

Air Quality Monitoring of Edmonton's Fine Particulate Matter Response Plan Initiatives

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Report Summary

Exposure to ambient fine particulate matter with the diameter less than 2.5 micro-meters (μm) (PM_{2.5}) is of increasing public concern over recent decades due to its health-related impacts (e.g. cardiac and respiratory diseases). Recently, there have been questions about ambient PM_{2.5} levels in the Edmonton Central Region (Figure 3.b). Accordingly, a response plan has been prepared in 2014 with the goal of reducing ambient PM_{2.5} concentration, and keeping the concentration below Level 4, at all the monitoring stations within the Capital Region. Based on the prepared science report (AESRD, 2014)[1], the investigations narrowed down the factors of increased PM_{2.5} concentration into secondary fine particulate matter formation (from NO_x, SO₂, and VOCs) mainly from electrical generating stations, refineries, petrochemical facilities, and off-road/on-road automobile sources.

The focus of this project is on Management Action and Investigation, by providing recommendations regarding practical methods in order to support the province in implementation and on-going work related to the management plan and improving the current PM_{2.5} monitoring network for Edmonton Central Region.

The following considerations are recommended for the study design of the mobile monitoring:

- The city can be divided into 4 or 5 different residential parts, each with a radius of 5 km and consisting of more than 2000 residents.
- The study should include different sampling periods between morning and evening in order to determine the peak time for the PM concentration.
- The monitoring should be done at the same locations during different seasons.
- The monitoring device should not be placed beside high traffic roads or high rise buildings, and should remain at each location for at least one hour in order to calculate an hourly average.

The next step for improving the PM_{2.5} management plan is to determine the contribution of different sources on PM_{2.5} emissions. Source apportionment is a suitable technique to accomplish this step. For this method, it is required to analyze the PM composition collected at the receptors through elemental analysis and assign the elements to their potential sources. Some studies previously performed the source apportionment on the Edmonton area; however, as previously mentioned the lack of suitable data (one station) and inappropriate location of the receptor (McIntyre) might lead to an inaccurate analysis, which might not be a good representative of the Edmonton Central Region. Consequently, a comprehensive source apportionment study is recommended in addition to the previous studies in order to provide further information about the PM_{2.5} emission sources contributions.