CLEAN-ROADS project: air quality considerations after the application of a novel MDSS on winter road maintenance activities

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With this poster we present the environmental benefit on air quality derived by the application of the CLEAN-ROADS pilot project. The CLEAN-ROADS project addresses the problem of the environmental pollution caused by de-icing salts during winter road maintenance activities in the Province of Trento (Italy).

A demonstrative Maintenance Decision Support System (MDSS) has been developed in order to improve the intervention procedures of the road management service. Specifically it aims to optimize the efficiency of how available resources (e.g., salt consumption) are currently used while guaranteeing the current level of road safety. The CLEAN-ROADS project has been tested and validated on a test area located in a valley bottom (Adige Valley), where the highest optimization margins are to be expected. The project supports current road maintenance practices, which has proved to be reliable and accurate, with a new scalable and energy-efficient road monitoring system. This system is based on a network of road weather stations (road weather information system, RWIS) installed on the test route. It is capable to collect real-time data about the road conditions and to perform short-term and now-cast road weather forecasts, which actively integrate weather data and bulletins covering the target area [1].

This poster presents the results obtained from a three-year monitoring activity with the aim to (1) determine the impact of de-icing salts on air quality and (2) quantify the improvements obtained by the application of the CLEAN-ROADS project on air quality.
The Ambient Air Quality and Cleaner Air for Europe Directive (2008/50/EC) states that contributions to exceedances of particulate matter PM10 limit values that are attributable to road winter salting may be subtracted when assessing compliance with air quality limit values, once provided that reasonable measures have been taken to lower concentrations [2].
As the de-icing salts used in road maintenance are mainly based on sodium chloride, which releases Na^+ and Cl^-, the estimation of the contribution of road salting to PM10 concentration can be carried out considering only measured concentrations of Na^+ and Cl^-. However, the presence of these elements might not be due exclusively to salting activities. For this reason data collected during first winter campaign were analysed using the Positive Matrix Factorization (PMF) Model developed by United States Environmental Protection Agency (EPA) to identify the presence of Na^+ and Cl^- in emission profiles of other PM10 sources (e.g., biomass burning, traffic) [3].

Through this study new guidelines have been defined for the optimization of current road management operations, and their applicability to other area in the Province of Trento has been assessed for future purposes.

[1] Pretto I. et al., SIRWEC 2014 conference proceedings, ID:0019 (2014)
[2] Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive (2008/50/EC)
[3] http://www.epa.gov/air-research/positive-matrix-factorization-model-environmental-data-analyses