Why a One Dimensional Approach Won't Work for a Multi-Dimensional Problem

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Outline

- *What is Cost-Effectiveness (CE) ?*
- *Problem of measuring CE with multiple pollutants*
- *Approaches to calculating CE*
- *What is typically done - Examples*
- *Conclusions, Future Directions*

What is Cost Effectiveness?

<u>Single Pollutant Case</u>

- *Cost of Control / Effect of Control*
- *e.g. Control program costs $30,000 and reduces 10 tons of SO2.*
- *CE = $30,000/10 tons = 3,000 $/ton*

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Problem

- *Many control programs control more than one pollutant for the same cost (e.g. mobile source controls.)*
- *TCM - Transportation Control Measures reduce all pollutants given off by a car.*
- *There is no generalizable theoretically justified way to allocate the costs of a control measure among pollutants.*

Example

<u>Multiple Pollutant Case</u>

- I&M: Costs $30,000 and reduces: 10 tons of NOx, 5 tons of VOCs and 2 tons of CO.
- What is CE of I&M program?
  - What is the context?
  - What is the question being asked?

Options

- *Allocate all Costs to the Pollutant(s) Targeted by the Control Measure (CE = Cost / NOx)*
  - *Simple, straight forward*
  - *Overstates costs, if multiple pollutants, & multiple programs.*
- *Adding all Pollutants Together (CE = Cost / NOx + VOCs + CO)*
  - *"A ton is a ton." Simple, popular.*
  - *What information does this provide?*

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Options

- *Add Related Pollutants Together*
  - *Related by effect*
  - *e.g. Pollutants which combine to form ozone → VOCs and NOx are added together as "smog reducing pollutants."*

<u>Asks</u>: Cost-effectiveness of what?

<u>Answer</u>: CE of reducing tons of smog forming pollutants.

Allocate Costs Based on Goal of the Control Measure

- *Apportion Costs among Targeted Pollutants Only e.g. CE= (Costs / NOx + VOCs)*
  - *Weight Pollutants by Ambient Impacts.*
  - *Apportion costs by contribution to reducing ambient ozone.*
  - *Need air quality modeling data on contribution of each ton of precursor emission reduced to reduction in ozone.*

Provides a Different Measure of Cost Effectiveness

- *Cost-effectiveness of what?*

<u>Answer</u>:

CE of reducing tons of ambient ozone, not tons of the pollutant(s) being reduced.

Variations

- *Adding Pollutants Together Based on Funding Source*
- *Gets back to question of cost-effectiveness of what?*
  - *Cost effectiveness of program dollars at achieving their mission.*
  - *Numerator and denominator are both determined by language governing funding.*
  - *Nothing new here.*

More Options

- *Assigning an equal proportion of the costs to each pollutant regardless of tons of each reduced*
  - *e.g. I&M: Assign 1/3 of total program cost to NOx, 1/3 to VOC, 1/3 to CO, then calculate CE ratio for each pollutant separately.*
  - *Easy, arbitrary, commonly done in States and EPA.*
- *Variations of above based on "best guesses" or other criteria.*

Conclusions

- *Procedures for calculating Cost-Effectiveness will likely be context specific.*
- *A more holistic, and multimedia approach to environmental protection is needed.*
- *Role of EPA's Office of Policy, Economics and Innovation*

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