core forum of available micrometeorological measurement networks and data holders in Europe, evaluate data fairness, and identify gaps. Guidelines for FAIR principles implementation and list of gaps will be identified. Inventory of available data will allow assessment of their “fairness” and existing gaps; comparison of different measurement methods.
● Development and implementation of Micromet_KSP with associated data and information sources. Implementation will take a place through the Action networking tools and region/environmental specific case studies. Micromet_KSP will be integrated into the Action web page. Exchange files will be stored at ZENODO.
● Establish FAIRNESS user’s community which includes: Micromet_KSP and case study participants and users; participants of trainings, summer schools, STSMs, and workshops; identified data users

and stakeholders. The involvement of students and researchers from low-performing countries and institutions will reduce the crowding-out effect related to the use of expensive measurement technologies.

Capacity Building

● Creating a Pan-European (and beyond) multidisciplinary network of researchers and stakeholders with diverse background in meteorology/climatology, agricultural and food production, forestry, health and urban heat island effects. It will strengthen ERA promoting global research agenda related to existing and emerging research topics such as (urban) health meteorology.

● Fostering skill and knowledge enhancement in order to avoid the "crowding out" effect and introduce new job skills. Training courses and other forms of education in data assimilation, management, and application (Micromet_KSP implementation) will be offered across FAIRNESS action members and users community Increasing employability of early-career investigators (ECI).

● Establish FAIRNESS “neighboring” community through communication and joint meetings with ongoing projects and measurement networks, COST actions, international organizations, and agencies sharing the same interest or using data and information managed by FAIRNESS.

# TECHNICAL ANNEX

# 1. S&T EXCELLENCE

## 1.1 Soundness of the Challenge

Reliable and sufficient knowledge on environmental conditions or processes delivered from micrometeorological and microclimatological data (see Remark1) plays a central role in **assessing** and **modelling** trends and effects of climate change (CC) and adverse weather events on the environment and ecosystems over all spatial and temporal scales. Enormous efforts have already been made on the European level in order to centralise data from ground-based (synoptic scale) and satellite measurements, weather and climate simulations and to make them available for public use (COPERNICUS, ECMWF data base, e-OBS, for example). These **well-established data sources** are broadly and successfully used in research, education and economics. However, beyond specific initiatives (see section 2.1.1), they are still **missing one very important component** – **micrometeorological data**, i.e. data addressing meteorological conditions of microenvironment (see Remark1) open and available for various application potentials and user groups.

Micrometeorological data are usually collected as a part of scientific projects and observational networks developed for different purposes, but they often "languish" in reports and institutional data storages. To address this shortfall FAIRNESS (see Remark2) COST Action will establish **micrometeorological knowledge share platform** (Micromet_KSP) in order to communicate: a) compiled inventory of available and quality proven micrometeorological in situ data sets on the European level and beyond, b) measurement and data management recommendations designed in order to meet FAIR principles and avoid temporal and spatial gaps (see Remark3), c) examples of rural and urban FAIR data sets and d) Q&A exchanged between Action members, stakeholders, specialised user groups and general public. Successful implementation and dissemination of Micromet_KSP, as a data framework, will create a strong background of future research and modelling studies as well as a European Micrometeorological database.

**Remark1**: Climatological data refer to long-term average of meteorological variables. Meteorological data refer to the current state of atmospheric variables. Micro-scale in meteorology refers to spatial scales of 1 km or smaller.

**Remark2**: Term "fairness" will be used to describe how data meet FAIR principles (Findability, Accessibility, Interoperability and Reusability). FAIRNESS (capital letters) is the Action title.

**Remark3**: The gaps which will be considered refer to: missing data in time series of meteorological data and/or metadata, missing spatial coverage and lack of knowledge and expertise.

### 1.1.1 DESCRIPTION OF THE STATE-OF-THE-ART

**IMPORTANCE**. **The greatest challenges of 21st** century such as climate change, natural hazards, biodiversity and ecosystem functions, food risks, deforestation, vector born (human and animal) diseases, air quality and urbanization **are either affected by or affect atmospheric conditions, particularly on the micro-scale.**

**Climate change** (CC) is accelerating (IPCC, 2018). Frequency and intensity of weather-related **natural hazards and extreme events are increasing** (IPCC, 2018, Alcantara-Ayala et al., 2015, World Economic Forum, 2019 https://www.weforum.org/reports/the-global-risks-report-2019) requiring urgent adaptations (The World Bank, 2010). This is considered both a European and a global challenge. Meteorological conditions can vary significantly within small spatial scales due to differences in surface

cover, soil and topographical characteristics. A good tactical and strategic plan for facing varying weather and changing climate relays on high spatial density and good quality of site-specific observations and measurements in order to improve high-resolution numerical weather prediction (NWP), climate, agricultural, environmental and urban simulation models. These challenges create the need for adequate measurement methods and strategic planning for establishing application-oriented data sets, where Micromet KSP will contribute to and set new and innovative standards.

**CURRENT STATUS OF DATA SOURCES.** *Weather station networks in charge of National weather services*, as a part of Global Climate Observation System (GCOS), are installed to monitor synoptic scale processes. These networks are not dense enough to provide information about the state of the atmosphere on micro-scales. Currently operating, available, high-quality *micrometeorological databases focus on tower measurements* and surface-atmosphere flux exchange (Pastorello et al., 2017, Lappalainen et al., 2018). They provide valuable information about the lower atmosphere but their spatial coverage is and will be limited due to significant investment and maintenance costs. However, they are organized within permanently operating European (e.g. European Fluxes database cluster) or global (e.g. FLUXNET) flux measurement networks and initiatives. More can be found in Section 2.1.1.

**FAIRNESS targets are**, primarily, ***networks of Automated Weather Stations (AWSs)*** **installed in rural, sub-urban and urban areas** which are in charge of dedicated projects, specialised agencies, regional or national government offices for specific applications in the sectors of agrometeorology (e.g. pest and disease warning systems), forest-, urban- and environmental meteorology (Muller et al., 2013, Lalic et al., 2020). AWSs are commonly designed to measure precipitation, air temperature and relative humidity, soil temperature, water content and, depending on the specific application, also other (micro) meteorological parameters such as wind speed, intensity of global and photosynthetic active radiation (PAR), leaf wetness. Strength of the databases associated with these networks is high spatial density of the stations representing small-scale environmental conditions and processes. The most profound weakness of existing data is lack of **findability**, **accessibility**, **interoperability** and **reusability** of the data, i.e. they do not meet FAIR Guide Principles in managing data and metadata (Wilkinson et al., 2016). Opportunity behind existing data sets is “to define a minimal set of related but independent and separable guiding principles and practices, which enable both machines and humans to find, access, interoperate and re-use research data and metadata” (PwC EU Services, 2018). A possible threat is lack of willingness of people in charge of AWSs data management to join the effort and apply new procedures on existing networks, mainly due to additional costs and resource limitations.

### 1.1.2 DESCRIPTION OF THE CHALLENGE (MAIN AIM)

The main aim of FAIRNESS COST Action is to establish, implement and disseminate Micromet_KSP across Europe and beyond. The strategy is to build Micromet_KSP on existing micrometeorological sources – data and methodologies (see 2.1.1) and permanently integrate new members from Full Members States, IPCs, NNCs and Specific Organisations thus widening spatial, multi-, inter- and transdisciplinary scale of the Action.

**Relevance**: Addressing FAIRNESS challenge allows : a) better analysis and picture of current state of small-scale climate change and adverse weather effects in rural and urban areas, b) enhanced planning of field crop operations (irrigation), plant protection measures (spraying), improved and more effective forestation, c) enhanced planning of urban energy consumption, d) improved adaptation options for fighting **carriers of dangerous viruses** : organization of effective surveillance and control of invasive species like *Aedes albopictus* and other *Aedes* invasive mosquitoes. FAIRNESS Action will directly support activities related to policies such as Common Agricultural Policy, European Green Deal, National Adaptation Plans (NAP) and strategies, Smart city strategy and allow effective development of urban areas based on sustainable solutions and climate change adaptation strategies on local and regional scales.

**Timeliness** : Long-term need for Micromet_KSP is strongly boosted by two independent but equally important issues : a) full awareness of the time, effort and money lost due to lack of FAIR data (it is

clearly quantified in EC PwC EU Services report (PwC EU Services, 2018) : "…the minimum true cost of not having FAIR data … is 78% of the Horizon 2020 budget per year) and b) urgent need to develop tailored adaptation and mitigation measures in rural and urban areas to reduce negative effects of adverse weather and climate change. It initiates internal community dynamics bringing together FAIRNESS data providers, researchers, user groups and stakeholders of different levels.

FAIRNESS aims and challenges are in line with Horizon Europe framework programme. The main goal and objectives of FAIRNESS are fully focused on **Open science** concept as one of the main pillars of future scientific strategy and are in line with 3 out of 5 mission areas : **Adaptation to climate change including societal transformation**, **Climate-neutral and smart cities** and **Soil health and food**. FAIRNESS activities and results will contribute to strategic planning process proposed by the European Commission in the following clusters and areas of intervention (https ://ease-storage.eu/horizon-europe/): **Health** – Infectious diseases (e.g. zika, denga), **Climate, Energy and Mobility** – Climate science and solutions, Energy supply, Communities and cities ; **Food and natural resources** – Environmental observation, Agriculture, forestry and rural areas, Bio-based innovation systems.

## 1.2 Progress beyond the state-of-the-art

### 1.2.1 APPROACH TO THE CHALLENGE AND PROGRESS BEYOND THE STATE-OF-THE-ART

**HOW THE CHALLENGE WILL BE APPROACHED.** Implementation and dissemination of Micromet_KSP will contribute to identification, standardization and integration of data and methodologies related to site-specific micrometeorological measurements that are/were part of research projects or local/regional observational networks established for special purposes (agrometeorology, urban microclimate monitoring and forest meteorology). The FAIRNESS Action will foster and strengthen collaboration among **specialists** maintaining and using data and communication with **societal actors** interested in the Action outcomes (for example, extreme weather effects, increase of urban heat islands, human thermal discomfort).

**Innovativeness of FAIRNESS.** The Action will establish the first **micrometeorological knowledge share platform** (**Micromet_KSP**) to serve as ground base of future **European micrometeorological database** (EU-Micro_Met) which will complement other databases such as the existing **European Eddy Fluxes Database Cluster (**EUROFLUX**). Micromet_KSP** will be established by a) compiling an inventory of available in situ micrometeorological data (including metadata) and calculated indices, b) evaluating and enhancing data "fairness" (whether data sets are designed according to FAIR principles), c) designing complete pilot data sets representing rural and urban micrometeorological conditions and d) evaluating Q&A communication in order to assess hot topics for all actors, particularly stakeholders and end-users at different societal levels (i.e., institutional/governmental, industrial/commercial and private/farmers). To demonstrate its functionality and application potential,the Action will implement **Micromet_KSP** as an element of the Action web page. The structure of **Micromet_KSP** will allow a broad range of applications from practice to the research level, which will be tested in sector-specific (agricultural, forestry, urban, health) case studies.

**ADVANCE THE STATE OF THE ART IN THE FIELD**. For the first time, a comprehensive, structured micrometeorological knowledge share platform (Micromet_KSP) of site-specific measurements will be established on the European level addressing the primary needs of : i) research applications (e.g. risk assessment and management decision-supporting tools under climate change conditions while considering the greatly varying ecosystem conditions in Europe) ; ii) stakeholders (specialists/experts, manufacturers of equipment, pharmaceuticals and food industry), policy and decision makers (from local to national and international level) ; iii) specialised user groups and general public related/interested in meteorology/climatology, agriculture and forestry, environmental sciences and health issues.

## 1.2.2 OBJECTIVES

The FAIRNESS Action intends to **develop synergy** among researchers, stakeholders and civil society, to **fully embrace FAIR data and "3-O"** (Open data, Open innovation, Open to the World) **concepts to enhance application potentials of micrometeorological data and their visibility.** This will be achieved through 4 research coordination objectives and 4 capacity-building objectives which will be put into force through four Working Groups (Figure 1).

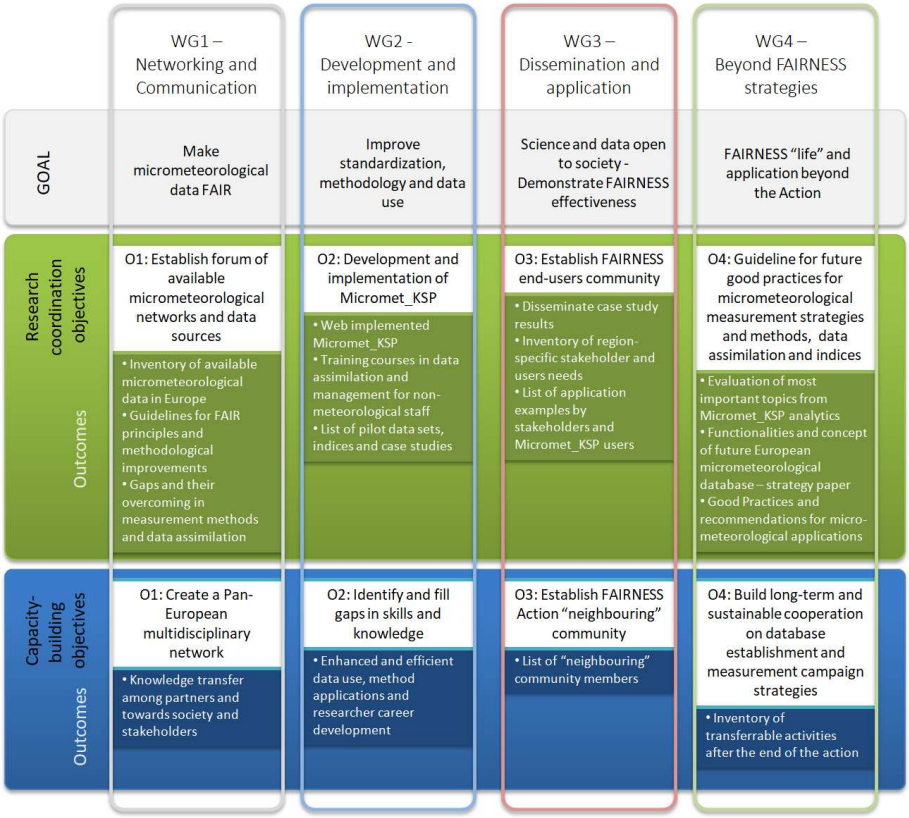


**Figure 1** Diagram mapping the main goals and Working Groups as well as the outcomes from Research coordination and Capacity-building objectives of FAIRNESS. (**Remark4** : "Neighbouring" community refers to projects, international organisations, agencies, specialised and public networks sharing the interest in FAIRNESS Action topics)

### 1.2.2.1 Research Coordination Objectives

The main research coordination objective is to empower the capacity for identification, description and mapping of potential weather- and climate-based environmental risks in Europe by establishing Micromet_KSP as a data framework and by demonstrating promising applications via different assessment tools (statistical methods, environmental indices, crop and pest/disease models and other ecosystem models). The effectiveness of FAIRNESS will be demonstrated through case studies designed in accordance with subjects of interest in participating countries. It will create added value and the potential for innovating different practical applications and research in order to identify and assess spatio-temporal weather-to-environment related effects and minimize risks for site-specific human activities that cannot be achieved without international coordination.

**SMART** research coordination objectives will be implemented by four Working Groups (WG) (see Section 4.1.1) as follows :

**Objective 1** (**WG1** – Networking and communication)

- **S** : Establish a core forum of available micrometeorological measurement networks and data holders in Europe (see section 2.1.1), evaluate data fairness and identify gaps.
- **M** : Networks (3) and individual (25) data sources will be introduced by Action members (see 2.2.1). Guidelines for FAIR principles implementation and list of gaps will be identified.
- **A** : Action members confirmed their status as "data providers".
- **R** : Inventory of available networks and data sets will allow assessment of their "fairness" and existing gaps. It will allow comparison and performance assessment of different measurement and data management methods and their future enhanced coordination.
- **T** : Inside-action inventory will be compiled until the end of M06 of the Action. Further coordination of information seeking and identification will take place during FAIRNESS lifetime.

**Objective 2 (WG2** – Development and implementation**)**

- **S** : Development and implementation of Micromet_KSP.
- **M** : Micromet_KSP with associated data and information sources including pilot data sets and selected indices will be developed ; Micromet_KSP will be implemented through Training Schools, , STSMs, workshops and region/environmental specific case studies.
- **A** : Micromet_KSP will be integrated into the Action web page. Case studies will be designed according to region-specific challenges in rural, urban, rural-to-urban and urban-to-rural areas. Exchange files will be stored at general-purpose open-access repository ZENODO.
- **R** : Micromet_KSP is a key tool in assessing FAIRNESS main aim. Its implementation will allow comparison and performance assessment of different models : a) meteorological (numerical weather prediction (NWP) and soil-vegetation-atmosphere (SVAT)), b) agronomy and agrometeorology (crop and fruit development models, agroclimatic (risk) models, pest and disease models), c) forestry (tree growth and gas exchange models), d) medicine/vector disease control (invasive species distribution models), e) urban (air quality, urban microclimate, urban heat island, urban living conditions and urban energy consumption models).
- **T** : Basic structure of Micromet_KSP will be uploaded until M06 of the Action. Afterwards, the content and functionalities will be permanently updated. Implementation and case studies éalisation process will start from M06.

**Objective 3 (WG3 –** Dissemination and application**)**

- **S** : Establish FAIRNESS users community.
- **M** : FAIRNESS users community will include : Micromet_KSP and case study participants and users ; participants of trainings, Training Schools, STSMs and workshops ; identified data users and stakeholders.
- **A** : Action networking tools and Micromet_KSP will be used to disseminate WG1 and WG2 results among identified FAIRNESS users community.
- **R** : Communication between FAIRNESS users community and FAIRNESS Action members with networking tools and Micromet_KSP allows synergy among researchers from different fields, specialists responsible for data measurement and assimilation and manufacturers (such as SME) of equipment. It will transform identified needs into novel/improved sources of information, standards and methodologies for stakeholders and general public. Involvement of students and researchers from low-performing countries and institutions will reduce crowding out effect related to use of expensive measurement technologies.
- **T** : Until the end of M06 "Dissemination and application action plan" will be established. A realistic and flexible (in respect to milestones) timeline with strict deadlines (in respect to deliverables) will ensure achieving goals and objectives during the Action lifetime.

**Objective 4 (WG4 –** Beyond FAIRNESS strategies**)**

- **S** : Guideline of future needs for micrometeorological measurements, data assimilation and application.

- **M** : Outputs from Micromet_KSP analytics and use of WG1-WG3 results (No. Of citations, views, data and information requests) will assess future needs for micrometeorological measurements, related methods and strategies, data assimilation and calculated parameters and indices, in order to be the commnuity who will set the research agenda for >2025.
- **A** : Micromet_KSP integrated analytical tools and scientific networks statistics (RG, Google Scholar, Scopus) will provide necessary data.
- **R** : The developed guidelines will be an important information and know-how source for stakeholders and future market applications (including cooperation with private enterprises) as well as researchers interested in development of future European micrometeorological database. It will allow application of FAIRNESS results beyond the Action.
- **T** : Until the end of M06 the structure and content of the Guidelines will be identified in order to introduce proper analytical tools in Micromet_KSP. From M12 “Guideline development plan” will be designed. From M12 to M40 data will be collected and analysed when the first draft of the Guideline will be offered for discussion to FAIRNESS users community and FAIRNESS Action members.

#### 1.2.2.2 Capacity-building Objectives

Internal dynamics of the established multidisciplinary network and cooperation with projects, international organisations and agencies sharing the same interest will : a) foster knowledge exchange and development of joint research agenda related to CC and adverse weather impacts on rural and urban micro-scales, b) foster bridging separate fields of research and application and c) act as a stakeholder/user platform.

**SMART** capacity building objectives will be implemented by the same four Working Groups as Research-Coordination objectives (see Section 4.1.1) as follows :

**Objective 1** (**WG1** – Networking and communication)

- **S** : Creating a Pan-European (and beyond) multidisciplinary network of researchers and stakeholders with diverse background in meteorology/climatology, agricultural and food production, forestry, health (vector born diseases) and urban heat island effects.
- **M** : Initial FAIRNESS consortium (see 2.2.1) already includes partners from 23 COST Countries NNCs-1, IPCs-5 and 1 international organisations/institutions.
- **A** : During the Action lifetime, regional and professional diversity of the Action will increase through involvement of new Action members and creation of FAIRNESS users community
- **R** : It will strengthen European Research Area and its collaboration with experts out of Europe in order to promote global research agenda related to existing and emerging research topics such as (urban) health meteorology (Boussoussou et al., 2019).
- **T** : Implementation of O1 is essential for FAIRNESS éalisation from the beginning until the end of the Action. Initial network is already established and éalisa be confirmed during Kick-off meeting.

**Objective 2** (**WG2** – Development and implementation)

- **S** : Fostering skill and knowledge enhancement in order to avoid « crowding out » effect and introduce new job skills.
- **M** : Training Schools and other forms of education in data assimilation, management and application (Micromet_KSP implementation) will be offered across FAIRNESS Action members and users community.
- **A** : Established FAIRNESS multidisciplinary network can offer high-quality training and education in order to overcome gaps in skills and knowledge. For specific topics particular experts will be invited as lecturers and trainers.
- **R** : Enhanced skills and knowledge will open opportunities for creation of new jobs and increased employability of Early Career Investigators (ECI), particularly from low-performing institutions and countries.

- **T**: Until the end of M12 “Skill and knowledge enhancement action plan” will be established. éalisation of the plan will take place from M12 to M46.

**Objective 3** (**WG3 –** Dissemination and application)

- **S**: Establish FAIRNESS “neighbouring” community through communication and joint meetings with ongoing projects and measurement networks, COST actions, international organisations and agencies sharing the same interest or using data and information managed by FAIRNESS.
- **M**: During the Action, the inventory of “neighbouring” community members and participants interested in cooperation with FAIRNESS will be permanently upgraded
- **A**: There is an initial list of international organisations and a large-scale Pan-European project interested in sharing data, knowledge and expertise with FAIRNESS (not included due to the anonymity policy but available on request).
- **R**: Further extension of knowledge exchange and introduction of new research fields will open a window of opportunity for new challenges and approaches. Micromet_KSP will introduce FAIRNESS “neighbouring” community and its results as much as possible.
- **T**: From the beginning of the Action, a list of potential FAIRNESS “neighbouring” community members will be updated and permanent communication maintained.

**Objective 4** (**WG4 –** Beyond FAIRNESS strategies)

- **S**: Build long-term sustainability which is essential for FAIRNESS “life” beyond the Action.
- **M**: Inventory of transferable activities will be made and upgraded during the Action.
- **A**: FAIRNESS has a large member community which can incorporate some small activities, important for FAIRNESS maintenance after the Action, into ongoing or new planned projects and actions.
- **R**: Long-term sustainability of FAIRNESS offers ground base for its extension and reuse of the established knowledge share platform without further investments. Use of ZENODO secures FAIRNESS data for the next 20 years.
- **T**: Until the end of M12 “Long-term sustainability plan” will be established. Until the end of M18 the initial Inventory will be prepared. From M19 to M40 Inventory of transferrable activities will be associated with potential points of transfer. From M40 until the end of the Action, testing of the transfer of activities will take place.

# 2. NETWORKING EXCELLENCE

## 2.1. Added value of networking in S&T Excellence

Addressing the identified challenges requires an effective **transboundary network** of partners and stakeholders (researchers, IT experts, field measurement specialists, extension services and environmental agencies, local authorities and ministries, SME involved in AWS production and installation, expert users community, specialized and general public) from Europe and beyond to identify and overcome knowledge and data gaps, standardize methods and data formats, optimize and promote new environment-tailored measurement and control methods and procedures, enhance research effectiveness and improve dissemination in **agricultural and food production, forestry,** human and animal **health** (vector born diseases) and **urbanization** (in further text denoted as “selected fields”).

### 2.1.1. ADDED VALUE IN RELATION TO EXISTING EFFORTS AT EUROPEAN AND/OR INTERNATIONAL LEVEL

**ONGOING PROJECTS**. The structural design and functionality of the Micromet_KSP as well as the empowered potential for assessment of weather- and climate-related environmental risks are of great importance for international projects related to : application of IT in agriculture, development of new precision farming techniques, improvement of environmental monitoring systems, urban leaving

conditions and energy consumption. Examples are : European Drought Impact Report Inventory (http ://europeandroughtcentre.com/news/european-drought-impact-report-inventory-edii-and-european -drought-reference-edr-database/), JRC based Mars Crop Yield Forecasting System (https ://agri4cast. Jrc.ec.europa.eu/), JRC based EDO drought catalogue (http ://edo.jrc.ec.europa.eu/edov2/php/index.ph p?id=1000), Czech Globe, Global Change research Institute (http ://www.czechglobe.cz/en/), PannEx–The Pannonian Basin Experiment (https ://sites.google.com/site/projectpannex/)), "A network of networks to progress urban climate science", URBAN-PREX (http ://www.urban-prex.org/).

STILL ACTIVE DATABASES AND NETWORKS

- **The European Eddy Fluxes Database Cluster** (http ://www.europe-fluxdata.eu/) is an example of good practice in keeping active results of finished research projects (EUROFLUX, ECO2S, Carbo Europe, Carbo Extreme, Carbo Africa, GHG Europe, IMECC, GreenGrass, Carbomont, CarboItaly, TCOS-Siberia, InGOS) and their merge with still active projects (ICOS, TERENO).
- **COPERNICUS** (www.copernicus.eu) is the European Union's Earth Observation Programme which offers information services based on **satellite Earth Observation and in situ (non-space) data.**
- The Pan-Eurasian Experiment (**PEEX**, https ://www.atm.helsinki.fi/peex/index.php/2-uncategorised/60-home) is a multidisciplinary, multiscale and multicomponent research, research infrastructure and capacity-building program in northern Pan-Eurasia with infrastructure which includes ground-based, aircraft, marine and satellite observations, as well as multiscale modelling platforms.
- **FluxNet** (https ://fluxnet.fluxdata.org/) is a global network of micrometeorological tower sites. It works to ensure that different flux networks are calibrated to facilitate comparison between sites, and it provides a forum for distribution of knowledge and data between scientists.
- Short Range Numerical Weather Prediction (**SRNWP**) Working Group (EUMETNET) (https ://www.eumetnet.eu/activities/forecasting-programme/current-activities-fc/c-srnwp/) Surface data pool provides ground-base measurements for NWP verification of surface processes.
- Urban meteorological networks (**UMNs**) : UMNs in Helsinki (Finland) (https ://testbed.fmi.fi/); BUCL in Birmingham (UK) (https ://www.nature.com/articles/sdata201638); AAMS in Amsterdam (Netherlands) (https ://www.ams-institute.org/urban-challenges/resilient-cities/amsterdam-atmospheric-monitoring-supersite/); FUMiNet in Berlin (Germany) (https ://www.geo.fu-berlin.de/en/met/ag/Stadtklima/FUMiNet-OpenStreetMap/index.html); MESSO in Olomouc (Czech Republic) (http ://mestskeklima.upol.cz/stanice.html); UMN in Szeged (Hungary) (http ://adatok.geo.u-szeged.hu/?lang=eng); NSUNET in Novi Sad (Serbia) (http ://www.urban-prex.org/); MOCCA in Ghent (Belgium) (http ://www.observatory.ugent.be/); UHIARC in several mid-sized cities of the Eurasian Arctic region (http ://urbanreanalysis.ru/uhiarc.html); urban monitoring network in Toulouse (France) (https ://www.sciencedirect.com/science/article/pii/S0269749110005932?via%3Dihub); NMA in Bucharest (Romania) (https ://meetingorganizer.copernicus.org/EGU2015/EGU2015-8587.pdf).
- Rural (agro)meteorological networks (**RMNs**) : Forecasting and Reporting Service for Plant Protection of AP Vojvodina and Republic of Serbia (Serbia) (http ://www.pisvojvodina.com/Shared%20 Documents/AMS pristup.aspx) ; WEGENER-Net (Austria) (https ://wegenernet.org/portal/); VitiMeteo (Austria) (https ://www.vitimeteo.at/vitimeteo/default/index), Lysimeter network (Austria) (e.g. https ://www.lysimeter.at/).
- **AIM COST Action** (http ://www.aedescost.eu/) is devoted to *Aedes* Invasive Mosquitoes surveillance, control and analysis practices, in order to develop best practice guidelines and protocols ensuring consistency across Europe.
- The Harvard forest data archive (**HF Data Archive**, https ://harvardforest.fas.harvard.edu/major-research-topics/major-research-topics/forest-atmosphere-exchange) contains scientific data collected over the last 30 years by scientists working at Harvard Forest plus selected data from

earlier studies recorded in the HF Archives. It provides direct links to data and metadata for each project.

STILL AVAILABLE DATABASES

- Boreal Ecosystem-Atmosphere Study (**BOREAS**, daac.ornl.gov/BOREAS/bhs/BOREAS_Home.html) was a large-scale international interdisciplinary experiment in the boreal forests of central Canada. Still available datasets include surface, airborne, and satellite-based observations collected from 1993 through 1996.
- Pre-LBA Anglo-Brazilian Amazonian Climate Observation Study (**ABRACOS**, https ://daac.ornl.gov/ cgi-bin/dsviewer.pl ?ds_id=899) provides quality controlled information from micrometeorology, climate, carbon dioxide, water vapour, plant physiology and soil moisture measurements.
- Highly important are national databases like Climate Change Center Austria (**CCCA**, https ://forschungsinfrastruktur.bmbwf.gv.at/de/institution/ccca-climate-change-centre-austria-datenzen_trum_122) data bank containing data on climate change impacts, including also micrometeorological data and impacts on crops, pests and diseases.

The **added value** of FAIRNESS **in relation to existing projects/databases/networks/international** organizations and initiatives (FAIRNESS "neighbouring" community) lies in an improved and extended collaboration among researchers and experts, user groups, students, stakeholders from various background and exchange of experience. This will enlarge network and visibility of FAIRNESS goals and results which leads to: a) **acceleration of dissemination and networking** with the same resources when the Action results are tested and promoted in the framework of FAIRNESS "neighbouring" community activities while this community itself can benefit from the Action dissemination and networking activities to promote their results, b) **new joint research projects** and publications with already established communication links, data inventory and common data policy, c) **reduced knowledge and skill differences among the user community**, which will enhance involvement of ECI (particularly from low-performing countries and institutions) in research projects and d) **leverage of EC funds** by enhancing "fairness" of micrometeorological databases available for future projects and public use.

## 2.2. ADDED VALUE OF NETWORKING IN IMPACT

### 2.2.1. SECURING THE CRITICAL MASS AND EXPERTISE

The composition of the FAIRNESS COST Action is ideal for achieving the Action goals. Geographical spread of SPs and Inclusiveness of ITCs and NNCs can be clearly seen in Figure 2. From the **critical mass** & **expertise perspective**, FAIRNESS COST networks have the capacity to achieve the Action goals: academics from different scientific disciplines (meteorology, biology, agricultural sciences, computer & information sciences, health), members of national/local public organisations, policy makers and stakeholder from governmental institutions and private companies from: research intensive countries, ITCs, cooperating member countries, NNCs and IPCs. Twenty seven institutions declared themselves as data providers.

**In order to ensure participation of young people each SP will include at least one ECI from the beginning of the Action taking into account gender balance.** Additionally, research groups from USA and China (International Partner Country) are included among SPs in order to communicate their éalisation in micrometeorological measurements and application. International organizations representatives (**EUMETNET, ECMWF**) will be members of **FAIRNESS Advisory board** in order to contribute, endorse and disseminate the Action Guidelines and recommendations and to provide strategic perspectives and guidance, others not included in the initial network (WMO) will be invited to participate in the Workshops and Training Schools with the same goal. FAIRNESS SPs with critical

expertise for the Action goals realization will be members of the FAIRNESS Core Pan-European multidisciplinary network.

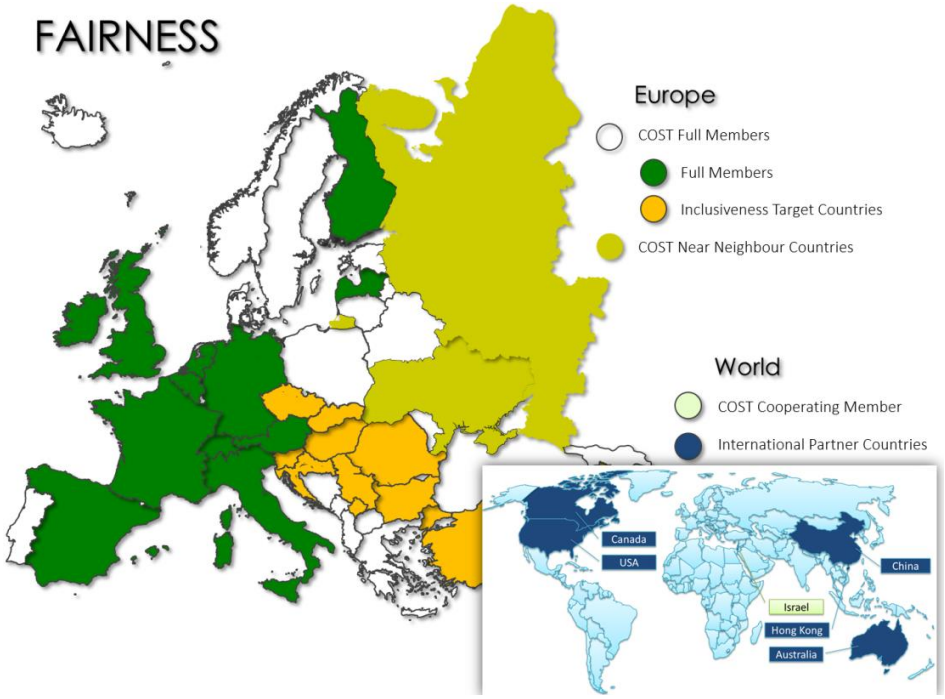


**Figure 2** Geographical spread of FAIRNESS COST Action Network.

### 2.2.2. INVOLVEMENT OF STAKEHOLDERS

Through involvement of stakeholders, the climate services and decision makers will be better informed about micrometeorological monitoring in rural and urban areas and how to use online datasets provided by Micromet_KSP platform. To fulfil these tasks, the FAIRNESS Action will involve the following stakeholders as SPs (due to the anonymity rule, the full title of stakeholders is avoided) : national Environmental Protection Agency, Institute of Public Health, national Forecasting and Reporting Service for Plant Protection, NGO sector (Environment Engineering Group, the National Green Roof Association), representatives of local communities. The Action will be strongly focused on cooperation with global networks, such as ICLEI – Local Government for Sustainability, which contains more than 1750 local and regional governments, promoting city and community resilience and engaging more than 3500 cities, towns and regions worldwide.

### 2.2.3. MUTUAL BENEFITS OF THE INVOLVEMENT OF SECONDARY PROPOSERS FROM NEAR NEIGHBOUR OR INTERNATIONAL PARTNER COUNTRIES OR INTERNATIONAL ORGANISATIONS

FAIRNESS Action challenge is as global as climate and weather variability. The more countries are involved from all over the World from the beginning – the better will be the Action activities and results achieved. Therefore, from the beginning until the end of the Action particular effort will be invested in enlargement of SPs number as well as FAIRNESS users and “neighbouring” communities. Collaboration among scientists and real professionals always brings mutual benefits. From NNC, IPC and International organisations (IO) the network invited highly motivated researchers and professionals to share and exchange their knowledge and experience.

NNC : **Lomonosov MSU** (Russia) and **Ukrainian Hydrometeorological Institute** (Ukraine) will bring expertise and insight into micrometeorological conditions in two large European countries. IPC : **ASRC** (SUNY, Albany, NY, USA) has 40 years of experience in forest micrometeorological measurements from polar regions to Amazonian forests. **The Chinese University of Hong Kong** has long experience in deployment of monitoring networks and data processing/visualization. Assessments and data based on *insitu* or remote sensing measurements for éalisation escale modelling and climate-councious urban environment have strong progress in **the University of New South Wales**, **Old Dominion University** and **University of Toronto** (UNSW Australia, ODU USA, UT Canada). The **Northwest Agricultural and Forest University** (Yanging, Shaanxi Province, China) is listed among the top ten agricultural universities in China with numerous experimental fields which are part of National environmental network. Their expertise in micrometeorological measurements and applications – under different conditions compared to European– will bring new perspectives to the Action work and obtained results. IO like, EUMETNET, will introduce a wider, even global, perspective and users' needs. For IO it is an opportunity to contribute to research planning, éalisation and application in the future. This two-way interaction will help to make real societal impact of the Action.

# 3. IMPACT

## 3.1. IMPACT TO SCIENCE, SOCIETY AND COMPETITIVENESS, AND POTENTIAL FOR INNOVATION/BREAK-THROUGHS

### 3.1.1. SCIENTIFIC, TECHNOLOGICAL, AND/OR SOCIOECONOMIC IMPACTS (INCLUDING POTENTIAL INNOVATIONS AND/OR BREAKTHROUGHS)

**Scientific impact of the Action.** *Short-term* : a) improved know-how on in situ data for weather- and climate-related research impact studies, calibration and validation of existing models ; b) enhanced NWP verification on small spatial scales, in particular for extreme and adverse weather events ; c) improved methods for local climate zones (LCZs) classification. *Long-term* : the first step towards the establishment of future **European micrometeorological database** (EU-Micro_Met). The Micromet_KSP of FAIRNESS will improve decision support tools for agricultural planning, crop management, crop and food risk assessments, forest management, GHG and invasive species monitoring as well as urban planning.

**Technological impact of the Action.** *Short-term* : a) introduction and standardisation of new methods for gap filling in meteorological data ; b) established Micromet_KSP ; c) improved methodology and set of guidelines, good practices and recommendations for FAIR data bases. *Long-term* : a) contribution to EC Open Research Data Pilot ; b) reduction of urban cooling/heating and energy consumption and c) fostering innovations in all sectors through available FAIR data (e.g. better calibrated models ; improved risk monitoring and warning tools and methods).

**Socioeconomic impact of the Action.** *Short-term* : a) enhanced networking among countries, disciplines, researchers, stakeholders ; increased visibility of low-performing countries and institutions ; b) increased awareness of public, decision and policy makers about weather- and climate- related events affecting everyday life ; c) sectorial benefits such as reduced agricultural and forestry losses ; enhanced food security, human and animal health, urban living conditions ; d) increased awareness and better assessments of micrometeorological impacts on GHG emissions and dispersion ; e) increased effectiveness of urban planning. *Long-term* : a) increased access to European research and technology of low-performing countries and institutions ; b) reduced costs of not having FAIR data for European economy – EU data economy and open data market ("The annual cost of not having FAIR research data costs the European economy at least €10.2bn every year" (PwC EU Services, 2018)).

**Potential for scientific, technological and/or socioeconomic innovation breakthroughs.** The capacity of the Action to turn the challenge into an opportunity to make scientific, technological and socioeconomic breakthroughs is so high that there is no doubt that all identified risks should be accepted in order to achieve the potential "return of investment ».

Scientific innovation breakthroughs – risk vs. Return trade-off. The new holistic approach brought in will create new synergies and "new reading" of weather and climate impacts on "selected fields". It will lead to new setup of NWP, agricultural and hydrological model impact studies, GHG emission assessments, forest and invasive species distribution model studies. It will finally result in updated and sophisticated simulation assessments on the regional and European level and improve mitigation and adaptation to climate change in many sectors.

Technological innovation breakthroughs – risk vs. Return trade-off. Development of Micromet_KSP and incorporation of gap filling methods are technological breakthroughs *per se*. Micromet_KSP can further foster application and development of new technologies (e.g. machine learning, automated sensor/station network and data acquisition systems etc.) and enhance forecasting and warning performance of monitoring systems.

Socioeconomic innovation breakthroughs risk vs. Return trade-off. Socioeconomic innovation breakthroughs will be derived from the expected (listed) socio-economic impacts and improved cost-effectiveness of adaptation and mitigation measures, monitoring and warning systems. Involvement of Early Career Investigators (ECI) from different countries in the existing networks, formal and informal (social networks) lines of communication, the public sector, Citizen science approaches, media and international organisations representatives will provide sustainability and multiply the impact of the established network.

## 3.2 MEASURES TO MAXIMISE IMPACT

### 3.2.1 KNOWLEDGE CREATION, TRANSFER OF KNOWLEDGE AND CAREER DEVELOPMENT

**Contribution to knowledge creation** can be summarized as follows: a) Micromet_KSP will contribute to the EU data economy and open data market thus fostering innovative research and activities; b) introduction of pilot data sets and indices will make model/tool development and testing comparable and thus develop better and tailored results and applications; c) improvement of existing guidelines and recommendations for micrometeorological measurements will enhance quality and quantity of data from micrometeorological measurements; d) publications related to the Action outcomes will be open access maximising dissemination of the acquired know-how.

**Contribution to transfer of knowledge**. In research-intensive fields, effective knowledge sharing and complementary resource use is the key element of success because the available "human capital" can fully concentrate on the targeted research work and does not need to spend too much effort in searching for already existing but not available data (already identified as the main weakness in European research communities). Taking further into account cross-cultural differences among SPs, differences in working styles and language barrier, Micromet_KSP will serve as a "many-to-many" effective knowledge transfer framework and data exchange platform.

**Contribution to career development**. In a fast-changing global economy, knowledge and skills largely determine individual, institutional and societal competitiveness and the capacity to drive innovation. New social stratification of Europe is based on knowledge and skills rather than on regional or national background. The expected outcomes from Micromet_KSP and networking are to **improve transferable skills** in measurement planning and implementation challenges (creative thinking and problem solving) and interdisciplinary approach (ability to combine work across different fields). Being increasingly valued by employers, but in great demand on the labour market, enhanced transferable skills and interdisciplinarity should be important drivers of individual career development. The STSMs for many

**ECI** will be the first experience in working in multidisciplinary international groups. In combination with Training schools, workshops and publication writing it is expected that it will enhance both their transferable skills and interdisciplinary understanding. The tools like STSMs, Training Schools, workshops and conferences will be used by FAIRNESS community to overcome the problem of initial lack of ECI involved, as well as to improve gender distribution during the Action lifetime and beyond. In case of **experienced researchers**, the action should fill gaps and enhance knowledge and skills in the area of micrometeorological measurement data management and application, and increase the capacity for further exploitation of the Action results.

### 3.2.2. PLAN FOR DISSEMINATION AND/OR EXPLOITATION AND DIALOGUE WITH THE GENERAL PUBLIC OR POLICY

The impact of FAIRNESS action as a whole strongly depends on the effectiveness of the **dissemination and exploitation** measures, including: (a) public disclosure of the Action results by any appropriate means; (b) communication of the Action activities; (c) management of research information; (d) utilisation of the results in further research activities. The **goals** of an effective dissemination and exploitation strategy are to: (a) spread awareness of the Action goals and results to the wider community; (b) expend SPs, FAIRNESS users and "neighbouring" community; (c) provide measurable impacts of the Action; (d) establish a strategy to maintain and extend Micromet_KSP and international cooperation beyond the end of the Action.

FAIRNESS dissemination and exploitation strategy is based on the assumption that the Action results should be made **visible to the wider research community as well as to the specialised and general public**, particularly through research media (articles, journals, books, conference presentations, upgraded teaching materials and experimental methods, (virtual) science cafes), the internet, and social media/networks. Altogether, better dissemination of S&T results achieved during FAIRNESS Action will allow for improved **reuse of data and results of publicly funded research**. Visibility of the results is particularly important in order to enhance further research and innovation in the field and to attract high-quality research institutions, SMEs and stakeholders into established network.

**The plan for dissemination and exploitation** of FAIRNESS results is based on the following key elements: (a) addressing target user groups and (b) visibility/availability of the results and Micromet_KSP. People increasingly learn in settings outside of formal education – online, at work, through professional courses, social activities or volunteering. Dissemination towards the **research and education community** is planned in the form of publicly open workshops, Training Schools, meetings, reports from STSMs posted on the project web page, scientific publications in open-access peer-reviewed journals, scientific conference presentations, research social networks (e.g. ResearchGate), the project web page, lectures and training material for undergraduate, master and PhD students. The **general public** will be informed about the highlights of the project outcomes through: popular lectures, articles in newspapers, the **FAIRNESS web page** and **Newsletter** and social networks (e.g. Facebook). These outcomes and training materials for undergraduates will be preferably made available in national languages of FAIRNESS participants.

In summary, measures to maximize the impact for all addressed target groups will be reached by the following support activities: a) publishable results of networking activities will be disseminated to the wider community by the FAIRNESS web page and Micromet_KSP as its element; b) Training Schools and workshop materials, lectures and exercises will be adapted for University lectures and publicly shared (also in national languages of the FAIRNESS participants by demand); c) Action-related papers published during or shortly after the end of the Action will be published as open-access papers (according to the Action budget). Permanent evaluation of Micromet_KSP analytics will allow improvement of **visibility and intelligibility** of the Action results for general public.

**Measures to address policy**. Dissemination towards stakeholders and policy makers is the most difficult part of the Action communication. Therefore, policy makers need to be informed actively, and

reached more effectively e.g. by press conferences or in connection with public events or activities such as presentation of the **FAIRNESS white book**, with short and clear messages.

# 4. IMPLEMENTATION

## 4.1. COHERENCE AND EFFECTIVENESS OF THE WORK PLAN

### 4.1.1. DESCRIPTION OF WORKING GROUPS, TASKS AND ACTIVITIES

The work plan is designed in order to guide both the Action execution and control. The STSMs are an important element of the work plan for all WGs. Each STSM will be planned according to the Action goals and objectives indicating: who, when, where and why will go, with detailed description of activities, knowledge sharing methodology (according to established platform and beyond) which will be applied, and outcome in accordance with WG/task outcomes. STSM activities and outcomes report will be submitted to the scientific board and published on the FAIRNESS website. Another important element of Knowledge sharing platform, relevant for all WGs, are training activities. The detailed timing and subject of trainings have to be drafted during MC meetings, depending on the individual partners and demands of the participating researches in the context of the FAIRNESS research questions. Dissemination and exploitation activities will cover the full project period, and they will be implemented in the context of the WGs 1-4. The FAIRNESS COST Action work plan will be implemented through four Working Groups. The activities common to all WGs or those which will be implemented at the Action level are summarized after WG description.

**DESCRIPTION OF WORKING GROUPS**: Members of all Working Groups will be senior scientist and experts, ECI, PhD students, stakeholders, SME.

**WG1: Networking and Communication**

This Working Group will be organised in subgroups for rural (WG1.1) and urban (WG1.2) applications with the same tasks and activities.

**Tasks**: **T1.1** Inventory of available micrometeorological data and their structure; **T1.2** Data “fairness” and gaps; **T1.3** Creating a Core Pan-European multidisciplinary network of experts for micrometeorological data measurement and assimilation.

**Activities**: **A1.1.1** Inventory of the Action partner data and publicly available data using a questionnaire designed and distributed among partners and potential data holders/suppliers (see 1.2.2.2 FAIRNESS “neighbouring” community). **A1.1.2** Inventory of data content and structure (including metadata). **A1.2.1** Evaluation of data “fairness” and gaps. **A1.2.2** Recommendations for enhanced data “fairness”, measurement, assimilation and gap filling (measurement techniques, format of data, data gaps management, metadata template for urban and rural measurements). **A1.2.3** Recommendations testing for selected data sets. **A1.3.1** Workshop of SPs with expertise in micrometeorological measurements and data assimilation and invited experts.

**WG2: Development and implementation**

**Tasks**: **T2.1** Micromet_KSP development and implementation; **T2.2** Pilot data sets and application-oriented indices; **T2.3** Case studies design; **T2.4** Skill and knowledge enhancement.

**Activities: A2.1.1** Design of Micromet_KSP structure and functionalities. **A2.1.2** Implementation via the Action web page and initial testing. **A2.2.1** Design of pilot data sets (using partner data sources) for rural and urban microclimate including metadata. **A2.2.2** Identifying promising applications of selected indices

for rural/urban environment and cross cutting areas. Indices testing using Micromet_KSP and pilot data sets. **A2.3.1** Design of in situ/regional case studies in order to test the Action application potential. **A2.3.2** Implementation and monitoring of the case studies. **A2.4.1** Design of Training Schools in data assimilation, management and application ("Skill and knowledge enhancement action plan").

**WG3: Dissemination and application**

**Tasks: T3.1** "Dissemination and application action plan". **T3.2** Application of the Action results. **T3.3** Stakeholders and users feedback on implementation in WG1-3 activities. **T3.4** FAIRNESS users and "neighbouring" community.

**Activities: A3.1.1** Design and monitoring of "Dissemination and application action plan". **A3.2.1** Dissemination of case study results and Micromet_KSP use. **A3.2.2** Exploitation, customisation and optimisation of the Action results for public use (incl. publication of the "white book"). **A3.3.1** Assessment of stakeholders and users feedback and their needs for data quantity, quality, form and presentation for specific applications. **A3.4.1** Identification of FAIRNESS users community. **A3.4.2** Identification of FAIRNESS "neighbouring" community. **A3.4.3** Identification of common knowledge gaps and misinterpretations, met in general and specialised public, related to weather and climate effects and description of their solutions (mitigating "fake news").

**WG4: Beyond FAIRNESS strategies**

**Tasks**: **T4.1** Future needs for micrometeorological measurements, data assimilation and application **T4.2** "Long-term sustainability plan"

**Activities**: **A4.1.1** Compilation and analysis of WG1-WG3 assessment results. **A4.1.2** Design and monitoring of "Guideline development plan". **A4.1.3** Assessment of future European Micrometeorological database concept and functionalities. **A4.2.1** Identification of transferrable activities. **A4.2.2** Design and monitoring of "Long-term sustainability plan".

**All WGs** will use **ZENODO** (https://zenodo.org/) as an open-access repository for the FAIRNESS Action storage of data and documents. **All WGs** will in parallel work on realisation of the Action objectives according to the Working plan and on introduction of new partners and extension of the network, having in mind the importance of involving PhD students, stakeholders and ECI as well as gender and generation balance. WG ACTIVITIES on the Action level are foreseen as follows:

- **Two FAIRNESS annual conferences (AC)** will be organised in the second and fourth year in order to present the Action results (**AC**, 2-3 days) with plenary talks according to thematic topics defined during MC and WG meetings. AC will be organised in conjunction with regular Management Committee (MC) and Steering committee (SC) meetings.
- **Four workshops** (**WS**, 1-2 days in conjunction with AC when possible) will be organised in order to share knowledge and ideas, improve communication with stakeholders and public, identify current status of work within Working Groups and make detailed plan of future actions. Tentative topics to be agreed on during Kick-off meeting (KM): "Cost-effectiveness of FAIRNESS, standardisation and methodology improvement of micrometeorological in situ measurements" (WG1), "Micrometeorological data management; mapping and modelling of selected indices and derived parameters" (WG2), "Selection of model application results in order to support 'Green Deal for Europe'" (WG3), "Exploitation of mapping, modelling and micrometeorological data-based application results according to end-user needs" (WG4).
- **Short-Term Scientific Missions** (**STSM**) will be implemented based on WG activities demand and available budget during the project lifetime and decided on during FAIRNESS MC metings.
- At least four **Training Schools** (**SS**, 4-5 days) dedicated to young scientists and students will be organised, according to WG and MC suggestions. Tentative topics are: "Filling common gaps in measured data" (WG1), "Entry level of mapping and modelling using user-friendly tools" (WG2), "Collecting application results" (WG3), "Training of micrometeorological data end-users" (WG3, WG4).

- **Working Group meetings** (**WGM**, 1-1.5 days, in conjunction with WS) will be organised in order to share experience, avoid knowledge redundancy and enhance Micromet_KSP. Assessment of a current stage of activities and plan for the period until the next WGM will ensure realisation of WG plan.

### 4.1.2. DESCRIPTION OF DELIVERABLES AND TIMEFRAME

- D1.1 Inventory of available micrometeorological data in Europe (M03)
- D1.2 Report on created Core Pan-European multidisciplinary network of experts for micrometeorological data measurement and assimilation (M06)
- D1.3 Recommendations for gaps identification and their overcoming in measurement methods and data assimilation (M24)
- D1.4 Guidelines for FAIR principles and methodological improvements (M39)
- D2.1 Web implemented Micromet_KSP (M09)
- D2.2 Skill and knowledge enhancement action plan (M12)
- D2.3 Report on selected pilot data sets and indices (M15)
- D2.4 Report on planned case studies (M18)
- D3.1 Dissemination and application action plan (M12)
- D3.2 Report on identified FAIRNESS users and "neighbouring" community (M36)
- D3.3 Report on application of the FAIRNESS Action results (M30)
- D3.4 Inventory of region-specific stakeholder and user needs (M45)
- D4.1 Inventory of transferable activities (M30)
- D4.2 Guideline for future good practices in micrometeorological measurement methods, data assimilation and indices (M33)
- D4.3 Report on Micromet_KSP analytics (M39)
- D4.4 Report on Long-term sustainability plan (M47)

### 4.1.3. RISK ANALYSIS AND CONTINGENCY PLANS

| Risk | Level | Contingency plans |
|---|---|---|
| Withdrawal of participants responsible for data providing and management, standardisation, indices selection and application | Low (possible but not probable) | For each key topic, there are more than three partners which can take a lead. |
| Lack of enthusiasm among data holders to perform actions towards increased "fairness" of data and gap filling | Medium | Networking, training and involvement of Early Careerlinvestigators (ECI) and stakeholders will reduce this risk. Data holders as well as users will have mutual benefits from participation, which will be communicated during WG 1 activities (survey). |
| Lack of interest among decision and policy makers to use Action results | Medium | Current public awareness affects their approach and recently they have been more prepared to take into account results of research studies. Awareness of "fake news" is rising; there is demand for sound information. |

The presented risk and contingency plan, together with the presented potential for scientific, technological and/or socioeconomic breakthroughs, shows that none of the major expected returns of the Action are considered to have high risks and those with a medium risk have readily identifiable mitigation strategies.

## 4.1.4. GANTT DIAGRAM

| Year-Quarter | Y1-I | Y1-II | Y1-III | Y1-IV | Y2-I | Y2-II | Y2-III | Y2-IV | Y3-I | Y3-II | Y3-III | Y3-IV | Y4-I | Y4-II | Y4-III | Y4-IV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MC, SC | KM | | | M1 | | | | M2 | | | | M3 | | | | M4 |
| Core group | KM | SM | SM | M1 | SM | SM | SM | M2 | SM | SM | SM | M3 | SM | SM | SM | M4 |
| WG1-4 | | | | M1 | SM | SM | SM | M2 | SM | SM | SM | M3 | SM | SM | M4 | |
| AC | | | | | | | | 1 | | | | | | | 2 | |
| WS | | | | 1 | | | | 2 | | | | 3 | | | 4 | |
| SS | | | 1 | | | 2 | | | | 3 | | | 4 | | | |
| Delivarables | D1.1 | D1.2 | D2.1 | D2.2, D3.1 | D2.3 | D2.4 | | D1.3 | | D4.1 | D4.2 | D3.2 | D1.4, D4.3 | D3.3 | D3.4 | D4.4 |
| WG1,2,3,4 | | | STSMs | | | | | | | | | | | | | |
| WG1,2,3,4 | Web page development | | | | | | | | | | | | | | | |

(SM-Skype meetings)

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