The Integrated Environmental Strategies (IES) Program in Beijing, China

What is the IES Program?

The IES Program helps developing countries like China identify policies and technologies that reduce greenhouse gases (GHGs) and local air pollutants at the same time. By analyzing and implementing these "integrated" policies and measures, such as clean energy (e.g., renewable energy), energy efficiency, and public transportation (e.g., converting diesel buses to compressed natural gas), IES partners have an opportunity to make a positive impact on local air quality, public health, and the economy, while at the same time reducing GHGs at the global level.

China's IES program was established in April 1999 through a Statement of Intent signed by China's Minister of State Environmental Protection Administration (SEPA) and the Administrator of the U.S. Environmental Protection Agency (EPA). The IES-China program is composed of three parts: (1) assessment of energy options and health benefits in Shanghai; (2) analysis of energy and transport programs in Beijing; and (3) a national assessment of GHG mitigation potential and expected health benefits of several air pollution control policies.

The IES Program in Beijing

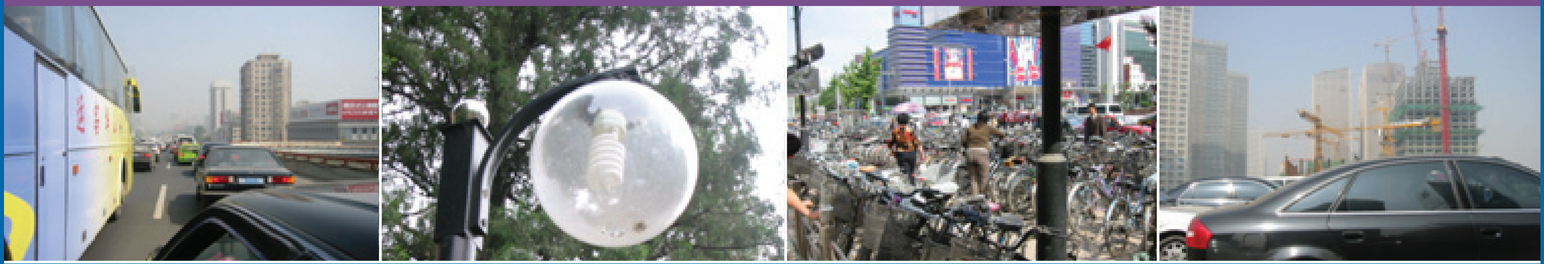
One objective of the Beijing project was to inform policymakers about strategies for improving the city's air quality in preparation for hosting the 2008 Olympics. The city of Beijing had already drafted an Olympic air quality action plan. Using the IES framework, the team sought to quantify potential benefits of the action plan, including reductions of GHG emissions resulting from energy and transport programs designed to reduce air pollution and protect public health in China. The ability to mitigate GHGs while at the same time improve local air quality ("co-benefit" potential) is the focus of this study.

Professor He Kebin from Tsinghua University, Beijing, led the IES team in modeling energy use under several different policy scenarios (see Figure 1). Next, applying EPA's Industrial Source Complex 3 Model to fossil fuel-based emission projections, the team modeled concentrations of particulate matter smaller than 10 microns (PM_{10}) and sulfur dioxide (SO_2) as indicators of air pollution. Professor Pan Xiao Chuan of Peking University Health Sciences Center then led the team's analysis of the air pollution impacts on public health.

Figure 1: Policy Scenarios Analyzed

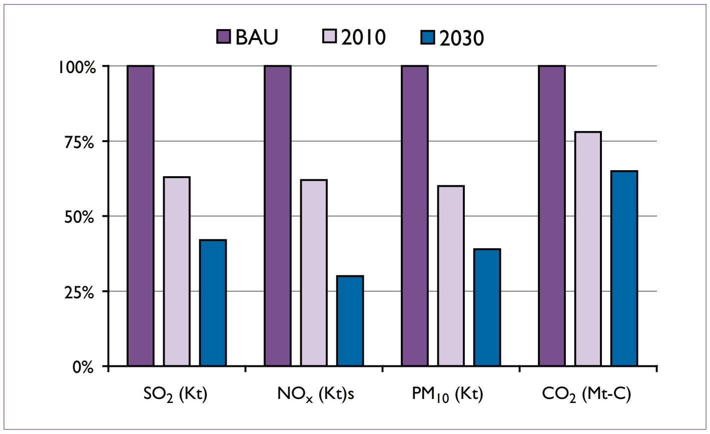
Policy Scenario	Key Features
Business as Usual (BAU)	Scenario without new policies implemented; rapid increase in gross domestic product; energy demand continues on current high growth trend; and increase in energy consumption in each sector.
Clean Energy Consumption	Changeover of coal-fired industrial boilers to natural gas; use of liquefied petroleum gas (LPG) for cooking in rural residences; and expanded natural gas power in grid.
Industry Structure Transformation	Adjust and/or relocate steel, cement, petroleum, and chemical industries from urban locations; reduce more than one million tons of coal equivalent (TCE) capacity of coking.
Energy Efficiency Improve residential	Improve residential lighting and air conditioning energy efficiency practices; initiate fuel economy program in light vehicles.
Green Transport	Expand public transportation development; slow growth of private car ownership; incorporate LPG in taxis; implement vehicular emission standards; develop advanced technology vehicles.

This figure shows the policy scenarios analyzed and their key features.



Photographs courtesy of National Renewable Energy Laboratory (NREL) and Collin Green

Figure 2: Annual Emissions as Percentage of Business as Usual (BAU)



This chart illustrates estimated annual emissions of SO_2, NO_x, PM_{10}, and CO_2 in 2010 and 2030 (as a percentage of BAU) when all four mitigation policy scenarios are implemented.

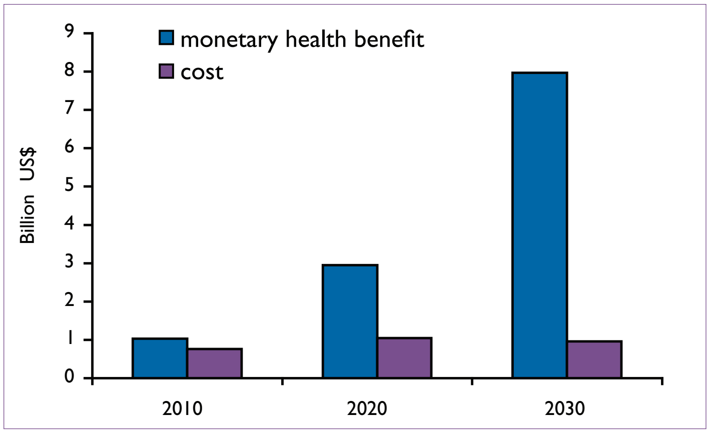
Finally, the costs of different energy policies and scenarios were compared to estimated health benefits. This cost-benefit analysis provided useful quantitative information to support energy policymaking.

Solutions Identified by the Project

The analysis concluded that if all four policy scenarios are implemented, SO_2 and PM_{10} emissions could be significantly reduced compared to the business as usual (BAU) scenario. Emissions of NO_x and the GHG, CO_2, could also be considerably reduced by these policies (see Figure 2). The analysis also suggests that the most effective methods for mitigating CO_2 are energy efficiency programs, with the promotion of fuel efficiency in industrial boilers, buildings, and vehicles being the most important.

The health benefit analysis indicated that considerable health benefits from improved air quality could be realized for Beijing by the 2008 Olympic Games. Additionally, the analysis concluded that all four policy scenarios implemented collectively could produce significant health benefits from air quality improvements by 2030 (see Figures 3 and 4). However, the results also demonstrate that implementing fewer than all four policy scenarios would not be as effective at controlling air pollution resulting from energy use and at attaining health benefits for people in Beijing. According to this study, better techniques to improve air quality and human health in Beijing are still needed.

Figure 3: Estimated Annual Monetary Health Benefits Compared to Associated Implementation Costs

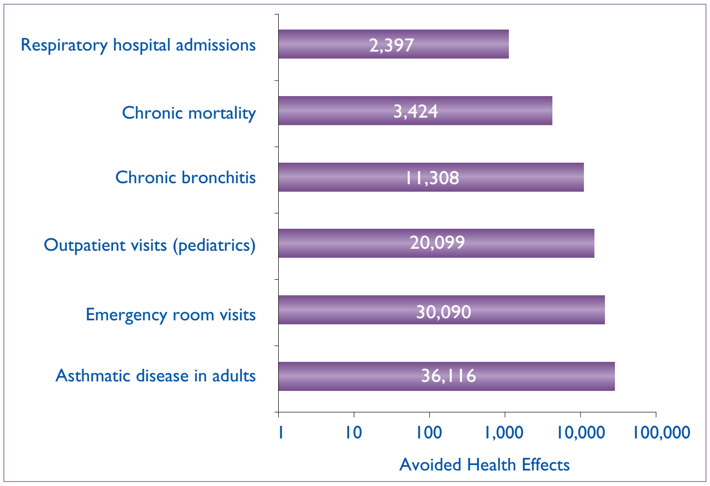


This chart illustrates estimated annual health benefits compared to the cost of implementation in 2010, 2020, and 2030 (in billion US$) when all four mitigation policy scenarios are implemented. Notice the increasing difference between the cost of implementation and resulting monetary health benefits with time.

Outcomes of the Project

The tools and analytical techniques included in the IES program are relevant to current and future policies and initiatives to improve air quality and can simultaneously reduce GHG emissions in China. Beijing's efforts to meet the city's clean air goals for the 2008 Olympics provide an excellent opportunity for showcasing the IES program's analytical and capacity building strengths.

Figure 4: Total Combined Health Benefits in 2030 Resulting from SO_2 and PM_{10} Reductions (Compared to Baseline Data)



This chart shows estimated annual health effects avoided in 2030 if all four mitigation policy scenarios are implemented.

For More Information

Visit the IES Web site at <www.epa.gov/ies>. You may also e-mail <ies@epa.gov>.

Integrated Environmental Strategies

EPA United States Environmental Protection Agency

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