

Abstract

The relationship between deteriorated outdoor air quality and human health is one of the most studied environmental health issues. The concept of exposure, the link between environmental status and human health, has emerged in the late 1970's, recognizing that fixed monitoring stations do not represent concentrations at the places where persons spend time. Many advances have been made since. Characterizing the individual's exposure reduces uncertainty in links with health, but it implies a question about how exposure (as opposed to directly using concentrations) can be used in the regulatory process.

This thesis addresses exposure assessment from several perspectives, with the aim to address its role in air quality management. We are interested in how to use exposure information for policy- and decision making, we investigate if a European-level subgroup-based exposure estimate can provide useful information for designing differentiated measures to protect specific groups, we design an exposure estimate for risk assessment in a specific situation with limited health and air pollution data, and we describe the challenges of the inherent inter-disciplinarity and suggest how to deal with them.

We introduce the “full chain” approach to environmental health that links policy – pollution source – concentration – exposure – effect – impact, and show that mitigation measures can be taken in all of its steps. The estimated European-level exposure differences between population subgroups imply the need for mitigation measures to address the subgroups specifically.

Exposure matters, but is it widely acknowledged? We investigate how “exposure assessment” is perceived compared to other elements of the “full chain” framework. Based on six case studies, where experts are asked “what is your level of confidence in the scientists' ability to predict... (individual elements of the framework)”, we find that exposure is often perceived as the issue where least knowledge is available. We illustrate how exposure was assessed using emission inventorying aided by remote sensing and used for risk assessment relating respiratory disease and local emission strength at the patient's home.

The interdisciplinary nature of exposure assessment poses challenges to scientists in their choice of methods, and in communication within and outside the research community. In this thesis, we describe a concrete example. Experiences from a large interdisciplinary project tell us that there probably is no universal method and that the best we can do is to learn from each other, rely on contextual negotiation and learn from experience.