Integrated Environmental Strategies: Overview of Methods and Results

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IES Overview

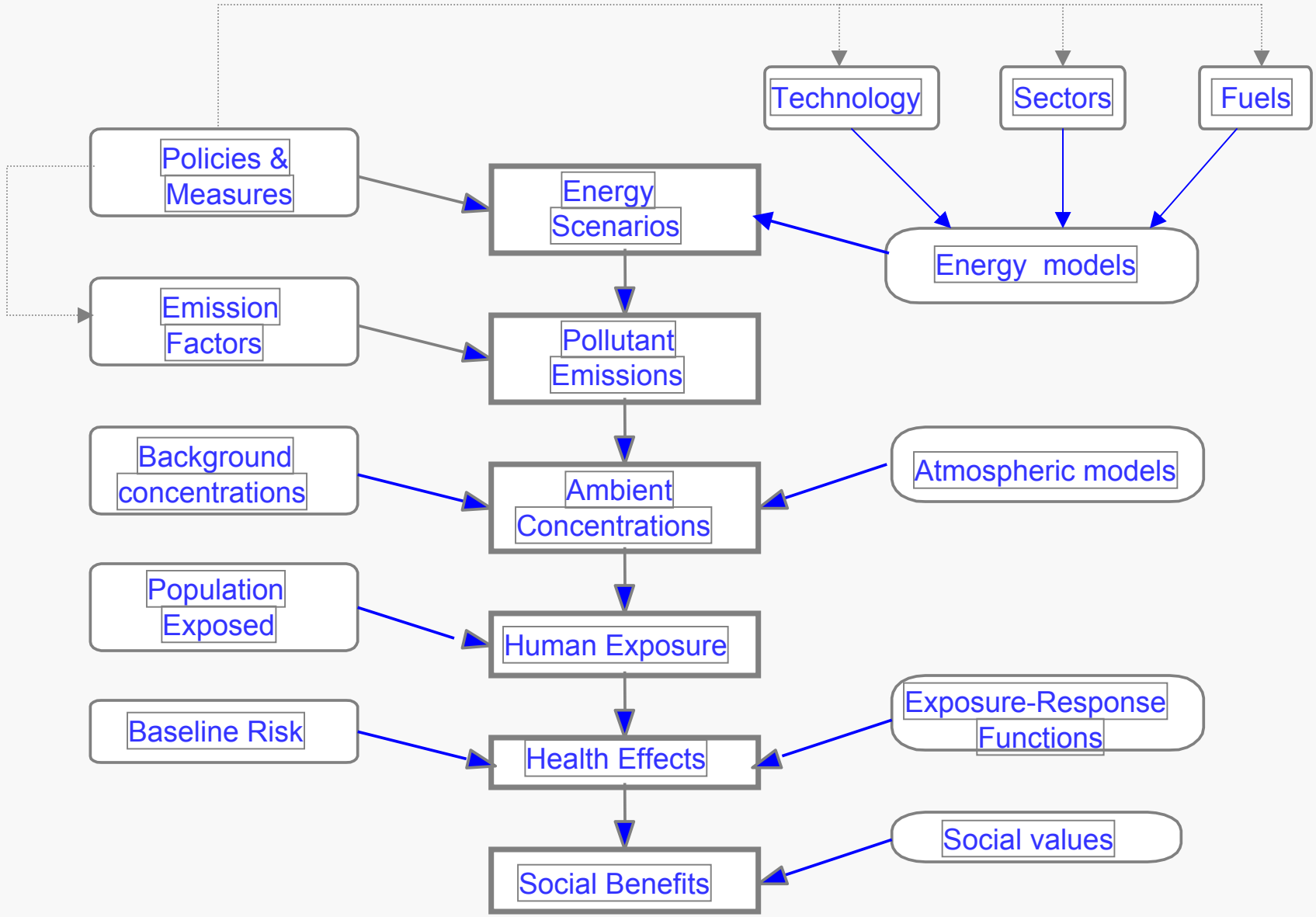
- Initiated by EPA in 1998 to:
  - build support for integrated strategies to address local environmental concerns and GHG mitigation
  - build linkages between local & global environmental policy
  - build country capacity for integrated, multi-disciplinary analysis
- Based on analytical methodologies developed and applied in the United States:
  - Benefits/Costs of the Clean Air Act (1997), (1999)
  - Co-control benefits of GHG control policies (1999)
- Currently providing support to eight countries:

Argentina	China	Chile	India
Philippines	Mexico	S. Korea	Brazil

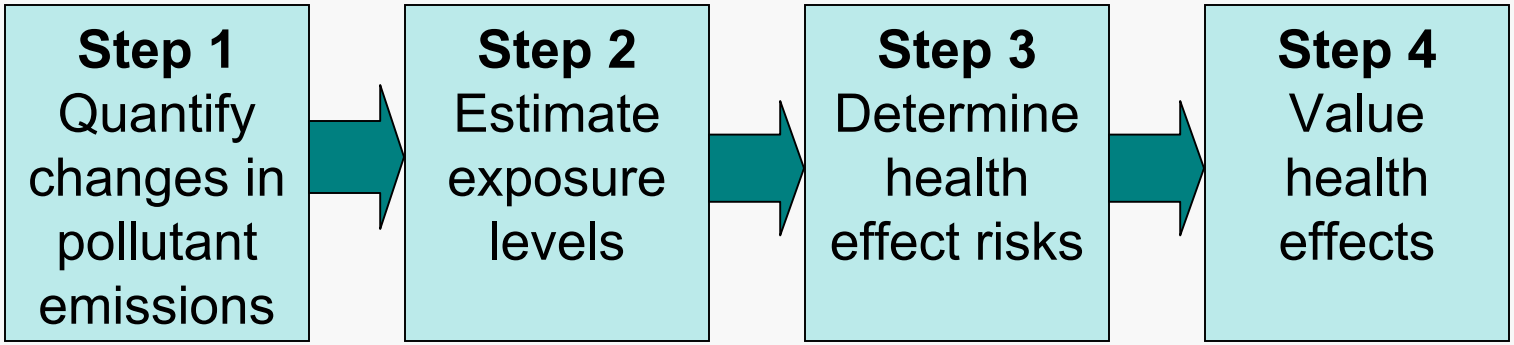
IES Objectives

- Identify cost-effective strategies that improve local air quality while meeting public health, economic development and GHG mitigation objectives
- Provide policymakers with quantitative data on the impacts and costs of policies and measures with significant local and global benefits
- Engage policymakers and other stakeholders to lay the groundwork for effective implementation of cost-effective air quality control strategies
- Build lasting analytical, institutional & human capacity for multidisciplinary analysis of health, environmental and GHG mitigation impacts of alternative strategies

Method/Approach



Simplified Steps to Quantify Co-Benefits (benefits in addition to GHG reductions)



Step 1 - Estimating Emissions

Chile	Box Model	PM conc. as function of daily emissions	Monitoring Data, Meteorological Data
	Source Apportionment Method	Changes in Ambient PM conc. Due to Changes in Primary Pollutant Emissions	Data on Relationship between PM2.5 conc. and Primary Pollutants for Study Area
China	Shanghai Environmental GIS	Selects Dispersion Based on Emission Characteristics	Location of Emission Sources, MARKAL Results
China, Korea	ATMOS/URBAT	Lagrangian Multi-layer Trajectory Model	Geographic Data, Meteorological Conditions, Emissions Data
Brazil	CIT	Eulerian 3D Photochemical Model	Current Emissions and Air Quality, Meteorology, Fuel Consumption

Step 2 - Estimating Exposures

Country	Approach	Description	Outputs
Argentina	Software de Impacto Atmosferico (SofIA)	Gaussian dispersion	Average pollutant concentration at any level
Chile	Box Model	PM conc. as function of daily emissions	Projected average daily concentrations through 2020
	Source apportionment method	Changes in ambient PM conc. due to changes in primary pollutant emissions	Future PM levels
China	Shanghai Environmental GIS	Selects dispersion based on emission characteristics	Ground level air concentrations
China, Korea	Urban Branching Atmospheric Trajectory Model	Lagrangian multi-layer trajectory model	Projected mean annual pollutant concentrations
Brazil	CIT Model	Eulerian 3D photochemical model	Pollutant concentrations

Step 3 - Estimating Health Risks

Health endpoint	# studies	Pollutants	Relative risk
Mortality	11	TSP, PM10, PM2.5	1.01-1.38
Respiratory hospital adm	7	PM10, PM2.5	1.03-1.15
Cardio hospital adm	6	PM10, PM2.5	1.03-1.06
ER visits	2	PM10, PM2.5	1.20
Chronic bronchitis	4	PM10, PM2.5	1.59-1.84
Acute bronchitis	3	PM2.5	3.89-4.44
Acute repiratory	2	PM10, PM2.5	1.19-2.49
Asthma attacks	9	PM10, PM13	1.01-1.32
Work loss days	3	PM2.5	1.26-1.45

Step 4 - Valuation Approaches

Approach	Applied to	Data requirements	Where used
WTP	morbidity & mortality	contingent valuation surveys, wage-risk data	Arg., Chile, China, Korea
Cost of illness	morbidity	medical expenditures	Arg., Chile, China, Korea
Human capital	mortality	demographic, wage data	Argentina, Chile
Value of stat life	mortality	WTP data on mortality risk	Arg., Chile, China, Korea

Summary Results: Reductions in CO2 Emissions

(Million Tons)	2010	2020
Shanghai	9-47	14-73
Buenos Aires	0.86-6.5	---
Santiago	5.4	14.3
Seoul	0.6-1.8	1.2-2.3

Summary Results: Estimated Avoided Mortality

	2010	2020
Shanghai	647-5,472	1,265-1,1130
Buenos Aires	1,463-3,957	---
Santiago	---	332
Seoul	62-75	93-120

Summary Results: Social Benefit (M $US)

	2010	2020
Shanghai	113-950	327-2,884
Buenos Aires	137-1,880	---
Santiago	113	737
Seoul	64-102	97-125

Summary Results: Benefit per Ton CO_2 Reduced

($/ton CO_2)	2010	2020
Shanghai	13-20	23-40
Buenos Aires	159-291	---
Santiago	21	50
Seoul	11-42	10-38

Successful Outcomes

- IES Shanghai recommendations adopted into Shanghai's 5-year air quality plan
- IES Chile partner awarded 5-year contract as a "Center of Excellence" by Chilean government to continue analysis, and Chile submitted proposal to GEF to implement transport measures with local and global benefits based on IES analysis
- Korea analysis showed 70% of cost of national GHG mitigation offset by health benefits resulting from mitigation measures
- Argentine Secretariat of Sustainable Development and Environmental Policy created teams on transport sector and electricity generation to strengthen institutional capacity and integrated technical analysis

Future Analytical Directions

- Continued refinement of analyses to reduce uncertainties
- Development of user-friendly analytic tools for policymakers
- Development of analyses of more specific policy measures for policy consideration
- Additional cities/regions to be analyzed
- National level studies to be done