LIFE13 ENV/ES/000263

DELIVERABLE 6
Minutes of the Expert´s workshop

Action E3
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IMPROVE LIFE13 ENV/ES/000263

CONTENT

1. COMMUTER AIR QUALITY IN RAIL SUBWAY SYSTEMS: CURRENT UNDERSTANDING AND FUTURE MITIGATION

Commuting by underground rail is a transport mode used daily by over 100 million people worldwide. Published reviews of subway air quality worldwide reveal a wide range of PM concentrations present in underground platforms, and beg the question: why is there such diversity? The overall aim of the session is to motivate discussion to achieve real improvements in subway air quality, identifying main pollutant sources and prioritise cost-effective and energetically green air pollution mitigation strategies.

Millions of people worldwide commute using subway systems and are routinely exposed to levels of contaminated air that are illegal above ground. In Europe alone more than 60 cities utilize rail subways to facilitate commuter movement. With average return journey times lasting around one hour, underground commuters inhale particulate matter at concentration levels than can be higher than the 50 µg/m^3 mean PM10 (Particulate Matter <10 microns in size) limit legally imposed for outdoor European city air. In addition inhalable particles on platforms are very different from those in the outdoor environment. Despite this one negative aspect, underground rail in general can be considered as "environmentally clean", facilitating commuter travel and reducing air pollution in the city above ground. Although there are currently no official regulations or recommendations with regards to air quality underground or indoors, several working groups are emphasizing the importance of including legislation for indoor air quality. Given this context, this special session aims to be part of a high-profile attempt to guide legislative frameworks towards more effective control of indoor air quality.

The session was chaired by Teresa Moreno (IDAEA, CSIC) and involved a far ranging discussion on the key issues relevant to subway air quality, within the frame of the IMPROVE LIFE project (http://improve-life.eu/en/), which aims to assess air quality in the subway facilities and propose measures to achieve cleaner public transportation, thus benefitting both users and employees. The session consisted of five platform presentations and five posters. Firstly Lidia Morawska (Queensland Univ., Brisbane, Australia), an expert in indoor air, outlined her work on infection spread in public transport, highlighting the importance of the proximity of passengers and the duration of each trip. Prof. Morawska sees a gulf of thinking between

clinicians, engineers and scientists on this subject, and explained that ventilation is not the only mechanism to control infection spread in any transport systems, including our cars. Caroline Duchaine (Université Laval, Quebec, Canada) emphasized the need the develop surveillance methods of disease transmission in public vehicles, summarizing the results of a joint Laval/CSIC study on bioaerosols found in the Barcelona Metro. Bioaerosols in this unique environment are relatively unknown, and have humans as main sources unlike most situations outdoors. Teresa Moreno (IDAEA-CSIC) outlined the objectives of the IMPROVE LIFE project and stressed the importance of the main variables affecting air quality in the subway. Thus, the air quality of a given subway platform involves a complex interplay of the ventilation system, station depth and design, train speed, frequency, wheel materials and braking mechanisms, and number of passengers being transported. Frank Kelly (King's College, London) overviewed progress on a currently ongoing study of air quality in the London Underground system, the oldest in the world. In this systems it is clear that air quality largely depends on the number of kilometres underground of each line (45% of the London tube is underground), with PM levels being higher at deeper stations and dropping to ambient outdoor levels within 5 minutes when travelling above ground. Finally Alberto Giretti (Polyt. Univ. Marche, Ancona, Italy) used his engineering expertise to demonstrate the need for intelligent control of subway ventilation systems using sensor networks. Prof. Giretti showed how simulation results can be used to estimate pollutants exposure levels for passengers, and how the dynamic of pollutants in a given station is dependent on both external (meteorological conditions) and internal (piston effect, passenger flow) factors.

The subsequent general *discussion*, led by the Chairwoman and involving both panel members and the audience, then ranged across a number of subjects, with the following key subjects:

• There is a need to compare the transient doses received when using different types of transport, and balance any negative health effects against positive effects such as the well documented cardiovascular benefits of exercise when walking or cycling.

• What is the health significance of short high exposures? What can be done to reduce exposure?

• There are technical solutions in the case of underground air quality, involving the adoption of new or improved systems of maintenance and energy use, such as regenerative braking and the use of intelligent sensors to allow monitoring and control in real time.

• Any suggested improvements must be cost effective and technically feasible. For example, can brake manufacturers be encouraged to change the metal content of their pads to produce more "ecologically sensitive" compositions and PM emissions?

• The IMPROVE LIFE project needs to identify good practice to improve air quality underground and share this information with other subway operators around the world.

IMPROVE LIFE
Implementing Methodologies and Practices to Reduce
air pollution Of the subway enVironmEnt

2. BRIEF BIOGRAPHIES OF SPEAKERS

Caroline Duchaine is a Professor and Health Funds Senior Scholar at Université Laval and the Quebec Heart and Lung Institute. Her main expertise is in the characterization of bioaerosols and respiratory viruses and the effects of their exposure to humans, and she has over 350 publications. She has acted as expert witness for the Quebec Government in several bioaerosol court trials after tragedies related to mould problems in homes, was invited by the NASA to the Workshop on life detection in extraterrestrial samples, and has received several awards for her work.

Alberto Giretti works at the Department of Engineering and Architecture of Università Politecnica delle Marche, Italy. He has been the scientific co-ordinator and leader of several projects in various recent European Framework programmes, and has co-founded spin-off companies based on the applications of his research. His research interests include advanced modelling for energy efficient buildings, Health and Safety in Automated Construction site, and Knowledge Based Systems for Design and Education support in Architecture and Building Construction.

Frank Kelly holds the chair in Environmental Health at King's College London, is Director of the Environmental Research Group operating the London Air Quality Network, and is Chairman of the UK Department of Health's Expert Committee on the Medical Effects of Air Pollution. His substantial research activity spans all aspects of air pollution research from toxicology to science policy, including the impact of London's Congestion Charging and Low Emission Zone, and the effect of urban air pollution and traffic management schemes on the respiratory health of schoolchildren.

Lidia Morawska is the Director of the International Laboratory for Air Quality and Health in Queensland University of Technology in Brisbane, and co-director of the Australia-China Centre for Air Quality Science and Management. She is a physicist by training who received her doctorate in Poland and continued her research in Canada as a Fellow of the International Atomic Agency before moving to Australia. With over 450 publications she is an expert on airborne particulate matter, a past President of the International Society of Indoor Air Quality and Climate, and is advisor to the WHO.

Teresa Moreno is a Senior Researcher at the Spanish Research Council (CSIC) in Barcelona. She is a geologist by training, educated to MSc level in Spain then receiving her doctorate in the UK followed by a Fulbright Award to visit the USA, before moving into the study of airborne particles as a British Medical Council Researcher in the lung toxicology group at Cardiff University. With her expertise on the chemistry and sources of atmospheric pollutants now back in Spain she is leading the Spanish-funded METRO and European-funded IMPROVE LIFE research projects on subway air quality.