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Title: Effects of a very low energy building scenario in Europe on air pollution and health

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Body: Substantial amounts of energy are used for domestic heating. Accordingly domestic heating significantly influences climate and air pollution. We investigated the effects of a very low energy building scenario (VLEB) with an annual retrofit rate of 2% in Europe on air pollution and the resulting health benefits. Energy savings from 2005 to 2020 due to insulation were calculated by comparing a business as usual (baseline) and the VLEB scenario. The resulting changes in emissions were entered in a Comprehensive Air-Quality Model with extensions, using meteorology for 2009[1]. Mean annual changes in particulate matter were calculated for each country. Demographic data were extracted from WHO databases. Changes in health effects per $\mu g/m^3$ change in mean annual PM were derived from published reviews as 0.6% in all-cause mortality among adults and 7.7 new persistent cases of chronic bronchitis per 100,000 adults. The mean annual change in PM2.5 varied between -0.008 $\mu g/m^3$ (Finland) and -0.538 $\mu g/m^3$ (Belgium). The number of life-years gained among adults varied from 0.9/100,000 persons/yr to 54.5/100,000 persons/yr - the mean being 24.5/100,000/yr. The total number of life-years gained annually varied from 31 in Finland to 22524 in Germany, totalling 75089 life-years in Europe. A total of 6899 cases of persistent chronic bronchitis were avoided annually under the VLEB scenario compared with baseline. In conclusion, a VLEB scenario in Europe would have substantial benefits on health by lowering air pollution. The saved societal costs from such benefits should be taken into account when planning mitigation of global warming by energy consumption reductions. [1]Korsholm US et al., Atmos Environ. 2012.