The role of time scale in assessing external costs of metal emissions

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Abstract:
Monetary evaluation of emissions is a fundamental component of a decision support tools like Cost-Benefit Analysis –CBA (Boardman A.E. et al., 2006). However, the results of such assessment are subject to high uncertainties partly dependent on the setting of space and time scale conditions in the modelling phase. This study focuses on the differences in keeping a short-term vs. long-term perspective in the analysis, where human biokinetic and environmental dispersion models (like e.g. Pounds and Leggett, 1998; Olesen et al., 2007) are used trans-disciplinarily inside the ExternE methodology framework (European Commission, 2004). Two case studies are taken as a starting point for a discussion on how such approach can be used for evidence-based decision making. In particular, two policy instruments are opposed: the implementation of air pollution control devices (APCD) on stack gases versus the remediation of contaminated soil, as both are possible measures for mitigation of lead (Pb) exposure-related impacts on human health (Pizzol et al., 2010a;Pizzol et al., 2010b). In the presented study, the total costs due to metal dispersion, accumulation, and exposure are quantified in different time scales, and different discount scenarios are analysed. Preliminary results show that, while in the short-term costs via the inhalation exposure route constitute the biggest share of the total costs, on the long-term they will become comparable to costs via ingestion. However, the application of a positive discount rate is expected to reduce the costs via ingestion that are due to cumulative exposure and are therefore occurring mainly in the future. Therefore, the choice of the time scale can influence significantly the outcome of the evaluation and consequently bias its application in decision making.

References:
Boardman A.E., Greenberg D.H., Vining A.R., Weimer D.L. Cost-Benefit Analysis, Concepts and Practice. 2006.
European Commission. ExternE - Externalities of Energy - Methodology 2005 Update. Office for Official Publications of the European Communities, Luxemburg, 2004.
Olesen HR, Berkowicz R, Løfstrøm P. OML: Review of model formulation. National Environmental Research Institute, University of Aarhus, 2007, 1-130 pp.
Pizzol M, Thomsen M, Andersen MS. Long-term human exposure to lead from different media and intake pathways. Science of the Total Environment 2010a; 408: 5478-5488.
Pizzol M, Thomsen M, Frohn LM, Andersen Mikael Skou. External costs of atmospheric Pb emissions: valuation of neurotoxic impacts due to inhalation. Environmental Health 2010b; 9.
Pounds JG, Leggett RW. The ICRP age-specific biokinetic model for lead: Validations, empirical comparisons, and explorations. Environmental Health Perspectives 1998; 106: 1505-1511.

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