

Assessing the Benefits and Costs of the Clean Air Act

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The Clean Air Act

- **Established a framework for the attainment and maintenance of clean and healthful air quality in the U.S.**
- **Originally enacted in 1970.**
- **Subsequently amended in 1977 and 1990.**

1990 Amendments required the EPA to:

- **Perform a “retrospective” analysis which assesses the costs and benefits of clean air legislation enacted prior to 1990.**
- **Perform periodic “prospective” analyses that estimate the costs and benefits of the 1990 amendments.**
- **Consult with a panel of outside experts in designing and implementing the studies.**

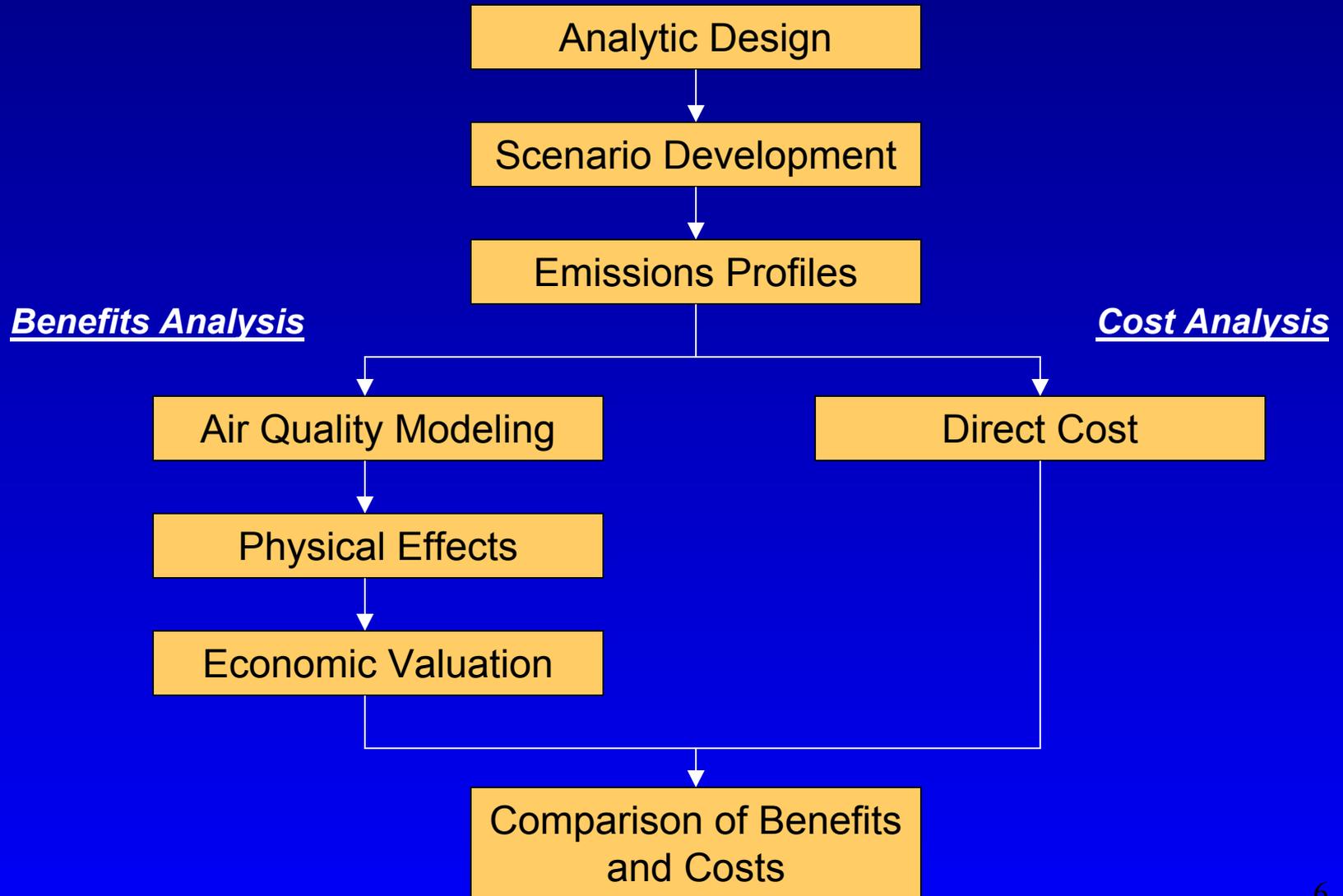
Studies Completed and in Progress

- **1997 - Retrospective Analysis (1970-1990)**
- **1999 - 1st Prospective Analysis (1990-2010)**
- **2003 - 2nd Prospective Analysis (1990-2020)**

Retrospective Analysis

1970-1990

Analytic Sequence



Analytic Design and Scenario Definition

- **No-Control Scenario**
 - Reflects the conditions it was assumed would have existed if all air pollution controls had been fixed at the levels of stringency and efficiency which prevailed in 1970, before the passage of the Clean Air Act.
- **Control Scenario**
 - Reflects the historical conditions resulting from the implementation of the 1970 Clean Air Act and its 1977 Amendments.

Economic Modeling of Scenarios

- **Jorgenson/Wilcoxon CGE model used for simulations.**
- **No-Control Scenario**
 - Model run to simulate 1970-1990 period without costs of compliance with CAA.
- **Control Scenario**
 - Model run with historical data for 1970-1990 period.

Development of Emissions Profiles

- Using economic indicators from the simulations as inputs, a variety of models were used to determine emissions levels under the two scenarios.
- The emissions models provided estimates of emissions of six criteria pollutants (PM, SO₂, NO_x, CO, VOCs, and Pb).

Estimating Air Quality Conditions

- **Historical data was used for the control scenario.**
- **For the no-control scenario, a number of air quality models were used to estimate the conditions that would have existed without the Clean Air Act.**
- **This part of the analysis produced statistical profiles for each pollutant characterizing air quality conditions at each monitoring site in the country.**

Translating Air Quality into Physical Outcomes

- **Dose-response functions were derived from a review of the scientific literature.**
- **The study attempted to quantify ecological effects, including effects on agriculture and forests. However, a lack of available studies rendered the later incomplete.**

Valuing Physical Outcomes

- **Valuation estimates were derived from a review of the relevant economic literature.**
- **The mortality risk valuation used in the study was based on the analysis of 26 policy relevant value of life studies, which produced a value of \$4.8 million per mortality avoided.**

Emissions Reductions, 1990

Pollutant	% Change	Sectors
SO ₂	- 40%	utilities
NO _x	- 30%	vehicles
VOCs	- 45%	vehicles
CO	- 50%	vehicles
PM (Direct)	- 75%	utilities, industrials
Pb	- 99%	lead phase down

Monetized Benefits, 1970-90

<u>Avoided Health Effect</u>	<u>Present Value</u>
Mortality – PM	\$16.6 tril.
Mortality – Lead	1.3 tril.
Chronic Bronchitis	3.3 tril.
IQ Points Lost by Children	0.4 tril.
<u>Total</u>	<u>\$22.2 tril.</u>

Estimated Benefits and Costs, 1970-90

Total Benefits (*mean estimate*): \$22.2 trillion

Total Costs: \$523 billion

Benefit/Cost Ratio: 42:1

Uncertainty

- **The Retrospective Study Team tried to make allowance for the numerous uncertainties which accompanied the analysis.**
- **All of the major results are reported as part of a distribution.**
- **For example, the total discounted benefits for the period 1970-90 were estimated to range between \$5.6 and \$49.4 trillion.**

1st Prospective Analysis

1990-2010

Projected Emissions Reductions, 2010

Pollutant	% Change	Sectors
SO ₂	- 31%	utilities
NO _x	- 39%	vehicles
VOCs	- 35%	vehicles
CO	- 23%	vehicles
<u>PM-10 (Direct)</u>	- 3%	<u>utilities, industrials</u>

Estimated Benefits and Costs, 1990-2010

Total Benefits (*mean estimate*): \$1,200 billion

Total Costs: \$210 billion

Benefit/Cost Ratio: 6:1

For more information:

<http://www.epa.gov/air/sect812/>