

## Annex no. 1 - call SGS-2 „Svalbard“

### A) Acquisition and installation of air quality sensors for the purpose of local monitoring

#### 1. Minimum specifications:

- Sensors suitable for outdoor air monitoring (according to the manufacturer's defined operating conditions for the sensor)
- With a warranty of at least 1-year sensor's lifetime
- A system enabling continuous recording and storage of measured data (including the possibility of transfer to a processing/management platform)
- PM<sub>10</sub>
  - concentration range from 0 to at least 500 µg/m<sup>3</sup>
  - with a maximum detection limit of 5 µg/m<sup>3</sup>
  - maximum uncertainty 35 %
- PM<sub>2,5</sub>
  - concentration range from 0 to at least 500 µg/m<sup>3</sup>
  - with a maximum detection limit of 5 µg/m<sup>3</sup>
  - maximum uncertainty 35 %
- PM<sub>1</sub> (not a requirement, but an advantage)
  - concentration range from 0 to at least 500 µg/m<sup>3</sup>
  - with a maximum detection limit of 5 µg/m<sup>3</sup>
  - maximum uncertainty 35%
- Meteorological elements
  - temperature measurement range -20 °C to +50 °C
  - maximum temperature measurement resolution of 1 °C
  - relative humidity measurement range 0 % to 100 %
  - relative humidity measurement resolution of maximum 10 %
- Meteorological elements (not a requirement, but an advantage)
  - the range of atmospheric pressure measurement 950 hPa to 1050 hPa
  - resolution of atmospheric pressure measurement maximum 10 hPa
  - resolution of wind direction measurement maximum 45 degrees (i.e. 8 wind directions or more detailed)
  - wind speed measurement resolution maximum 1 m/s

#### 2. Conditions for measuring location:

- placement of dust sensors at representative locations for measuring immissions that can be assumed to come from local combustion plants
- location at a height of at least 2 m to a maximum of 4 m above the ground (out of the normal reach of people), sufficiently far from sources of pollution (out of the direct reach of the chimney, smoking areas, busy roads)
- at least one dust measurement should be located at a sufficient distance from the municipality/city (i.e. background concentrations will be measured)

- the meteorological measurement should be installed in a representative location of the sensor measurement network (installation in places without the presence of wind barriers, the temperature sensor should be placed in a radiation shield so that it is not affected by direct sunlight up to a height of 2 m to a maximum of 4 m above the ground, the wind sensor should be placed at a minimum height of at least 7 m above the ground)

3. What must be done before starting the measurement:

- Ensuring metrological continuity in the form of comparative measurement of sensors with a reference or equivalent devices (i.e. devices regularly metrologically linked to certified reference materials or calibrated by calibration laboratories) in real outdoor conditions on the basis of collocation (all sensors in one place).
- Such measurement can only be carried out by an entity authorized by the Ministry of the Environment to measure immissions (see list of authorized entities at <https://www.mzp.cz/cz/autorizace>) or an entity accredited by the Czech Institute for Accreditation to measure the concentration of aerosol particles / airborne dust / dust particles in outdoor air.
- The minimum duration of measurements for the initial verification of alignment of sensors with reference or equivalent devices based on sensor collocation is 40 days (the recommended period is 3 months). The implementation of the measurement should be timed outside the summer period (i.e. from September 1 to April 30).
- The result of the measurement will be the determination of the calibration/validation function, the determination of the correction coefficients and the uncertainty of the measurement.
- Sensors that come out of the measurement as defective (i.e. with a deviation of more than 50 % at the daily average level of 50 µg/m<sup>3</sup> compared to the reference or equivalence, or sensors with unpredictable or unstable behavior of the measured concentrations) will be discarded and their replacement will be ensured (complaint /acquisition of new sensors), or in the order at the beginning, it is, therefore, necessary to calculate with a reserve.

Justification: Without carrying out a measurement with a reference or equivalent method, it is not advisable to deploy any sensor unit from any manufacturer (need to meet the minimum requirement for checking the correctness of the device's measurements).

4. Must be done at least during measurement (network management):

- Every month, check the consistency of the data from the sensors with each other (comparison of the measured concentrations within the network).
- Continuous comparison of selected sensor units (i.e. either problematic units with a long-term deviation of more than 50 % compared to other sensors, or selected representative units - near the location of the meteorological measurement) with

reference analyzers or analyzers equivalent to the reference device (in the form of bringing these devices close to the location sensors - securing by purchasing the service from

authorized or accredited persons). It is recommended to perform the measurement every 4 months for a minimum duration of 48 hours. The output of the measurement is the control of the set correction coefficients, or the determination of new calibration functions and correction coefficients. Sensors that appear to be faulty (with an expanded uncertainty greater than 50 % at a daily average level of 50 µg/m<sup>3</sup>) will be discarded.

The public will be informed about the implementation and results of the initial and ongoing measurement (i.e., for example, in the form of a website or official notice board).

5. What to do at the end of the measurement:

- evaluation of the measured data, including results from the comparison of sensors with reference and equivalent methods and assessment of the quality of measurements of individual sensors during the campaign;
- eligible subjects for data analysis will be approached for evaluation (knowledge of air quality measurement issues is an advantage).

6. the post-winter report should contain (a retrospective analysis):

- description of the equipment used (technical specification, reference to the manufacturer);
- description of the form of the sensor measurement network (distribution method, maps, description of the method of installation of individual devices, photo documentation);
- a description of the data handling methodology, including the method of data interpretation (how the measured information was transmitted to the public);
- used correction/validation functions and correction factors, including a description of the method of their determination;
- information on service interventions or device replacements (with an indication of the reason for the intervention).

7. Recommended content of feedback from residents:

- information on the use of continuously obtained information on air quality (in the form of information boards or web presentations) by residents of the municipality/city;
- other information applicable to the evaluation of the impact of the measurement campaign, e.g.:
  - methods of heating in the village, including the type of fuel (can also be obtained from the boiler subsidies implemented).
  - information on the method of waste management in the municipality (such as whether there are enough collection containers, support for waste separation, return collection, operation of the collection yard, etc.)
  - residents' opinions on the measurement campaign (for the possible identifying behavioral changes, the effectiveness of education, etc.) including residents' recommendations for the future development of the village/city.

#### 8. Required Output:

- All measured data (primary and measurement data), including the necessary metadata (GPS coordinates, date and time, measured value) will be available as a public database.
- In the case of data corrections, the reason for the correction will be given (for example, in a note).
- A publicly available report from the project.

## B) Ensuring medium-term local measurement of air quality (service)

### I. Measured quantities:

- PM<sub>10</sub>
- PM<sub>2,5</sub>
- PM<sub>1</sub> (*not a requirement, but an advantage*)
- Benzo[a]pyrene

### Minimum specifications:

- reference or equivalent methods for measuring PM<sub>x</sub> and benzo[a]pyrene (with a proven test of equivalence in the conditions of the Czech Republic) - measurement according to Ministry of the Environment Decree no. 330/2012 Coll. as amended (methods, uncertainties, etc.);
- measurements can only be carried out by an entity authorized by the the Ministry of the Environment to measure immissions (list of authorized entities at <https://www.mzp.cz/cz/autorizace>) or an entity accredited by the Czech Institute for Accreditation to measure the concentration of aerosol particles / airborne dust / dust particles in the outdoor air;
- complete conditions for carrying out measurements see ČSN EN 12341, ČSN EN 16450, ČSN EN 15549 (always in the valid version).

### II. What must be done as a minimum before starting the measurement:

- device checks (flow rates and weather sensors);
- measurement accuracy (automatic PM<sub>x</sub> measurement methods) with control standards.

III. What in particular must be done during measurement (network management):

- cleaning of sampling heads after 14 days (manual methods).

IV. What must be done at the end of the measurement:

- device checks (flow rates and weather sensors);
- measurement accuracy (automatic PMx measurement methods) with control standards;
- the evaluation of the measured data.

V. What the post-winter report should contain (retrospective analysis):

- description of the equipment used (technical specification, reference to the manufacturer);
- description of the form of the measuring network (distribution method, maps, description of the method of installation of individual devices, photo documentation);
- a description of the data handling methodology, including the method of data interpretation (how the measured information was transmitted to the public);
- used correction factors and a description of the method of their determination;
- information on service interventions or device replacements (with the indication of the reason for the intervention).

VI. What resident feedback should include:

- information on the use of continuously obtained information on air quality (in the form of information boards or web presentations) by residents of the municipality/city;
- other information applicable to the evaluation of the impact of the measurement campaign, e.g.:
  - methods of heating in the village, including the type of fuel (it can also be obtained from the realized boiler subsidies);
  - information on the method of waste management in the municipality (such as whether there are enough collection containers, support for waste separation, take-back, operation of the collection yard, etc.);
  - residents' opinions on the measurement campaign (for the possibility of identifying behavioral changes, the effectiveness of education, etc.) including residents' recommendations for the future development of the municipality/city.

VII. Required Output:

- all measured data (primary and adjusted data), including the necessary metadata (GPS coordinates, date and time, measured value) will be available as a public database;
- in the case of data corrections, the reason for the correction will be given (for example, in a note);
- a publicly available report from the project.