



Brazil Case Study for COP6

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INTRODUCTION

The work in Brazil to develop integrated climate change and air pollution strategies for São Paulo is in the early stages of development. This chapter provides a brief summary of the methodology for this ICAP work in Brazil, which is led by the São Paulo State Environmental Sanitary Company and includes participation of the University of São Paulo and the Institute for Applied Economic Research. A considerable amount of work has already been conducted in São Paulo and in Brazil that directly relates to each of the key components of the ICAP approach. The ICAP project seeks to build upon these past studies by improving the understanding of the benefits of integrated climate change and air pollution strategies and supporting the development and refinement of such integrated environmental strategies. This project is building linkages in Brazil between the multiple technical disciplines required to conduct integrated air pollution, greenhouse gas, and health effects policy analysis and engaging policy makers in design of the studies and evaluation of the results.

Goals and Rationale

The general objective of the ICAP project in Brazil is to analyze the environmental and public health benefits, of integrated strategies, including mitigation of GHG emissions, to address urban air pollution in the São Paulo metropolitan area (SPMA).

Specific objectives identified by the Brazil project team include:

- ❖ Development and evaluation of integrated strategies to reduce air pollutant emissions and greenhouse gases from the transportation sector including new vehicular technology, modal substitution, vehicle maintenance and inspections programs and introduction of cleaner fuels.
- ❖ Estimation of emission inventories and emission scenarios for key air pollution precursors and greenhouse gases.
- ❖ Analysis of the changes in air urban quality that result from the baseline and alternative emissions scenarios.
- ❖ Analysis and quantification of reductions in the air pollution health effects resulting from the implementation of the integrated environmental strategies for addressing urban air quality and greenhouse gas emissions.
- ❖ Economic valuation of the anticipated changes in health effects resulting from the integrated air quality improvement scenarios.
- ❖ Dissemination of results and outcome to local and national domestic policy makers in the air quality and climate change fields as well as international climate change policy community.

Project Team

The Brazil ICAP team consists of a multidisciplinary team comprised of academic institutions, government agencies and research institutions. The following list identifies the main team members and their roles and responsibilities on the ICAP project.

CETESB – São Paulo State Environmental Sanitary Company: is designated as the administrative lead and focal point for the project and will lead the technical work on energy/emission scenarios and integrated strategy development. CETESB will also provide inputs to the University of São Paulo for the atmospheric modeling component of the project.

IAG-USP – Astronomy and Geophysics Institute of the University of São Paulo: will be the technical lead for the air quality modeling component of the ICAP work.

FM-USP – Medical School of the University of São Paulo: is designated as the technical lead for the health effects evaluation component which will require input data from both FM-USP and CETESB.

IPEA – Institute for Applied Economic Research: will assume the lead role for the economic valuation component.

ANALYSIS APPROACH

The ICAP analysis in Brazil has been designed to follow the general overall approach developed by the ICAP project and applied in other participating countries to analyze the air pollution health benefits of integrated environmental strategies. Key steps in this approach as applied to Brazil are outlined below:

- ❖ Development of a workplan for Brazil that focuses the initial analysis on the metropolitan area of São Paulo, and the establishment of country teams of experts with linkages to energy, environmental and development decision makers and policy makers. In developing this workplan, the Brazil team will identify specific areas and technical needs for cooperation with the international team lead by the US EPA and the National Renewable Energy Laboratory (NREL)
- ❖ Refinement and/or development of integrated strategies to simultaneously address local air pollution and global GHG mitigation
- ❖ Development of emission inventories and forecasts of changes in concentrations of key air pollutants
- ❖ Analysis of changes in public health and other environmental impacts as a result of the implementation of the integrated air pollution and GHG mitigation scenarios
- ❖ Estimation of the economic consequences of these health and environmental benefits for use in policy analysis and formulation to promote implementation of integrated mitigation measures
- ❖ Presentation and review of the methods, approaches and results at technical and policy focused workshops held in-country and international forums including meetings of the UNFCCC.

Key Scoping Decisions

The following project scoping decisions were made through an initial project scoping workshop and further consultations with climate change, air pollution, health, and economic valuation experts.

- ❖ **Area:** Due to data availability, and the policy focus of CETESB, the metropolitan area of São Paulo, was selected for this analysis.
- ❖ **Time Period:** Historic years of 1990-2000, and future years of 2010, 2020. The specific base year for emissions and meteorological analysis was not selected, but it would be a “typical” year in the late 1990s for which high quality data were available.
- ❖ **Pollutants of Concern:** Emissions (point and area: CO, SO₂, PM₁₀, NO₂, HC, TSP); Monitoring data (same as emission + O₃ and PM_{2.5})

- ❖ **Air quality modeling:** The University of São Paulo will use the California Institute of Technology (CIT) Air Quality Model for this analysis. The CTI model was developed is a three-dimensional, Eulerian, photochemical air quality model. Current applications have only dealt with transportation emissions and particulate modeling has not been undertaken. However, with technical assistance for this project, the modeling analysis will be extended to particulates and the other pollutants of concern.
- ❖ **Health effects:** Endpoints considered include cardiovascular and respiratory premature deaths, respiratory and cardiovascular diseases, hospital admissions, emergency room visits, and related impacts. Dose response functions are available from a wealth of epidemiological studies conducted at FM-USP.
- ❖ **Economic Valuation Methods:** Three possible methodologies were suggested for conducting economic valuation of health effects for the São Paulo study. Human capital: based on income and foregone income generation; and hospital expenditure costs; Benefit transfer functions derived from the EU and USA; and Adjustments of willingness to pay values from property prices derived from past studies.

The flow chart diagram below shows the major analytic components of the Brazil ICAP project for São Paulo and the “inputs and outputs” of each component and the responsible institution member of the Brazil team.

Analytic Components for Brazil ICAP Project

Inputs (source)	Institution	Outputs/products
<ul style="list-style-type: none"> • Fuel consumption in SPMA (from ANP*) 	<p>CETESB São Paulo State Environmental Sanitary Company</p>	<ul style="list-style-type: none"> • Meteorological data (temperature, pressure, humidity, wind, radiation, vertical wind profile) • Emissions (point and area: CO, SO₂, PM₁₀, NO₂, HC, TSP) • Monitoring data (same as emission + O₃ and PM_{2.5}) – hourly data (for IAG-USP) and daily data (for FM-USP) per station for the last 10 years (1990-2000) • Projections for emissions and fuel consumption • GHG inventory and projections (identifying limitations)
<ul style="list-style-type: none"> • Fuel consumption in SPMA (from ANP*) • Number of vehicles in SPMA (from CET**) • Monitoring, emission, meteorological data, and projections (from CETESB) 	<p>IAG-USP Astronomy and Geophysics Institute, University of São Paulo</p>	<ul style="list-style-type: none"> • Simulation of base year • Projected concentrations • Meteorological data (daily minimum temperature; noon humidity)
<ul style="list-style-type: none"> • Temperature, humidity (from CETESB, IAG-USP) • Monitoring data (from CETESB) • Projected ambient pollutant concentrations (from IAG-USP) 	<p>FM-USP Medical School, University of São Paulo</p>	<ul style="list-style-type: none"> • Dose response functions • Premature deaths, respiratory and cardiovascular diseases, hospital admissions, emergency room visits • Daily estimations of health effects
<ul style="list-style-type: none"> • Fuel consumption (from ANP*) • Morbidity/mortality (from FM-USP) • Daily health effect estimations (from FM-USP) 	<p>IPEA Institute for Applied Economic Research</p>	<ul style="list-style-type: none"> • Valuation of morbidity/mortality • Monetary valuation of daily health effects estimations

* ANP – Agência Nacional do Petróleo (National Petroleum Association)

** CET – Companhia de Engenharia de Tráfego (Company of Traffic Engineering)

Currently available data for the São Paulo Metropolitan Area (RMSP) will likely be used for the analysis of pollutants and its health and environmental effects. The generation of new data and/or implementation of new monitoring procedures will not be a major focus of the initial ICAP studies. The project will use data from CETESB and/or other local institutions generated in previous years, and emphasis would be on the linkage of these data and existing tools into an integrated analysis. Once the integrated analysis is completed in a preliminary way, it will be possible to use these results to prioritize needs for additional data and methodological improvements for future work, in ICAP or related efforts.

There was a general agreement among all Brazil and international project participants that the project should be designed so that it provides real benefit to CETESB staff in terms of data and tools which are useful in carrying out air quality management

ANTICIPATED SCHEDULE OF ACTIVITIES

Date	Activities
August 2000	Project scoping meeting in São Paulo, Brazil
January 2001	Project Workplan completed and approved
August 2001	Preliminary integrated analysis completed
October 2001	Draft and Final report on air pollution health effects of integrated strategies for Brazil
November 2001	Policymaker and project technical review workshop