Expert Panel on Clean Air in Cities

Bratislava 27 November 2019

Key messages

Despite emission reductions since the 1980s, air pollution is still a leading cause of health damage in European countries. Significant local sources in the most polluted cities are traffic and residential heating.

The import in cities of pollution from surrounding areas and countries is also important. WHO guidelines cannot be achieved unless these sources are also addressed, emphasizing the need for multi-scale modelling. Since cities are net exporters of pollution they also affect the surrounding region and other cities.

Advanced approaches combining local models and regional models that take into account chemical and meteorological processes on various scales are becoming available and offer possibilities for more robust analysis for formulating effective measures and policies. A variety of models were presented dealing with this issue, some complex requiring expert use and some less complex that are openly available. Both types of models have roles to play in effective air quality management, There is a need to better define how the findings of large scale modelling can be integrated with local models and used in local decision making.

Estimation of local exceedances of air quality limit values requires other model characteristics (and measurement strategies) than estimation of the average exposure of the population in a city (or neighborhood) and the associated health impacts.

There is limited data available on the costs, air quality benefits and co-benefits of local measures, particularly those involving behavioral change (e.g., modal shift in transport). Further work should be undertaken to fill this gap to improve the efficiency of future air quality action planning.

1. Around 80 participants from national governments (20), cities (10), the scientific community (30), NGO's (15) and industry, European Commission and World Bank participated in a workshop that was held back-to-back with the Clean Air Forum meeting of the European Commission. Rob Maas (Netherlands) chaired the meeting.
2. Introductory presentations by the chair, the European Urban Partnership on Air Quality, the European Environment Agency showed the need for co-operation across spatial scales in order to meet the air quality guideline values of the World Health Organization in cities. Whilst there are of course important local sources, the exposure of the urban population to particulate matter (PM2.5) is significantly influenced by sources outside the cities. The regional background can easily be of similar order of magnitude as the local contribution to PM2.5 concentrations, requiring a multilevel response to improve air quality in many cities. Secondary PM concentrations, that form a large part of the PM2.5 concentrations, are influenced by emissions of ammonia, nitrogen oxides and sulfur dioxide from 10 to several hundreds of kilometers away from the city. At the same time, cities are net exporters of air pollution affecting the surrounding region as well as other cities. Emission reductions in a city will also improve the air quality outside the city, by reducing air pollutant concentrations in the surrounding background. Reducing local exceedances of legal air quality limits in general was an effective way to improve of air quality for people at the highest risk, but can also trigger measures that would not reduce emissions. For example an alternative

distribution of traffic and pollution across the city that could even increase the average population exposure and associated health risks.

3. Several presenters stressed that current statutory air quality limit values are not 'safe levels'. Substantial health impacts occur below the current air quality limit values in the EU. That raises the question what effective multi-level policy strategies can be designed to maximize health benefits. There are still few examples of a successful cooperation across spatial scales.
4. There are doubts whether even the strictest feasible emission standards for cars, installations or farms will be sufficient to meet WHO-guideline values. While the call for systemic changes in the transport-, energy- and food-system increases, there are still few successful examples of such an integrated approach across policy domains. In some cases, energy-, transport- or agricultural problems are even tackled at the expense of air quality.
5. Mike Holland (UK) discussed assessment of the costs and benefits of action, and identified a lack of data on behavioral and infrastructural measures and the reasons for it. This acts as a barrier to the development of efficient local air quality management plans. Several institutions expressed interest in further discussion in this area. The quantification of damage costs per kg emitted (to assess the costs of inaction or the benefits of measures) is growing across Europe, though it was noted that there are examples of bad practices.
6. Representatives from the World Meteorological Organization, the European Commission's Joint Research Centre (JRC) and the Centre for Integrated Assessment Modelling at IIASA presented methodologies for attributing local air quality to local, national and international sources and calculating the effectiveness of policy measures at different scales. For assessing future air quality, results were presented showing the importance of taking account of interactions with climate change, and reductions of greenhouse gas emissions. Models ranged in complexity from those requiring extensive modelling experience to web-based tools (e.g. SHERPA-city). With sufficient data it would be possible to define an optimal multi-level policy strategy, as was shown for studies in Asia in the context of the Pollution Management and Environmental Health program of the World Bank. Germany and the Netherlands presented a modelling framework for nationwide assessments of local exceedances of limit values and average population exposure, including both national and local measures. This facilitates a coordinated approach between the two government levels. In the Netherlands almost all exceedances of limit values have disappeared. The policy for the next 10 years is to gain health improvement by further reducing the average exposure of the population in cities. In the discussion the need for more use of validated low-cost sensors to support modelling was identified.
7. In a panel discussion the conclusion was drawn that local policies should be based on robust knowledge of the contribution of both local and external sources. Existing efforts to produce such source apportionments should be compared and made available to cities from up-to-date databases. One option can be that all available models run certain policy scenarios and produce an ensemble output. The next challenge is to nest fine-scale local models in the more complex large scale regional and global models that take into account chemical and meteorological processes to the extent required. At the same time, gaps in availability of local level data were highlighted in the discussion. While the models and results are typically made publicly available, researchers are often facing difficulties to get access to emission inventory inputs, or to experience on effects and costs of 'non-standard' interventions.
8. Policy strategies should include both the effects of international and national measures on the city level and the impacts of additional local policies. The assessment of local (and national) policies should include transboundary impacts to surrounding regions and

countries. In designing policies, attention should be paid to constraints from other policy domains such as the nitrogen limits in groundwater, the deposition constraints that result from nature protection agreements, and the reduction obligations for greenhouse gases.

9. During the lunch results from two EU LIFE projects were discussed. A project on Clean Air Farming illustrated the need for a coherent agricultural policy to reduce ammonia, methane and nitrous oxides at the same time. A project on Clean Heat was aimed at comprehensive consumer information on domestic wood burning.
10. In the afternoon one of the representatives from Poland presented research on the abatement of emissions from residential heating. A representative from the EU LIFE project 'MOTTLES' claimed that trees in cities could reduce ozone concentrations by 2%, and are a more effective aid in improving air quality than green roofs. The state of the art in local traffic related air quality modelling was shown for Coimbra, Pamplona, Madrid and London. Low-emission zones are currently the instrument that dominates. For Pamplona a.o. the use of photocatalytic paint was analysed (effect not significant). Madrid policies included clean package delivery and parking tariffs that depend on the emission characteristics of the car. To meet air quality targets in London a host of mainly traffic measures are being investigated through a series of rapid assessments and deep-dive case studies following evaluations in 61 cities. However to meet air quality targets also tackling other sources need to be considered, such as residential wood burning, reduction of non-exhaust emissions, of emissions from non-road mobile machinery and from international shipping, as well as from kitchens in areas with many restaurants. Health benefits are closely related to the reduction of the average exposure of the urban population. Further steps were identified to use proxy indicators to assess the costs and potential impacts of local infrastructural measures. Discussion on these presentations concluded that in most cities in the long run (2050) it is probable that all available measures to end combustion processes would be needed to meet both climate targets and WHO-guideline values.
11. The question remained to what extent more detailed modelling of air turbulence in streets and of personal (in- and outdoor) exposure would change local policy advice (and at which costs).
12. During discussions several research issues were brought up by city representatives and NGOs such as on the health impacts of specific PM-compounds, especially carbonaceous aerosols, ultrafine particles, persistent organic pollutants and emerging issues like microplastics.
13. Roald Wolters and Guus Velders (Netherlands) closed the meeting and concluded that further interaction with local experts, authorities and NGOs was needed to disseminate available results from large scale models and to learn from local assessment tools in order to define best practices and policy actions. They acknowledged the challenge to engage cities in the progress of the expert panel. They announced that they would coordinate the organization of the meeting of the Expert Panel on Clean Air in Cities next year.

14. All presentations have been uploaded on the TFIAM-webpage: https://www.iiasa.ac.at/TFIAM/past-meetings.html