

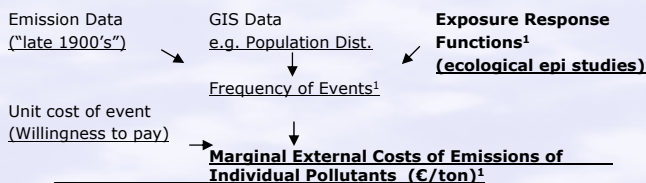
Estimating The Health-Based Economic Impacts Of Ground Level Ozone Attributed VOC Emissions: An Alternate Science-Based Approach

Background

BeTa Version E1.02a

- Created for European Commission DG Environment by Netcen
- Provides marginal external cost of emission of individual pollutants
 - SO₂, SO₂-SO₄, NO_x-NO₃, NO_x-ozone, PM_{2.5}, **VOC-ozone**
- Used to support cross media BREF, SLFD, Decorative Coatings Directive

BeTa Version E1.02a - Conceptual Framework



¹Components examined in the current study

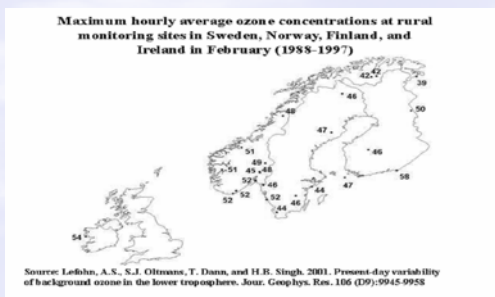
Study Objective: Evaluate Marginal External Costs Of VOC Emissions-Ozone

- Focused on health impacts: ~75% of total VOC impact
- Focused mostly on acute mortality: >99% of health impact
- Evaluated key assumptions with focus on all available data
 - Epidemiology, **human clinical, toxicology, mechanistic data**
- Develop alternative assumptions where supported by latest data
- Re-run BeTa using alternate assumptions: quasi sensitivity analysis

Summary Of Evidence For Acute Ozone Mortality Hypothesis (1a)

Data Category	Summary
Epidemiology	Partial support but serious methodology questions exist
Human clinical and toxicology	No or limited support
Mechanistic	No or limited support
Overall	Limited support

Alternative approach for impact analysis: assume no mortality occurs



Summary Of Major Assumptions in BeTa and Alternate Approaches

Assumption	Alternate Assumption / Approach
Current ambient ozone levels produce acute mortality	Current levels do no produce mortality
There is no threshold for acute ozone mortality	Mortality threshold is evident at current background levels of 0.04-0.05 ppm
RRs of 0.59 per ug/m ³ in Barcelona are representative for Europe	Use central value of 0.02-0.3 ug/m ³ from recent WHO report
High and low ozone produce equal risk	Use risk ratios from 1-hour averaging times without upward adjustment
Life years lost from acute ozone mortality is 6 months	No reliable value available / suggested
Percent of population affected is 0.099%	No reliable value available / suggested

Summary Of Marginal External Health-Based Cost of VOC Emissions Using BeTa And Alternate Approaches

Approach	Health Effects	Assumptions	Cost/ton (€)
BeTa VE1.02a Base case	Respiratory hospital admissions Asthma provocation Minor restricted activity days Acute ozone mortality	No threshold for all effects High end ER function for mortality	1623
Alternative 1	Respiratory hospital admissions Asthma provocation Minor restricted activity days Acute ozone mortality	No threshold for all effects Central ER function for mortality	566-837
Alternative 2	Respiratory hospital admissions Asthma provocation Minor restricted activity days Acute ozone mortality	No threshold for morbidity Mortality Threshold at 0.05 ppm High end ER function for mortality	88 ¹
Alternative 3	Respiratory hospital admissions Asthma provocation Minor restricted activity days	No threshold for morbidity effects	23

¹Estimated from analysis by Holland et al. 1998

Conclusions And Future Considerations

- Acute ozone mortality and no threshold assumptions have dramatic influence on cost estimates
 - No mortality: reduction of nearly 99% in health-related marginal external costs of VOC emissions
 - Mortality with threshold: reduction of nearly 95%
- Use of more central ER function for mortality has significant impact
 - Reduction of 50-75% in health-related marginal external costs of VOC emissions

Suggestions for Future Work:

- Evaluate effects of NO_x on ozone levels
- Incorporate photochemical reactivity concept to more accurately differentiate impact of individual VOCs
- Perform review of the marginal external costs of environmental impacts