

TECHNICAL ARRANGEMENT

on

“Ozone and its Precursors Monitoring Project”

Among

BEIJING MUNICIPAL ECOLOGY AND ENVIRONMENT BUREAU
(BEE)

and

THE DIRECTORATE FOR SUSTAINABLE DEVELOPMENT,
ENVIRONMENTAL DAMAGE, EUROPEAN UNION AND
INTERNATIONAL AFFAIRS
OF THE MINISTRY FOR THE ENVIRONMENT, LAND AND SEA OF
THE ITALIAN REPUBLIC
(IMELS)

(Hereinafter referred to as the Parties)

Recalling that since 2002, IMELS has launched continued cooperation with the People’s Government of Beijing Municipality under the framework of Sino-Italian bilateral environmental protection cooperation. The cooperation has proved to be a win-win fruitful cooperation on supporting Beijing’s efforts to fulfill “Green Olympics Commitment” and improve environmental quality.

Taking into account the “Agreement IMELS-Beijing Municipality for the Establishment of a Sino-Italian Environmental Cooperation for Sustainable Beijing Fund (SIEC-SUB)” signed on the 14th of May 2005, between the IMELS and BEE, to financially contribute for projects’ implementation by the IMELS and BEE.

Recognising that the cooperation between IMELS and BEE is framed in a mutually beneficial partnership as an important opportunity to create value for a fruitful business exchange and *taking into account* that IMELS and BEE intend to define a working program based on the agreement signed on the 15th of November 2013;

Recalling that on August 3rd 2015 IMELS and BEE agreed to develop activities to enhance

the capabilities of BEE on air quality management and signed an Implementing Arrangement on *Technical Cooperation on particular matters monitoring* and the tender was awarded to the Italian ENVINT s.r.l..

Based on the existing cooperation, IMELS and BEE signed on 16th of June 2017 a Memorandum of Understanding (MoU), with the objective to strengthen their joint work for building a more sustainable Beijing through supporting Beijing to implement strategic research and technical projects.

Acknowledging the good result of the project activities related to technical and institutional issues related to regional air pollution with a specific target to the 'Jing-Jin-Ji' region, addressed to enhance the capabilities of BEE on air quality management, within the project Sino-Italian PM_{2.5} Monitoring Capability construction project under the *Technical Cooperation on particular matters monitoring*.

Considering the efforts made so far and the results achieved in order to, further support BEE in strengthening air quality and environmental management.

It is hereby agreed as follows

Art.1 – General Provisions

IMELS and BEE agree on developing the project “Ozone and its Precursors Monitoring Project” (“the Project”), in order to building capabilities of BEE in effectively improve the air quality monitoring technology of ozone and its precursor, the source appointment and the regional transmission, the pollution reduction of VOCs and the health effects of air pollution.

Art.2 – Objectives and Activities

The Project aims at assisting BEE to upgrade its capabilities related to technical and institutional issues with regards to regional ozone and its precursor pollutants with a specific target to the ‘Jing–Jin–Ji’ region.

The activities will be implemented according to the structure, content, and schedule described in the Annex 1 to this Technical Arrangement.

Flexibility will be given to the Parties of the service contract for future changes in the working plan. The Parties shall jointly agree upon modifications.

Art. 3 - Cooperation Method

BEE and IMELS will be responsible for project management and coordination.

In order to guarantee a productive and effective expertise, BEE identifies Beijing Municipal Environmental Monitoring Center(BMEMC)as Chinese implementing agency for the Project and ENVINT s.r.l the Italian most suitable enterprise to contribute to the project, having successfully completed the previous project.

Art. 4-Financial Resources

The Parties will all make necessary financial contribution for a successful implementation of the Project. The share of IMELS contribution and Beijing Municipality contributions on the Project total investment would be around 42% and 58% respectively.

The Project total budget is 1.140.000,00Euro.

The breakdown of Project budget is described in Annex 2 to this Technical Arrangement.

Any financial resources regarding project's activities under this Technical Arrangement will be borne by the available budgeted resources of the Parties and will not, in any event, create additional expenditures for the State budgets of the Italian Republic and of the People's Republic of China.

IMELS will contribute with 490.000,00Euro, to cover activities of Italian implementing agency and logistics costs in Italy for Beijing participates. The above mentioned amount has been already transferred by IMELS to SIEC-SUB fund according to the agreement signed on the 15th of November 2013.

BEE will contribute with 650.000,00Euro to cover the activities of Chinese implementing agency and local logistics costs in Beijing for Italian implementing agencies.

Art. 5 - Accounts and auditing

Accounts, directly comparable to the budget, shall be submitted to the Steering Committee, established under the MoU between IMELS and BEE signed on 16th of June 2017, along with the relative report for approval.

The accounts shall be endorsed by a qualified accountant and the person responsible for the projects, who, by their endorsement, confirm that the accounts are presented in accordance to the agreement. Notwithstanding, IMELS reserves the right to demand third party auditing.

Art.6 - Law in force

This arrangement will be implemented in conformity with international law principles, international Conventions and Protocols signed by the Parties, national legislation of China and Italy, as well as, as for Italy, with any other obligations arising from the membership of the Italian Republic in the European Union.

Art. 7- Settlement of Disputes

Any dispute arising from the interpretation and implementation of this Technical Arrangement shall be settled through consultation among the Parties.

Art. 8 - Duration

This Technical Arrangement shall enter into force on the date of Signature and it will remain effective until the end of April 2021, in accordance with the provision of article 1 of the present Technical Arrangement, unless one of the Parties notifies the other in writing, at least three(3) months in advance, of its intention to terminate it.

The Technical Arrangement may be extended by written agreement between the Parties at least three (3) months in advance.

The following annexes are integral part of this Technical Arrangement:

- Annex 1 - Project Proposal
- Annex 2 - Break down of project budget.

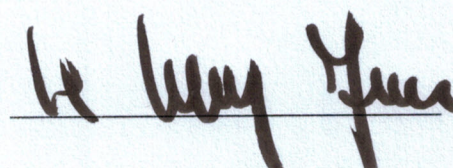
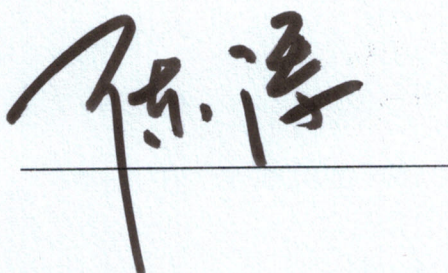
Signed for acknowledgement and acceptance on 19 March 2019 in Beijing, in 2 copies of English.

For Beijing Municipal Ecology and
Environment Bureau (BEE)

For the Directorate for Sustainable
Development, Environmental Damage and
European Union and International Affairs
of the Ministry for the Environment, Land
and Sea of the Italian Republic (IMELS)

Mr. Chen Tian
Director General

Mr. Francesco La Camera
Director General



ANNEX1: Project Proposal

Ozone and its Precursors Monitoring

Project's background

In recent years, the problem of air pollution has drawn unprecedented attention from all walks of life. Since the implementation of the air pollution control measures, government departments at all levels have increased their efforts in the environmental supervision and pollution control. The air quality has tended to improve overall. Beijing has made significant contributions to the continuous emission reduction of air pollutants. The situation of regional joint prevention and control of air pollution in the 'Jing-Jin-Ji' region and its surrounding areas have already been formed preliminarily, but heavy pollution remains relatively severe in winter. After being included in the air quality assessment system, PM_{2.5} has become the primary pollutant in most Chinese cities, followed by O₃. The pollution of PM_{2.5} becomes severe in heating season, while O₃ pollution is serious in summer. PM_{2.5} and O₃ will also be the major air pollutants that Beijing will face in the next few years or even decades to improve its air quality. Volatile Organic Compounds (VOCs) are the important precursors for the formation of fine particulate matter (PM_{2.5}) and O₃. Meanwhile, some VOCs has toxicity, which may pose a great influence on ambient air quality. It is of great significance for environmental management, air quality warning and prediction, the control of PM_{2.5} and O₃ that monitoring of VOCs and deeply analysing its pollution characteristics. Ozone and its precursors have also received great concern from the Italian environment ministry. In order to identify the essence of ozone pollution and collect relevant information, solving the ozone and its precursor and other air pollution problems at a higher level, the research on the ozone and its precursor has been carried out in Italy and some achievements have been made, which may provide support and assistance for ozone control in Beijing in terms of monitoring technology, public information and environmental system.

In recent ten years, the Sino-Italian cooperation has carried out many projects, including "Beijing intelligent traffic and traffic pollution monitoring project", "Beijing 2008 Olympic Games air quality service technology consulting project", "Beijing air

quality forecast consulting project”, “PM_{2.5} monitoring capacity construction project”, etc., and achieved good cooperative results. Recently, with the PM_{2.5} concentration reducing year by year, the pollution problems of ozone and its precursor are gradually standing out, which become the important aspects of air pollution. To effectively improve the air quality, in the monitoring technology of ozone and its precursor, the source appointment and the regional transmission, the pollution reduction of VOCs and the health effects of air pollution, Beijing Municipal Environmental Monitoring Center needs to continue to cooperate with Italy, to learn the advanced technology and experience of Italian and European Union, to promote the development and progress of Beijing related work.

Since 2012, a monitoring network of environmental air quality with 35 monitoring sub-stations has been established in Beijing, which has continuous monitoring capability for O₃. Through cooperation with Peking University and other scientific research institutions, the researches on the characteristics, development trend and control approach of atmospheric ozone pollution in Beijing have been carried out. The preliminary research results have supported the formulation of air pollution prevention and control policies in Beijing. To scientifically evaluate the control effects of air quality in Beijing and provide the technical support for the prevention and treatment policy of ozone, the monitoring network of VOCs components has been established in Beijing, in 2015. It consists of eight points of VOCs manual monitoring and mainly analyses a total of 113 VOCs, including PAMS and TO15, aldehyde, ketone compounds, etc. Also, the VOCs on-line monitoring network including 6 sites has been established, implementing the real-time online monitoring of ambient air VOCs and industrial VOCs, obtaining the basic data of atmospheric environment VOCs in Beijing. However, the research on ozone and its precursors is still at the starting stage in China. Many technical difficulties and experience are still existing in the technical research on the traceability of value and transfer system of ozone, the maintenance and management of automatic monitoring system, the sampling and detection of VOCs in the pollution sources and the manual monitoring analysis technology of VOCs. Thus, it is needed through the Sino-Italian cooperation project to train the related technical personnel and build up the technical methods and management experience with international standards.

Project's activities

1. Technical Assistance

The project will include activities related to technical and institutional issues related to regional ozone and its precursor pollution with a specific target to the 'Jing-Jin-Ji' region. These activities are described below.

Activity 1.1 - Monitoring technology and application of ozone and precursors

The proposal aims to technical assistance in order to provide data for O₃ and its precursors characterised by high accuracy and precision. In addition, the concentration of ozone and precursor data and its component analysis unifies, helps us to understand the process of ozone pollution. Mainly includes:

- (1) the training for O₃ and its precursors and related pollutants monitoring technology, monitor equipment, QA&QC regulations of EU and hand-on experience;
- (2) the intensive training of EU reference method on O₃ and its precursors in air and pollutant source, includes the selection of sampling points, quality assurance, quality control measures;
- (3) Monitoring networks for ozone and precursors in EU or Italian regulations, including point location, monitoring frequency, operational management, data evaluation and application.
- (4) the atmospheric VOCs (especially low carbon VOCs and OVOCs) monitoring instruments, monitoring method and control index and evaluation criterion in European Union, etc; Introducing the monitoring instruments with PID detector used for the determination of VOCs in atmospheric environment, which can be laboratory or portable.
- (5) chemical components and organics in O₃ and its precursors: the new research progress or analysis technology of organic species in O₃ and its precursors; the analysis methods of organic tracers such as VOCs (especially low carbon VOCs and OVOCs)
- (6) the environmental assessment of VOCs: The supporting roles of environmental VOCs monitoring results for management, including the environmental quality evaluation, the comprehensive analysis of VOCs and other contaminants, the source appointment of VOCs and its uncertainties, the influence of VOCs chemical transformation mechanism on the formation of SOA, the influence of VOCs chemical transformation mechanism on the formation of O₃, the advice on the priority control component in VOCs, the model

and methods used for controlling O₃ precursors in Europe, the practical application cases of EKMA curve, the synergetic control mechanism of VOCs-NO_x, etc.

Activity 1.2 - The Monitoring technology and application of air quality sensor devices

This part is mainly through investigation within the scope of the EU air quality sensor technology and product (the particulate and gaseous pollutants, including PM_{2.5}, TSP, VOCs, NO_x, O₃, etc.), through related sensor test and data reliability investigation, evaluation and data for atmospheric monitoring grid network application research work to provide products and technical support, the main content as follows:

- (1) study on the sensor device performance evaluation and comparison method, the monitoring application research progress of small sensors equipment related EU or Italian regulations;
- (2) introduces the application of air quality sensor case in EU or Italian regulations, for example in the environmental assessment, exposure and human health, and the application of popular science education, etc.
- (3) sensors comparison experiment: mainly introduces the JRC, ENEA sensor alignment of research institutions and related than standard, and to carry out the sensor field comparison experiment.

Activity 1.3 - Source analysis and regional transport of ozone and precursors

This proposal is addressed to the assistance in identification and characterisation of particulate polluting sources with the objective of assisting BJMEEB in proper planning control programs and activities aimed to the general reduction of pollution levels. The part of the cooperation is to provide technical support for the source data analysis, including source analysis technology of ozone and its precursor related to EU or Italian regulations, and provide technical assistance in the cross-border pollution transfer of ozone and its precursor. Mainly include the following contents:

- (1) study on the source analysis work of ozone its precursor related to EU or Italian regulations;
- (2) pollution sources monitoring technology: the VOCs and NH₃ monitoring technology, equipment and related management carrying out actual operation training;
- (3) the emission factor and the total calculation method of pollution source VOCs and NH₃ ;
- (4)Introducing the implementation of the EMEP program in Europe, including the

development situation of monitoring campaign, how to assess the transboundary of pollutants transport, how to provide the supporting for the administrative department, what analytical methods were used, the cooperation mechanisms of regional institutions, typical examples.

2. Capacity Building and study tour

(1) Technical exchange tour 1 for Chinese experts: a visit 6 Beijing experts to Italy for 10 days technical discussion, and the main contents could be monitoring of O₃ and its precursors, the pollutants sources monitoring and the components analysis, key on the monitoring technology of VOC and NH₃.

(2) Long-term training: a training program for 4 Beijing experts in Italy for 1 months. The Italian sides could provide professional training for instruments and technologies, which including: 1) the operational management of O₃ and its precursors monitoring system; 2) the monitoring methods of O₃ and its precursors, including VOCs (especially low carbon VOCs and OVOCs) etc; 3) source sampling and monitoring; 4) regional transport.

(3) One international conference: the theme of "ozone and its precursor substance pollution and control" international conference will be held in Beijing in the middle and later periods of the project. Invited more than 10 Italian or EU experts to Beijing for 1 or 2 days international conference, focus on ozone and its precursor monitoring technology, pollution status quo analysis, source analysis, and pollution control measures and countermeasures, etc, which related to the project content.

(4) Two workshop and Training course in Beijing: Bring around 2~3 Italian experts to Beijing for one week technical training and instruction in Beijing, focused on special theme and the progress of the project, once a year.

3. Procurement of Instruments

In the project, investigation will be carried out on instruments produced by Italian companies (or EU countries companies) for air quality monitoring. A number of instruments identified to be suitable will be purchased for test use in Beijing.

- 1) O₃ and its precursors monitoring equipment based on EU statutory methods;
- 2) sensor devices;

An evaluation report will be generated on the investigation and test use of Italian instruments, recommendation will be put forwards for future utilization in Beijing.

4. Project's timetable

1) 1st Workshop, in Beijing:

The first workshop is scheduled in the first and second quarter. During the meetings the Partners will define the detailed technical exchange program. Four Italian experts will participate the workshop for discussion and guiding the research work for 1 to 2 weeks in Beijing.

2) Technical exchange for Chinese experts in Italy:

The activity is organized for 6 experts for 10 days in the 3th and 4th quarter of the cooperation program. The experts are mainly major in O₃ and its precursors monitoring, O₃ and its precursors, the pollutants sources monitoring and the components analysis, key on the monitoring technology of VOC and NH₃. The Italian Side will provide the organization of trips, selection of lectures and experts, provision of working stations for technical exchange.

3) International conference, in Beijing:

The international conference is scheduled in the 4th and 5th quarter. More than ten Italian or EU experts to Beijing for 1 or 2 days international exchange, focus on ozone and its precursor monitoring technology, pollution status quo analysis, source analysis, and pollution control measures and countermeasures, etc.

4) long-term training in Italy:

The activity is organized for 4 experts to Italy for 1 months training in the 5th and 6th quarter of the cooperation program. The Italian sides could provide professional training for instruments and technologies, helping to solve the corresponding difficulties.

5) 2nd Technical Investigation for Chinese experts in Italy:

The second Technical Investigation is scheduled in the 6th and 7th quarter. the second batch of study focused on pollution monitoring and management, such like VOC, NH₃ monitoring techniques, and the total emissions inventory management;

5) Final report

A detailed technical and economical final report will be produced by both Sides.

	1st quarter	2nd quarter	3rd quarter	4th quarter	5th quarter	6th quarter	7th quarter	8th quarter
1 st Seminar, Beijing								
technical exchange for Chinese experts								
international conference, Beijing								
Long-term training								
2 nd Seminar, Beijing								
final report and distribution of output								

5. Project Output

Through two years of exchanges and study tour, drawing on the advanced Italian technology and experience. This project will make in-depth analysis of several major aspects of the big gap between Beijing and Italy. And put forward improved technical schemes, which will effectively promote the level of air quality monitoring, prediction and management in Beijing.

During the project, One international conference and two technical seminars involving experts from both sides and two technical exchanges between Italian environmental protection departments and research institutes will be held. Two progress reports and two technical exchanges will be produced. For the long-term training, a training report and a training manual will be completed for the training content, and technical training will be carried out for all station technicians by overseas trainers. After the completion of the project, the General report on the project activities will be submitted, the report should contain all the consulting technology. Final Workshop for distribution of the project output, including the evaluation of the Italian instruments.

ANNEX 2: Breakdown of project budget

Activity	Tentative Budget (K€) IMELS	Tentative Budget (K€) Beijing side	In total
TECHNICAL ASSISTANCE			
1.1 - Monitoring technology and application of ozone and precursors	115	225	340
1.1.1 Monitoring Technology QA&QC			
1.1.2 Reference methods for sampling and analysis			
1.1.3 Monitoring networks according to EU regulations			
1.1.4 VOC Monitoring instruments. VOC monitoring with PID			
1.1.5 Chemical components. Technologies for organic species			
1.1.6 Environmental assessment of VOC, formation of SOA, priority VOC control			
1,2 Monitoring Technology and application to air quality sensor devices	40	60	100
1.2.1 Study on sensor devices			
1.2.2 Applications of air quality sensors in EU			
1.2.3 Sensor comparison and field experiment			
1.3 Source analysis and regional transport	40	70	110
1.3.1 Source analysis related to EU regulation			
1.3.2 Pollution source monitoring technology, VOC and NH3			
1.3.3 Emission factors for VOC and NH3			
1.3.4 Introducing EMEP Program			
2 CAPACITY BUILDING & STUDY TOURS	125	25	150
2.1 Technical exchange for 6 Chinese			

experts in Italy for 10 days			
2.2 Long term training for 4 Chinese experts for 1 month in Italy			
2.3 International conference in Beijing with 10 Italian experts			
2.4 Two workshops in Beijing for 2-3 Italian experts			
3- PROCUREMENT OF INSTRUMENTS	130	260	390
3.1 Monitoring equipment based on EU regulation			
3.2 Sensor Devices and electronics			
General Expenses (project management)	40	10	50
TOTAL	490 (42%)	650 (58%)	1.140