Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2019-702-RC2, 2020

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modelling of the public health costs of fine particulate matter and results for Finland in 2015" *by* Jaakko Kukkonen et al.

Ståle Navrud (Referee)

stale.navrud@nmbu.no

Received and published: 12 May 2020

This paper is an excellent and state-of-the-art application of the impact pathway approach (also termed the damage cost approach by economists) to assess public health costs of fine particulate matter (PM2.5) in ambient air from domestic primary and precursor emissions of PM2.5 in Finland in 2015. The paper provides a very transparent overview of the assumptions and calculations in all steps of the impact pathway model they develop; from emissions from different sources through dispersion and exposure to concentration-response functions and the economic valuation of the selected health endpoints. In the economic valuation of premature death due to PM2.5 the authors argue for using the number of lost life years and the Value of a Life Year (VOLY) rather than valuing all people at the Value of Statistical Life (VSL). This implies assigning a

lower value to the elderly, that make up the majority of people dying prematurely due to PM2.5. The authors state in line 402-407: "The monetized estimates in the computations of the economic impacts in this study are based on the average value of a life year (VOLY), instead of the value of statistical life (VSL). The VOLY-based approach has been commonly used as a measure to assess a decrease in mortality risk (Im et al., 2018), whereas the VSL-based approach, despite its disadvantage, is in line with EPA's standard procedure and recommendations (Wolfe et al., 2019)". The "despite disadvantages "phrase should be deleted. They should instead say choosing between the VSL and VOLY approaches is also an ethical question in terms of whether one should assign the same economic value to all adults, independent of age; and that a constant VOLY assumes that people value a life year the same independent of age. Also the authors further down in the paper (line 669-672) say that they have performed calculations using both VOLY and VSL (see also table 4), in order to show the difference in calculated economic benefits from emission reductions; which is of course very good that they do. However, in line 402 (see citation above) they state that they only used VOLY. This has to be corrected to made consistent with the calculations/sensitivity analyses they actually performed. In line 399 after the sentence "This also facilitates numerical comparisons with those studies" they should add that: "Ideally a country-specific VSL (and a derived VOLY from this VSL) for Finland should be applied in this analysis, which could be based on value transfer (Navrud and Ready 2008) from the most recent global meta analysis of stated preference studies of VSL (Lindhjem et al 2011). However, this would preclude the direct comparison of results with similar impact pathway models e.g. Holland et al (2005). In the appendix the authors use VOLY as the abbreviation for Value of a Life Year , whereas in the text also VLY is used (e.g. in the paragraphs including lines 670, 685 and 705). This should be consistent, and I suggest using VOLY all the way through the paper. They find that the economic benefits om emission reductions are clearly largest for the emission reductions for the source categories that have low emission heights, and are located in more densely populated regions (i.e. vehicular traffic, non-road and machinery and

residential wood combustion urban versus rural areas). In the Abstract they say “It was found that economically the most effective measures would be the reduction of the emissions in urban areas of (i) road transport, (ii) non-road vehicles and machinery, and (iii) residential wood combustion”. However, in economics cost-effectiveness, that this can statement can interpreted as, is a measure of e.g. reduced number of kg of PM 2.5 emissions per euro of abatement costs. Thus, the authors should rather say that “ the economic benefits in terms of avoided public health costs is largest for measures that will reduce of (i) road transport, (ii) non-road vehicles and machinery, and (iii) residential wood combustion”. Whether these measures have the largest net benefits (Economic health benefits minus the abatement costs) depends of course on the costs of reducing emissions from theses sources. This also has to be corrected when using the word “effective” both in the abstract and in line 399-805.

There could also be other economic benefits than to public health from reducing the PM2.5 emissions , such as reduced soiling and corrosion of residential and commercial buildings, historic monuments and cultural heritage buildings as well as reduced environmental damages., The authors very briefly mentions this at the end of the paper, but they could also mention that there are ways to value these economic benefits and refer to e.g. Navrud and Ready (2002, 2007) and Watt et al (2009).

References: Holland, M, A. Hunt, F. Hurley, S. Navrud, and P.Watkiss 2005: Methodology for Cost-Benefit Analysis of CAFE (Clean Air for Europe). Volume 1: Overview and methodology. Report to DG Environment. European Commission, 112pp. Lindhjem, H., S. Navrud, N.A. Braathen, and V. Biausque 2011: Valuing lives saved from environment, transport and health policies. A meta analysis. Risk Analysis 31 (9); 1381-1407. Navrud, S. and R. Ready (eds.) 2002: Valuing Cultural Heritage. Applying environmental valuation techniques to historical buildings, monuments and artifacts. Edward Elgar Publishing. Navrud, S and R. Ready (eds.) 2007: Environmental Value Transfer: Issues and Methods. Springer, Dordrect, The Netherlands.

Watt, J., S. Navrud, Z. Slizkova and T. Yates 2009: Economic Evaluation.. Chapter

7 (pp. 189-214) In Watt, J., J. Tidblad, V. Kucera and R. Hamilton (eds.) 2009: The Effects of Air Pollution on Cultural Heritage. Springer. 306 pp.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2019-702, 2019.