



Terms of Reference for the “Consultancy Services for the Study on Air Particulate Matter Filters for Black Carbon (BC)”

I. Rationale

Black Carbon (or soot) is a tiny particle and major component of particulate matter 2.5 (PM2.5) air pollution, which is emitted with other co-pollutants through incomplete combustion of fossil fuels and biomass.

When suspended in the atmosphere, BC particles contribute to global warming directly by absorbing incoming solar radiation and converting it to heat. Indirectly, when deposited on ice and snow, black carbon darkens the surface, making it less reflective and more light absorbent, which causes local warming and increases the melting rate of snow and ice. The arctic and glaciated regions like the Himalayas are particularly vulnerable to the effect of BC.

BC is always emitted with co-pollutants particles, such as organic carbon and sulphates, which can have a neutral or even cooling effects on the climate. The ratio of BC to its co-pollutants varies depending upon the emission source and fuel type and impacts whether the source has a net-positive or negative warming effect. For example, emissions from diesel engines have a high proportion of BC for cooling co-pollutants, whereas emissions from wilderness and the open-burning of biomass contain a more balanced ratio. It is important to take the net climate effect into account when assessing BC emission reduction measures.

BC and co-pollutants make up the majority of PM2.5 air pollution which consists of particles 2.5 micrometers or smaller in diameter (approximately 40 times smaller than a grain of table salt) and is leading the environmental cause of poor health and premature death. In 2010, household PM2.5 air pollution were estimated to have caused over 3.5 and 3.2 million death, respectively (Lim S. et. al. 2012).

BC can also affect ecosystem health in several ways: sunlight that reaches earth and modifying rainfall patterns. The latter can have far-reaching consequences for ecosystem and human livelihoods, for example, by disrupting monsoons, which are critical for agriculture in large parts of Asia and Africa.

The main source of BC includes residential and commercial combustion and transport, which accounted for 80% of anthropogenic emission in 2005 (UNEP and WMO 2011). Other important sources include industrial processes and the burning of agricultural waste. There are also small sources such as fossil fuel extraction, large scale combustion (including power plants and industrial boilers) and open burning of garbage. New data also shows that kerosene lamps may be a significant source of black carbon (Jacobson A. et. al. 2013). Important regional variations in emission are expected in the coming decades, with

decreases of up to half in North America and Europe due to mitigation measures in the transport sector and significant increases in Asia, and Africa.

Based on the emission inventory of the BLISTT in CAR, 75% account from mobile sources, 1% from the stationary sources and 24% from area sources, which means that most of the air pollutants come from the transport sector.

II. Objectives

Generally, this study is to come up with the analysis of Black Carbon at identified monitoring sites.

III. Scope of Work

The DENR EMB-CAR shall:

1. provide air particulate matter filters from the manual monitoring sites of interest, taking into consideration the following:
 - a. the filters shall be submitted to the service laboratory, in coordination with the technical expert;
 - b. a matrix blank filter (filter that has not been subjected under the manual sampling device) should be submitted;
 - c. the filter samples should include the manual sampling data such as but not limited to the following:
 - c.1 start and end time
 - c.2 start – end day
 - c.3 location
 - c.4 volume
 - c.5 volumetric flow rate
 - c.6 pre and post weight
 - c.7 temperature
 - c.8 humidity
 - c.9 barometric Pressure and
 - c.10 other applicable atmospheric conditions;
 - d. only those data taken from the manual monitoring for the past three (3) years should be included;
 - e. data should be quality assured and quality controlled. They should have passed the 75% valid data capture.
2. review the reports submitted by the Consultant. The OIC Chief, EMED and Ambient Monitoring Section Staff, the OIC Chief, CPD, and Air and Water Permitting Section Staff will undertake the review; and
3. draft the DENR Memorandum Circular on the black carbon concentration levels in the monitoring site, if necessary.

The CONSULTANT shall:

1. present the inception report to DENR-EMB CAR;
2. in coordination with the DENR-EMB-AQMS, analyze for black carbon not less than fifty (50) filters;
3. receive, label, and preserve the air particulate matter filter samples for analysis;
4. perform pre-conditioning of the filter samples in preparation for BC analysis;
5. perform BC analysis using a Multi-wavelength Absorption BC Instrument (MABI);
6. present the preliminary report for comments of the DENR-EMB; and
7. prepare the final report of the black carbon concentration levels of the monitoring sites.

IV. Qualifications of the Technical Consultant

The technical consultant must be in the field of air quality monitoring and management for at least five (5) years.

V. Fees

Particulars	Cost
1. Consultant's fees* (9-man days – Technical expertise in calculation of results, preparation of graphs and plots, preparation of presentation materials, writing reports, and leading the stakeholder consultations, including preparation of materials and pre-meeting)	Php 50,000.00
2. Laboratory Services, taxes* and fees*	Php 150,000.00
Grand Total 1+2	Php 200,000.00

*Inclusive of taxes and fees.

VI. Timeline and Schedule of Payment

Activities	Output/deliverables	Schedule	Cost
Initialization and Inception Meeting	Minutes of the meeting and Inception Report	Month 1	10% of the Project cost (Php 20,000.00)
Submission of the air particulate matter filters for analysis	Results of analysis	Month 2-3	60% of the Project cost (Php 120,000.00)
Presentation of results	Feedback on the results	Month 4-5	10% of the Project cost (Php 20,000.00)
Writing of the report	Preliminary report on the BC concentration levels of the monitoring sites	15 days	10% of the Project cost (Php 20,000.00)
Finalization	Final report of black carbon	15 days	10% of the Project cost (Php 20,000.00)

VII. Institutional Arrangements

Coordination with the Consultant shall be borne by the AMS, EMB-CAR, with the assistance from various agencies.

VIII. Consulting Firm Qualification

The Consultant should have a proven track record on air quality management such as monitoring, black carbon analysis and source apportionment.

IX. Reporting Arrangements

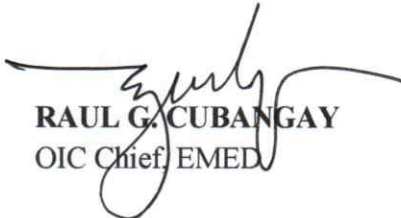
The Consultant's accomplishments will be supported/managed by the OIC Chief, EMED and the Regional Director of the EMB-CAR will oversee the whole project. Arrangement will be made between the EMB-CAR (schedule of reporting/activities and output shall be in accordance with the contract) and the Consultant for the reporting and/or based on project output.

The approved budget for the contract is **Php 200,000.00** inclusive of taxes. ↗

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