



Appendix 1

Specification of Requirements

for

tenders concerning the supply of data from air-quality measurements in Copenhagen



1. Introduction

The Specification of Requirements contains a description of the requirements, preferences and expectations of the Contracting Entity for the delivery of data produced by air-quality measurements. The supplier must be able to meet all the requirements specified below, unless otherwise indicated.

The Specification of Requirements lays down the overarching requirements relating to the supply of air-quality data, whereas the more specific details and day-to-day contact will be handled by the contact persons during the term of the contract.

1.1 Contracting Entity

The Technical and Environmental Administration and the Health and Care Administration of the City of Copenhagen are in charge of the project concerning data produced by air-quality measurements in the City of Copenhagen. The City of Copenhagen has decided to task the Technical and Environmental Administration with managing the public procedure and the subsequent performance of the contract.

1.2 Supplier

In this Specification of Requirements, the term “supplier” designates the winning tenderer(s) of the public procedure.

1.3 Basis for the procedure

The Contracting Entity wishes to learn more about the harmful effects of air pollution in Copenhagen. Therefore, a project is being launched to obtain data on the content of selected substances in ambient air by conducting air-quality measurements.

The air-quality data must be valid, i.e. it must be possible to use the measurements for the following purposes:

- to supplement existing knowledge,
- to create new knowledge,
- to issue health warnings to Copenhagen residents.

The data obtained from the measurements must provide as much knowledge as possible about the following:

- air pollution caused by road traffic,
- air pollution caused by wood-burning stoves,
- air pollution in the most intensely trafficked parts of Copenhagen where air pollution is presumed to be worst.

1.3.1 EU measurement

As a minimum, the City of Copenhagen wants to obtain air-quality data from one (1) measuring station which conforms to European requirements for location and measurements as laid down in Directive 2008/50/EC of the European Parliament and of the Council on ambient air quality (hereinafter referred to as “EU measurement”), as well as selected specified criteria for location.



1.3.2 Other measurements

In addition, the City wants to obtain data from two (2) other measuring stations which can supply air quality data by making measurements, taking samples and conducting analyses pursuant to the parameters and reference methods explained in point 2.2 (hereinafter referred to as “other measurements”). Although the location of other measurements has not been firmly established, some criteria are specified for where they should be located.

2. Measuring stations and method

2.1 Measuring programme and methodology for data from an EU measuring station

The Contracting Entity wishes to obtain data from air quality measurements, which is why the supplier will be responsible for setting up, measuring, operating, maintaining at least one air-quality measuring station and reporting on measurement data supplied by it.

As far as the EU measurements are concerned, the supplier must supply data directly from measurements comprising NO₂ and PM_{2,5}, which complies with the requirements for sample-taking/measurement method and location as laid down in Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe. In addition, the supplier must supply data on ultrafine particles pursuant to the specifications of form 1.

The supplier must provide data on the content of substances in the air obtained through measuring stations, which can make measurements in accordance with the reference methods below:

Parameter	Average time	Unit	Measurement method
NO ₂	1 hour	µg/m ³	Measurement pursuant to EN 14211. Uncertainty and data-coverage requirements are described under “Fixed measurements” in Annex I of the EU Ambient Air Quality Directive.
PM _{2,5}	1 hour	µg/m ³	Measurement pursuant to EN 16450. Uncertainty requirements are documented under “Fixed measurements” in Annex I of the EU Air Quality Directive.
Ultrafine particles	1 hour	qty/m ³	CPC (Condensation Particle Counter) or similar

Form 1

In so far as NO₂ and PM_{2,5} are concerned, a report must be enclosed with the provision of data which documents the testing of instruments pursuant to European (EN) standards wherever such standards are available.

The supplier must obtain weather data from the Danish Meteorological Institute or a similar body on an ongoing basis. Local weather data is to be obtained and collated with air quality data, as weather data for rain, wind velocity and wind direction are required for subsequent analysis of air quality data.

2.2 Measuring programme and methodology for processing data from other measuring stations

The Contracting Entity wishes to receive data from at least two (2) other measuring stations, which is why the supplier is responsible for setting up, taking measurements from, operating and maintaining at least two other measuring stations as well as reporting on measurement data provided by them.



In relation to other measuring stations, the supplier must supply data from measurements, sample-taking and analysis pursuant to form 2 below. Data must be obtained through measurements from selected locations for three (3) years in order to provide the most valid data possible for compiling knowledge on the harmful effects of air pollution in Copenhagen.

The supplier must provide data on the content of substances in the air obtained through measuring stations, which can make measurements in accordance with the reference methods below:

Parameter	Average time	Unit	Measurement method
NO ₂	1 hour	µg/m ³	Measurement pursuant to EN 14211. Uncertainty and data-coverage requirements are described under “Fixed measurements” in Annex I of the EU Ambient Air Quality Directive.
PM _{2,5}	1 hour	µg/m ³	Measurement pursuant to EN 16450. Uncertainty requirements are documented under “Fixed measurements” in Annex I of the EU Air Quality Directive.
Ultrafine particles	1 hour	qty/m ³	CPC (Condensation Particle Counter) or similar

Form 2

The supplier must obtain weather data from the Danish Meteorological Institute or similar body. Local weather data is to be obtained and collated with air quality data, as weather data for rain, wind velocity and wind direction are required for subsequent analysis of air quality data.

2.3 Time period

Measurement data must be supplied for a total of three years. Data must be delivered from the measuring stations as soon as possible after contract start-up, but no later than from 1 September 2020 and three years forward.

3. Implementation plan

3.1 EU measuring station

EU measurements must be conducted pursuant to EU requirements for the location of measuring stations as described in point 1.3.1.

EU measurements must be taken in an area designated by the Contracting Entity. The supplier is responsible for applying for permission for the erection/construction of equipment from relevant entities in the City of Copenhagen. The supplier is also responsible for determining whether permission needs to be obtained from the police.

The Contracting Entity provides no output related to the performance of the task, which is why the supplier is responsible for:

- obtaining all relevant, necessary equipment for performing the task;



- storing urban fixtures, e.g. paving materials such as flagstones or similar during the term of the contract, in the event that the erection/construction of equipment requires the supplier to dig into the ground;
- erecting/constructing a cabinet/housing for equipment; the supplier is solely responsible for ensuring that the type of cabinet/housing selected is resistant to weather, vandalism and other urban hazards;
 - o obtaining approval from the Contracting Entity for the cabinet/housing selected, including its colour;
- restoring areas where equipment has been erected/constructed at the end of the term of the contract;
- establishing power supply, including the establishment of distribution board with a separate meter; consumption is to be settled with the supplier;
- Erecting a cabinet/housing for power supply/distribution board that must be erected/constructed. The supplier is also solely responsible for selecting a cabinet/housing that is resistant to weather, vandalism and other urban hazards;
 - o obtaining approval from the Contracting Entity for the cabinet/housing selected, including its colour.

3.1.1 Location

Data from the EU measuring station must be collected from a location which meets the following criteria:

- road sections where EU location requirements can be met;
- road sections with high levels of pollution;
- heavily trafficked road sections;
- road sections in densely populated areas;
- road sections with institutions;
- a road section where it is physically possible to find space for the measuring station.

The exact location will be assessed in close dialogue with the Contracting Entity at contract start-up.

3.2 Requirements for an establishment phase related to data from an EU measuring station

In the period 11 February 2020 to 11 June 2020, the supplier must do the following:

- present the final time schedule and activity plan to the Contracting Entity no later than the end of week 9 in 2020;
- prepare for the collection of measurement data for the final erection/construction of a measuring station pursuant to requirements in Annex III of the Ambient Air Quality Directive, cf. point 1.3.1;
- calibrate the requisite equipment pursuant to requirements described in appurtenant standards;
- obtain permissions and coordinate with relevant entities in the City of Copenhagen, as well as with the police.

3.3 Location of other measuring stations

The other measurements must be carried out for the purpose of providing the greatest possible amount of knowledge about:

- air pollution caused by road traffic,



- air pollution caused by wood-burning stoves,
- air pollution in the most heavily trafficked parts of Copenhagen where air pollution is presumed to be worst.

On the basis of the above location criteria, the supplier must enter into close cooperation with the Contracting Entity to determine the final placement details. The supplier can expect the working relationship with the Contracting Entity to involve a number of technical administration entities in the City of Copenhagen.

The Contracting Entity provides no output related to the performance of the task, which is why the supplier is responsible for:

- obtaining all relevant, necessary equipment for performing the task;
- preserving urban fixtures, e.g. paving materials such as flagstones or similar during the term of the contract, in the event that the erection/construction of equipment requires the supplier to dig into the ground;
- erecting/constructing a cabinet/housing for equipment; the supplier is solely responsible for ensuring that the type of cabinet/housing selected is resistant to weather, vandalism and other urban hazards;
 - o obtaining approval from the Contracting Entity for the cabinet/housing selected, including its colour;
- restoring areas where equipment has been erected/constructed at the end of the term of the contract;
- establishing power supply, including the establishment of a distribution board with a separate meter; consumption is to be settled with the supplier;
- Erecting a cabinet/housing for power supply/distribution board that must be erected/constructed. The supplier is also solely responsible for selecting a cabinet/housing that is resistant to weather, vandalism and other urban hazards;
 - o obtaining approval from the Contracting Entity for the cabinet/housing selected, including its colour.

3.4 Requirements for an establishment phase related to data from other measuring stations

In the period from 11 February 2020 to 11 June 2020, the supplier must make sure to do the following:

- draw up a final time schedule and activity plan for the task during term of the contract; present the final time schedule and activity plan to the Contracting Entity no later than the end of week 9 in 2020;
- calibrate the requisite equipment pursuant to requirements described in appurtenant standards;
- obtain permissions and coordinate with relevant entities in the City of Copenhagen, as well as with the police.

4. Operation, service and maintenance

All output described in the tender documents must be carried out in accordance with Danish law and be performed by the supplier. The supplier bears full responsibility for operating, servicing and maintaining the equipment and for reporting. The Contracting Entity cannot be enjoined to be responsible for performing the task.



4.1 Data for a website or app

Data based on mean hourly values for all substances measured must be supplied.

Data must be open and publicly accessible. The Contracting Entity must have unlimited access to data during the term of the contract. In addition, all data must be delivered as one total supply to the Contracting Entity at the expiry of the contract. The Contracting Entity reserves the right to stipulate detailed terms and conditions in the contract for access data.

Data obtained from measuring stations must comply with the following:

- it must be delivered in JSON format or a format equivalent to this;
- it must be delivered as either a dump or as API.

At the end of April, the Contracting Entity must provide the specifications for data logging and data collection.

The supplier is responsible for ensuring that the data is supplied in such a way that there are no technical IT obstacles to prevent the Contracting Entity from issuing health alarms based on the data received.

Preliminary data on the substances deemed relevant is to be delivered for online viewing on the website every hour. The specific data and any additional data that are to be supplied will be designated immediately after the conclusion of contract. Invalid data during periods of calibration, maintenance, stoppages or similar must be removed wherever possible before being uploaded to the website.

The supplier must discontinue and/or resume online viewing as soon as possible on the orders of the Contracting Entity.

4.2 Data quality objectives

The supplier is required to provide a minimum uptime of 75%. The downtime permitted must not exceed a maximum of five (5) consecutive days and must never exceed ten (10) days in one month. In the event of stoppage, maintenance or other similar situations, the Contracting Entity's contact person must be notified without delay.

5. Reporting

5.1 Annual reporting

A report must be drawn up once a year. The reports must be submitted no later than one (1) month after the last day in the reporting period.

- The first report covers the period from start-up to 31 December 2020.
- The second report covers the period 1 January 2021 – 31 December 2021.
- The third report covers the period 1 January 2022 – 31 December 2022.
- The fourth report covers the period from 1 January 2023 up to the date on which the three-year measurement period is reached.

The data report from the EU measurements must contain the following as a minimum:

- A brief summary with a conclusion.



- Tables depicting results of measurements of the above-mentioned substances, as well as EU and WHO threshold values/target values for substances such as NO₂ and PM_{2,5}.
 - o Graphs are to be prepared on the basis of a representative 24-hour period (an average which does not include any unusual fluctuations in the calculation). In addition, the report must also show a best case and worst case 24-hour period and the period from 12 noon on 31 December until 12 noon on 1 January, where the variations over the periods can be seen. The short-term threshold values/target values from the EU and WHO must also be depicted.
- Tables must include information on all substances measured averaged over one 24-hour period for all 12 months.
- Comments on the results, including on the basis of weather data in cases where it is relevant to include weather data.
- Description of measurement method and measurement programme.
- Specifications of who drew up the report and who can be contacted if there are any questions about the report.
- The report can be written in either Danish or English.

The data report from EU measurements must also contain the following:

- The results of measurements based on the specifically measured values, indicating control criteria as well as validation according to requirements in the Ambient Air Quality Directive.
- Specification of the number of instances per calendar year with excess concentrations of NO₂ and PM_{2,5}, including a specification of the date and time for the specific overruns.
- A separate summary in English is requested for data from the EU measurements, which solely considers any overruns of EU threshold values.

5.2 Presentation of report

The reports must be presented at an annual meeting with the Contracting Entity, at which air quality experts will participate.

6. Follow-up meetings

The supplier must include in its calculations the time spent for holding two annual meetings with the Contracting Entity. The purpose of the meetings is to report the measurements from the preceding/completed period, including data transfers to the website, as well as reporting on any measurement outages. One of the two annual meetings must concern a review of the annual data report.

7. At the expiry of the contract

The supplier retains ownership of all equipment, including measuring stations, equipment and cabinets housing the equipment. At the expiry of the contract, the supplier is responsible for dismantling and removing the measurement equipment. Furthermore, it is incumbent on the supplier to restore the site, including soil, vegetation, flagstones and other changes that may have been made on the area affected. This task is to be coordinated with the City of Copenhagen, which sets out the guidelines for works on streets and roads in the City of Copenhagen.