Predicted health impacts of congestion pricing in Stockholm
– a local assessment

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AIRNET A Thematic Network on Air Pollution and Health

NERAM Network for Environmental Risk Assessment and Management

Aim and background

Traffic congestion leads to substantial waste of time, extra fuel combusted, polluted air and negative health effects. Using price to allocate space on congested roads involves charging relatively higher prices for travel during periods of peak hours than in other periods. The introduction of such a system is planned in Stockholm, and we have estimated the effects on air pollution levels and health.

Methods

Traffic models, a dynamic emission database and an air quality dispersion model have been used to calculate the effect on NO_2 and PM_{10} levels of a system for congestion pricing.

Air pollutant concentrations have been combined with spatial distribution of the population (100×100 m resolution for the inner city, 500 x 500 for outskirts) to obtain population weighted means and extreme values.

The modelled exposure reductions have been combined with reported exposure-response functions and local base-line frequencies to quantify health benefits expected from the pricing system.

Results and conclusions

-For approximately 330000 inner-city residents it is estimated that the reduction in long-term exposure corresponds to 46 deaths per year based on NO_2 as exhaust exposure indicator (Dutch study by Hoek et al).

- If instead PM10 is used as indicator (US coefficients as used by Künzli et al and in APHEIS) the reduction is estimated to 18 deaths per year.

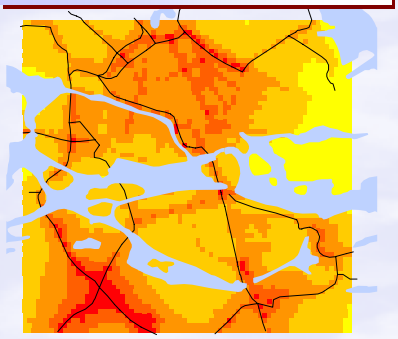
Estimated long term effects on the inner-city mortality

Indicator	Assumed RR per µg/m³	Reduction deaths per year	With day time population
PM_{10}	0,43 %	17,7	18.3
NO_2	1,2 %	46,3	48.1

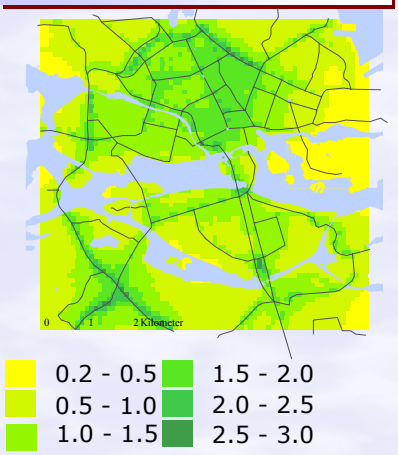
In both cases the population weighted annual mean concentration was estimated to be reduced by 1.2 µg/m³. If the effects on concentration reduction in the outskirts (a population of about one million people) is included, the total reduction in mortality is estimated to be 65 cases using NO2 as indicator. "Reductions in hospital admissions were also estimated, but only as a decrease in short-term effects.

Applied relative risks are associated with uncertainties. Other factors cause additional uncertainties, why we see it necessary to further develop this kind of assessments.

Annual mean NO_2 background concentration (µg/m³) in the inner city



Estimated reduction in annual mean NO_2 concentration (µg/m³) in the inner city



Estimated reduction in NO_2 annual mean population exposure (µg/m³ ×persons) in the inner city