CLIMATE ALERT

Volume 12, Number 3 September 1999

States and Cities May Take Joint Cuts in Greenhouse Gases and Air Pollution

Many states and localities have grappled for years with the challenge of reducing air pollution to comply with the Clean Air Act. With a growing realization that the effects of climate change may also bring pressure to reduce greenhouse gases, many jurisdictions have become interested in ways both to meet air pollution goals and curtail greenhouse gas emissions.

There are tremendous opportunities to accomplish this, killing two birds with one stone, according to a report just issued by two national associations of air pollution control agencies. The report, "Reducing Greenhouse Gases and Air Pollution: A Menu of Harmonized Options," sets out a "multitude of measures" to slash greenhouse gas emissions below the US target proposed by the

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Climate Institute Will Cite Two Environmental Pioneers in Mexico City

The Climate Institute is presenting awards to two individuals who have made a real difference in advancing scientific understanding and have taken steps to respond to threats to the climate. The awards will be given to Mario Molina and Manuel Guerra at a dinner on September 22 during a Mexico City conference, "North American Symposium on Coordinated Strategies for Climate and Air Quality Protection," at Colegio de Mexico. The Institute's chairman, Sir Crispin Tickell, will speak at the dinner.

Mario Molina

Mario Molina is cited for "advancing understanding of stratospheric ozone depletion and climate protection." Dr. Molina, a native of Mexico, published with F. Sherwood Rowland the scientific work in the early 1970s alerting the world to threats chlorofluorocarbons posed to the stratospheric ozone layer. (Dr. Rowland is a

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Luis Manuel Guerra

The Climate Institute honors Luis Manuel Guerra, President of the Mexico City-based Instituto Autonomo de Investigaciones Ecologicas (INAINE) for developing grass roots interest in climate and air quality protection. About a decade ago, at Mr. Guerra's initiative, INAINE persuaded a city radio station to fund an INAINE-staffed van to make daily runs through Mexico City neighborhoods taking air and water samples and broadcasting the results. This public awareness campaign led to public clamor for tougher air pollution controls, including a one-day-a-week ban on driving by particular cars, a decision in 1991 to close a PEMEX oil refinery in the city, and an aggressive pollution control effort that has lowered lead levels in children's blood below those in many European cities. Despite a steady population growth of 650,000 per year, ozone and particulate matter levels have also fallen.

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Seattle Summit Will Spur Global Energy Revolution

Urban air pollution and climate change — plus the growing demand for electricity by the two billion people around the world still off the grid — are driving change in the energy industry. A meeting, April 3-5, 2000 — the Seattle Summit —will launch a multi-year initiative to boost investment in clean energy companies, speeding progress in global energy transformation. It will be a worldwide event leading up to Earth Day 2000 on April 22 and will promote the Earth Day goal, New Energy for a New Era.

The Summit will bring together 250 leaders in the ongoing information and telecommunications revolution who will spur the energy innovations already underway. They will represent the energy, trade, finance, information, communications and public policy sectors, pacesetters in a Pacific Northwest and British Columbia effort to create economic opportunity from environmental necessity.

Growth in Heavily Polluted Air Is Making Large Numbers of Children in Developing World Vulnerable to Serious Infectious and Chronic Disease

By Devra L. Davis, Ph.D., M.P.H., Senior Scientist, World Resources Institute and Member, Board of Directors, Climate Institute, and Paulo H. N. Saldiva, M.D., Ph.D., University of Sao Paulo

Millions of the world's children are growing up in rapidly expanding urban areas in the developing world where they regularly breathe dirty air. Levels of air pollutants in these cities are often two to eight times the maximum World Health Organization (WHO) Guidelines. As many as 85 percent of all children under the age of 15 live in developing countries and roughly half of them live in cities. The widespread exposure of large numbers of children to heavily polluted air in developing countries has skyrocketed and is a relatively new public health issue. Massive and unprecedented migrations from rural to urban areas in the past decades are fueling urban growth worldwide. In the developing world more people now live in expanding urban and industrial zones than at any time in history.

The growth of industries and cities, while associated with welcome social and economic benefits, is often accompanied by seriously degraded air quality. Poorly controlled industrial emissions and automobile exhausts have contributed to dangerously high levels of urban air pollution. When not well managed, economic development can greatly increase exposures to potentially hazardous materials.

Health Indicators

The World Resources Institute and other national and international organizations have developed environmental health indicators to assess the risks of air pollution to children. These indicators estimate the percentage of the population potentially or actually exposed to physical, chemical or biological pollutants and compare them to existing standards. This report examines the indicators in the world's cities with populations over one million to assist policy makers in identifying priority areas of intervention. Two analyses are presented: cities with population over nine million ranked in terms of three air pollutants, and cities which place the greatest number of children at risk from the combined effect of the pollutants.

Air Pollution Indicators

How bad is air pollution today in cities? To provide a systematic risk assessment, we have combined information from 1993-95 on yearly average levels of three common pollutants: total suspended particulates (TSP), nitrogen dioxide, and sulfur dioxide. The three pollutants are representative of the total urban air pollution burden and are linked with serous acute or chronic health effects. We assessed the proportion of the population under 5 in cities of one million or more where levels of the three pollutants exceed WHO or European Union guidelines.

To create the indicator TSP (also known as black smoke) we gathered information from international and national agencies, statistical yearbooks, and WHO's Air Monitoring Information System. The proportion of children under 5 in a country was used to estimate the population under 5 in each of the cities.

Because uniform data were not available, we did not include estimates of indoor air pollution or compounds such as heavy metals, carbon monoxide, ozone and volatile organic compounds.

TSP, a generic term, describes a complex mixture of airborne particles, varying in size, origin, and chemical composition, buoyant over long distances and times. They originate mainly from coal-fired power plants, although auto and diesel exhausts are also major contributors, especially in crowded urban areas.

Particulate matter has an aerodynamic diameter of less than 10 and 2.5 microns. A single micron is 50 times smaller than a human hair. Typically fine particulate matter cannot be seen but is most hazardous because it penetrates deeply in the lung causing a variety of respiratory problems. About 1.1 billion people around the world are exposed to high TSP levels.

Particles can attract to their surface volatile materials and heavy metals such as lead, enhancing their toxicity. Fine particles, such as those found in smoke from the Indonesian and southern Mexico forest fires of 1998, can remain suspended in the air for days and even weeks, causing health problems thousands of miles away. Studies in experimental animals have found that only three days of exposure to concentrated particulate matter can kill rats that

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333 1/2 Pennsylvania Ave., SE
Washington, D.C. 20003
Phone: (202) 547-0104
FAX: (202) 547-0111
E-Mail: ncwilson@climate.org
Web: http://www.climate.org

already have pneumonia or chemically damaged lungs.

Sulfur dioxide, a product of fossil fuel combustion, is often found with particulate matter, constricting airways and leading to respiratory ailments such as asthma. Chronic exposure causes the mucus layer of the trachea to thicken and may eventually lead to reduction in the body's ability to remove foreign and infectious agents.

Nitrogen dioxide, a gaseous pollutant, is a precursor of smog and ozone, tending to be elevated in regions where traffic density is high. It damages the cells lining the lung, contributes to difficulty in removing bacteria and other agents, and increases susceptibility to respiratory infections.

Scientific debate revolves about the precise mechanisms linking air pollution to health. Some studies indicate the combined effect of the pollutants can be greater than additive; lung tissue damage from one can worsen the effects of another. Therefore our indicator also takes into account the total effect of all three pollutants.

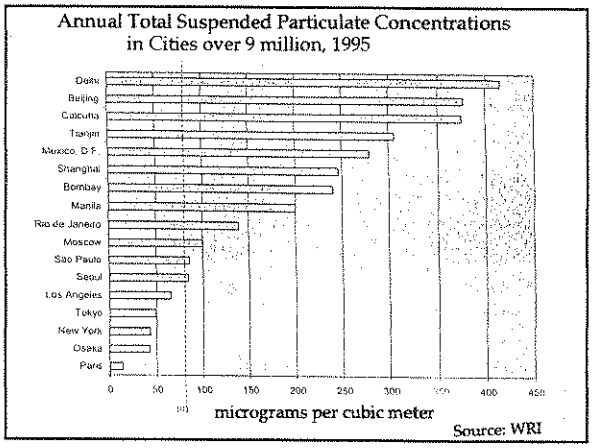
Changing Nature of Cities

In the 1970s, New York City was the only city in the world with a population greater than 10 million. By the turn of the century, more than 21 cities will be this size or larger, and 18 will be in the developing world. The average age of the population in many of these developing country megacities is under 16. High levels of pollutants regularly occur in many urban zones where there has been little consideration for the need to control emissions.

More developed regions are faced with chronically elevated pollutant levels, especially where traffic density is high or poorly controlled coal-burning is used for energy. Despite improved technologies and increased efficiency, traffic-based pollutants often exceed WHO Guidelines. The developing world must contend in addition with hazards from growing traffic congestion, inadequate transportation and poorly designed industrial systems.

Children at Increased Risk

Air pollution affects children more severely than adults. Already in the developing world it is responsible for 50 million cases of chronic cough in those under 14. Respiratory disease is now the leading cause of death in children worldwide. As urbanization expands, more children will be exposed to hazardous pollutants, driving up the proportion with serous respiratory illness.



Children are at enhanced risk because: 1) physiologically their organ systems continue to develop through their first few years. A child's lung grows most rapidly in the first two years and continues to grow until the late teens. Developing organs can be extremely sensitive to the toxic effects of air pollution. 2) Children tend to absorb pollutants more readily than adults and retain them for longer periods. While the average adult inhales about 10,000 to 20,000 liters of air a day, a 3-yr-old takes in twice that amount per unit of body weight. In a US study of infant deaths in the first month of life correlated with particulate matter, a high 10-micron exposure to particulate matter correlates with a 45 percent increase in likelihood to die of respiratory causes.

Scientists do not know the lifetime consequences of many young people growing up regularly breathing polluted air. The proportion exposed to heavy pollutants is without precedent, giving youths more time for the effects of pollutants to accumulate and health problems to develop.

Damage that occurs during the growing years can have a greater impact later, including: diminished productivity from shortened life spans and reduced lung capacity, increased number of sick days, greater incidence of age-related chronic diseases, and a reduced quality of life. Toxic pollutants such as lead carried on airborne particles can have a detrimental effect on children's physical and neurological development.

To learn where the most people faced the highest air pollution levels in 1995, we ranked cities with populations of 9 million or more where information was available for all three pollutants. TSP and sulfur dioxide levels were highest in areas with extensive coal burning, China, Iran and India. For sulfur dioxide alone, with high levels in diesel fuels, gasoline and coal, Rio de Janeiro tops the list. Among megacities, Delhi has the highest levels of TSP, followed by Beijing, Calcutta, Tianjin, and Mexico City.

In cities where highly polluting motorcycles and inefficient older cars, trucks, and buses prevail, much higher levels of nitrogen compounds fill the air. The World Bank has reported that emissions from motor vehicles can be especially hazardous because of the number of toxic and extremely small particles they emit. Highly polluting, inefficient engines dominate the expanding fleet in rapidly growing regions in India and many other nations.

Megacities and Exposed Children

The estimated number of children under age 5 in cities with popula

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Pollution and Children

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tions of 9 million or more was linked to the annual level of our three pollutants for 1995.With all three combined, weighted by a city's population under 5, the largest urban center with the highest risk was Mexico City. Major cities in India, China, Iran, and Brazil follow.

It is important to note that this study measures the **potential** for children in major areas in 1995 to be exposed. It indicates **populations at risk**. An average child in Mexico City will be exposed to less pollution than a counterpart in Beijing, but because the population in Mexico City is much younger, the risk to the population living in the urban area is far greater.

The average annual concentration of nitrogen dioxide in 1995 was high in Mexico City (about 2.5 times WHO Guidelines). Studies there indicate that short-term increases in ozone and particulate matter diminish lung function in urban children, suggesting longer chronic exposure may lead to sustained pulmonary damage. With almost half the population under 15, the need to address environmental quality is self evident.

Encouraging Sign

The number of days when ozone levels triggered major public disruptions has begun to decline after various bans have been enforced in emergencies. The government has persuaded all car manufacturers to meet Mexico's emission standards (which are similar to USEPA TIER I standards.)

Conclusion

An unprecedented health crisis is unfolding. More children than ever are being exposed to high levels of air pollutants.

Devastating levels of air pollution stalk many rapidly developing countries where they can insidiously damage the respiratory and neurological systems of children and adults. The three billion people expected to live in cities in the first quarter of the next century face a double peril: 1) Unparalleled density will continue in many of these cities, leaving a greater proportion exposed to hazardous materials than in the past. 2) Environmental threats can be particularly damaging to rapidly urbanizing populations at risk from poor living conditions, inadequate health care and malnutrition, including some of the 2.5 billion in overcrowded cities. Pollution can directly injure their health and may also weaken their immune systems, making them more vulnerable to both infectious and chronic disease. The world's 18 megacities today are plagued by gross air pollution at levels that greatly exceed recommended limits of WHO.

An expanded focus on the issue of child health in urban environments will become increasingly important in the years to come. Given the projected growth of cities and the relatively young age of their populations, the opportunity to promote energy efficiency and reduce urban pollution is a fundamental challenge to public health. A broad array of available technologies can improve efficiency and reduce the threat of air pollution today. Newly industrializing countries are exploring ways of improving energy efficiency and the use of renewable technologies so that the future pollution burden will be reduced as their economies continue to grow. Investing in improved technology offers one of the most promising routes for reducing health threats to children from air pollution.

If sustainable development requires protecting the rights of future generations, that commitment must manifest itself foremost with our children.

The photos in this issue were taken by Institute President John C. Topping, Jr.

Mario Molina

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former Institute award winner.) In 1995, Dr. Molina and Dr. Rowland (and Paul Crutzen) were recognized with the Nobel Prize for Chemistry.

Now based at the Massachusetts Institute of Technology, Dr. Molina has recently begun to focus the resources of MIT and Harvard University on how local air quality, and regional and global climate concerns can be addressed in the Mexico City area. He envisions extending the study to other Latin American cities interested in an integrated approach to climate and air protection. He will discuss his initiative at the opening session of the Mexico City symposium.

Guerra

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Mr. Guerra is working with hundreds of elementary schools in Mexico City to encourage children to grow seedlings for planting in forests to store carbon, preserve water, and reduce airborne dust. Several years ago, he arranged for the Ministry of Education to underwrite the production of Spanish language slides on climate change, developed jointly by the Climate Institute and INAINE, to be shown in secondary schools throughout Mexico. He hosts a weekly television and radio program on the environment, frequently focusing on air quality management and climate change.

Conference Sponsors

The September Mexico City Symposium is cosponsored by the World Bank, the US Environmental Protection Agency, the David Suzuki Foundation, and Environment Secretary of Mexico City. Experts from Mexico, Canada, the US, and Europe will discuss integrated strategies to achieve climate and air quality protection, especially in megacities.

States and Cities

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Kyoto Protocol and shrink air pollutants below clean air mandates. Some of the measures are already in effect in the US and around the world.

The two national associations — STAPPA and ALAPCO — cover 55 states and territories and more than 165 major metropolitan areas and provide the technical expertise behind state and local efforts to achieve clear, clean, healthy air. (The acronyms stand for 'State and Territorial Air Pollution Program Administrators" and "Association of Local Air Pollution Control Officials".)

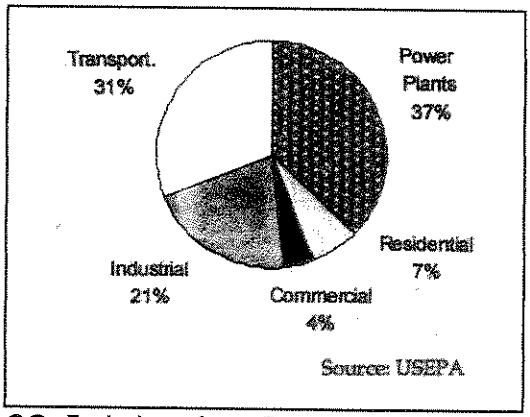
While greenhouse gases are mainly a problem in the stratosphere, and air pollution occurs in the troposphere, there is a clear "harmony" between options to mitigate one and control the other. Burning fossil fuel is the major source of the greenhouse gas CO_2 but also of such pollutants as particulate matter, nitrous oxide, sulfur dioxide, and carbon monoxide. Reducing fossil fuel use will benefit both climate change and air pollution control.

Ozone is a potent greenhouse gas in the upper troposphere, and ozone (smog) in the lower troposphere, one of the gravest air pollution problems in the US. The effects of most greenhouse gases are measured in terms of Global Warming Potential (GWP) but this is a poor measure of ozone's effect on climate. Reducing ozone concentrations has significant climate benefits generally unrecognized because of our accounting methods.

Harmonized Strategies

The main anthropogenic emissions covered in the study are "criteria pollutants" and greenhouse gases. The Clean Air Act defines six substances as "criteria pollutants": ozone, particulate matter, carbon monoxide, sulfur dioxide, lead and nitrogen dioxide. Greenhouse gases include carbon dioxide, methane, nitrous oxide, hydro-fluorocarbons, perfluorocarbons, sulfur hexafluorides, and ozone.

This study has focused primarily on CO_2 emissions because they account for more than half of the predicted impact of global warming and made up 82 percent of US greenhouse gas emissions in 1997. Their primary source is burning of fossil fuel; emissions are regulated by state and local officials.



CO_2 Emissions from Fossil-Fuel Combustion, 1997

The most attractive harmonized strategies include:

- switching to low- or zero-carbon fuel in furnaces, boilers and combustion turbines
- employing demand side management (encouraging an increase in the efficiency of fuel and electricity use) for lighting, heating, cooling and operation of appliances in residential and commercial buildings
- promoting fuel efficiency and decreased use of motor vehicles in the transportation sector
- converting landfill gas to energy or reducing gas emissions, and recycling, in managing municipal solid waste
- promoting better management of manure in agriculture, and

taking advantage of the ability of soils and plants to remove carbon from the atmosphere (sequestration) in forestry.

Strategies by Sector

Transportation

This sector accounts for more than 30 percent of CO_2 emissions and 16 percent of N_20 emissions. Converting a vehicle to natural gas is estimated to cost $1500 to $4000. Switching to ethanol would entail high fuel prices and specialized engines. Electric vehicles have a 50 percent cost premium, hybrid propulsion vehicles a 35 percent cost premium and fuel cells, at present, a very high cost.

Power Generation

Mitigation options for generating electricity — the largest contributor to CO_2 emissions — include: switching from coal (which fuels 57 percent of US electricity) to natural gas. While this may require boiler modification in some units and may reduce efficiency, it could lower carbon emissions by 40 percent.

Renewable energy is an ideal harmonized option for simultaneously reducing emissions of both conventional pollutants and greenhouse gases. In 1996, hydroelectric power contribued 10.7 percent to US power **generated**. Renewable energy accounted for 8 percent of energy **used** with more than half coming from hydro, followed by biomass and geothermal.

Solar and wind totaled less than two percent of energy used. However a solar heater annually produces 5500 to 7500 less pounds of carbon dioxide than a gas hot water heater. Every kilowatt hour generated by a solar photovoltaic cell (which converts light directly into electricity) reduces by one kilowatt hour energy generated by a utility system and its accompanying pollution.

Although growth of biomass offsets CO_2 emitted, its combustion does produce significant amounts of sulfur dioxide, carbon monoxide, nitrous oxide and particulate matter. Currently advanced biomass conversion technologies

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States and Cities

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and biomass plantations are in their infancy, according to the report, and need more research and development. Fuel cells using natural gas do emit CO_2 but if they burn landfill methane there is no additional carbon.

Industry

The biggest single emitters of greenhouse gases in the US are large industrial plants. A switch to cogeneration (combined heat and power) systems results in a 20 to 40 percent reduction in energy and significant reductions in CO_2, SO_2 and NO_x emissions.

Residential and commercial buildings together consume 35 percent of total US energy. Voluntary approaches, e.g. federal programs like Green Lights and Energy Star, based on performance instead of prescription, are more cost effective. Building codes and appliance standards are common mandatory approaches. Market mechanisms such as Energy Efficient Mortgages are a third policy approach.

Market Strategies

The market — through subsidies and taxes, voluntary energy programs and emissions trading — can be effective in environmental protection and accelerating emissions reduction. The strategies have the advantage of being "cross cutting," applied to a variety of sectors, although with varying degrees of effectiveness. Allowance trading is effective for electricity emissions but less well suited to, for example, smaller vehicles (where subsidies for alternative fuels or rebates for hybrid vehicles are more appropriate).

Among market strategies for criteria pollutants are subsidies that encourage development of products that lower pollution. The federal government and some states offer tax incentives to help cover the high capital costs of vehicles running on alternative fuels.

Taxes on pollution decrease it. If pollution taxes are introduced, other taxes may be reduced, and so the net effect is revenue neutral. But because taxes are politically sensitive in the US, few systems are based on them, although planners in several states have recommended consideration of a cross-sector carbon tax that applies alike to the electricity, industrial, residential/commercial, and transportation sectors.

Enormous cost-savings and emissions reductions are possible with voluntary measures. When participants in EPA GreenLights program install more energy-efficient lighting, they save an average of 65 percent on light bills. "Green" labeling makes it easier for consumers to choose energy-saving appliances. In Colorado's "Windsource" Program, many consumers choose to purchase electricity generated from wind, even though it costs more.

Emissions trading is the most cost efficient strategy to cut pollution, much superior to the command and control approach. Under the Acid Rain Program of the Clean Air Act, sulfur dioxide emissions are diminished based on a market approach known as "cap-and-trade." Electric utilities are granted allowances for each generating plant. If the plant is emitting less than its allowances permit, it may sell the excess or bank it for the future. If it exceeds its allowances it must purchase enough to cover the excess. In 1979, 7.9 million allowances were traded.

Iowa, Oregon, and Vermont have all recommended CO_2 emissions trading for electric utilities, and New Jersey is considering an even broader trade that would include energy, waste and other CO_2 sources.

The market will play a key future role in reducing greenhouse gas emissions at the local, state, national, and international level, according to the study.

Assessment Model

A model has been built to compare the emission cuts under harmonized strategies in four areas: the state of New Hampshire; Atlanta, Georgia; Louisville, Kentucky; and Ventura County, California. (These areas are not currently implementing the strategies nor have they committed to do so.) The model estimated reductions of criteria pollutants and greenhouse gases in the electricity, commercial and residential, transportation and industrial sectors.

In most areas, the electric or transportation sector is the largest greenhouse gas emitter, with industry coming in third. Harmonized strategies included:

- switching to natural gas steam generation at a coal- or oil-fired plant
- replacing a fossil-fuel steam cycle with natural gas-fired combined cycle system
- replacing fossil-fuel power with renewable power or fuel cells
- reducing electricity consumption with improved end-use efficiency
- establishing cogeneration systems
- improving fuel efficiency
- car pooling, mass transit or telecommuting

Some of the most challenging issues facing us in the next 10 years — how to meet health standards for particulate matter, how to comply with nitrous oxide limits, how to restructure electric utilities, how to improve visibility — offer the greatest opportunities. Any area can select the most appropriate mix of measures from the harmonized strategies to fit its own circumstances.

The study analysis indicates that the seven-percent reduction in greenhouse gas emissions under the Kyoto Protocol is well within reach of most states and localities. The harmonized control strategies also reduce criteria pollutants to meet current and future clean air mandates.

Mexico City's Air Quality Problems, And Progress in Solving Them

By Devon Lake, Stanford University

As one of the most polluted cities in the world, Mexico City is often cited as an example of both what not to do with current urban planning or what to do when trying to right the wrongs of earlier city development.

Air pollution in Mexico City is a result of both anthropogenic and natural causes. Rapid urbanization, begun in the 1950s, skyrocketed the population of Mexico City from 9 million in 1970 to 20 million in 1995 with it projected to top 25 million by the year 2000. Transportation of this large urban population produces three quarters of the air pollution; industries, services, and natural causes make up the rest.

The effect of these emissions is compounded by the city's location in the Valley of Mexico, where air pollution naturally settles, and "thermal inversion." Especially in the winter months a hot upper layer of air above the city traps air pollution. Elevated air pollution levels cause significant health effects and have resulted in emergency restrictions of urban activities and vehicle circulation in 1998.

Government efforts to control the mushrooming air pollution problem began in the early 1980s with the establishment of environmental standards and an air quality monitoring system.

Subsequent policies have had varying success. Direct policies applied to stationary point sources or specific mobile sources were more effective than policies aimed at diffuse and varied pollution sources, such as the entire mobile sphere. For example, there were originally two power plants and one refinery supporting the metropolitan area, with the two power plants producing 9% of the air pollution from non-transportation sources and 28% of the sulfur dioxide from all sources. The government closed the refinery in 1991, and both power plants switched to natural gas soon after. These and other industrial sector measures decreased sulfur dioxide emissions by 30%.

While mobile sources of pollution are more difficult to control than stationary ones, some direct mobile target measures have been effective. For example, direct retrofitting or replacement of taxis, trucks, or vans have made significant contributions to shifting the fleet towards newer, less-polluting vehicles. However, a severe economic crisis in Mexico in 1995 seriously affected this modernization process, raising interest rates and decreasing international participation in funding and credit programs supporting modernization efforts.

The city's public transport system is a 175 km Metro network carrying the majority of public passengers. Light trains and buses handle another 12%. The entire public transportation network has been expanded and many units retrofitted. The recent 37 km extension of the Metro system allows for an additional 300 million passengers per year, a decrease in vehicle use of 100,000 vehicles per day, and a decrease in pollution from mobile sources of 22,000 tons.

Some policies worked well for a while. The Hoy No Circula ("Today my car stops") program helped for a time, and then total kilometers traveled started to creep up again as population swelled and people found a way to get around the restrictions. Twenty-two percent of households responded by buying a second car, including 170,000 old, more polluting vehicles, to cover blacked-out days.

Setting technological or quality standards for private, mobile sources has been less than effective, because they are both difficult to enforce and often not very cost-effective. These problems can be overcome by implementing indirect, incentive-based price instru-

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Climate Institute News

Ponce-Nava Elected to Board of Advisors

Diana Ponce-Nava

The Climate Institute has appointed Diana Ponce-Nava, Director General of Environmental Projects for the Environment Secretariat of the Mexico City Government, to the Board of Advisors. She is also Chair of the Clean Air Initiative for Latin American Cities sponsored by the World Bank, and will participate in the Climate Institute's Climate and Air Quality Symposium in Mexico City in September.

Lic. Ponce-Nava's career has been focused on environmental concerns both for her country and internationally. She has been international policy coordinator and special adviser in the Natural Resources Secretariat and the Ministry of the Environment. She has also served as policy adviser to the executive director of UNEP in Kenya. She has taught at universities in Mexico and the US and is a member of the International Council of Environmental Law of the IUCN.

Her educational background includes, besides a law degree from the National Autonomous University of Mexico and an L.L.M from the London School of Economics and Political Sciences, courses at the International University of Strasbourg and the University of San Diego.

Talk by Sir Crispin Tickell

Board Chairman Sir Crispin Tickell gave a speech entitled, "Tackling Climate Change," at a British Industrial Energy Seminar on March 3. The text of it can be found on the Climate Institute's web site, www.climate.org.

Mexico City

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ments, such as a gas tax or automobile tax based on vehicular emission characteristics. A more effective method could be regulatory standards such as catalytic converters or specific fuel quality levels. Mexico City has implemented these regulatory standards as well as vehicle emission standards and vehicle inspection programs. There has been a noticeable decrease in emissions, and Mexico was the first country in Latin America to come into compliance with US exhaust emission controls.However, corruption in the inspection system has undercut the effectiveness of these programs. Later revisions include centralization and periodic monitoring of stations.

The current air pollution umbrella program, PROAIRE, recognizes the need for rehabilitating current programs as well as introducing new ones, aimed at ecological recovery and renewable energy.

Climate Institute

3331/2 Pennsylvania Ave. SE
Washington, DC 20003

Address correction requested

INSIDE

Urban Air Pollution Risks to Children: a global environmental health indicator

The Climate Institute is a private nonprofit organization formed to advance public understanding of climate change including the greenhouse effect and of strategies to avert stratospheric ozone depletion.