The Clean Air Initiative Strategy For Latin American And Caribbean Cities 2007-2012

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The Clean Air Institute

For:

The Clean Air Initiative
for Latin American and Caribbean Cities

Acronyms and Abbreviations

ACS	American Cancer Society
CAI	Clean Air Institute
CAI-Asia	Clean Air Initiative - Asia
CAI-LAC	Clean Air Initiative for Latin America and the Caribbean
CAI-SSAC	Clean Air Initiative - Subsahara African Cities
CCAD	Comisión Centro Americana de Ambiente y Desarrollo
CO	Carbon Monoxide
EC	Environment Canada
EPA	US Environmental Protection Agency
EU	European Union
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gases
GTZ	German Society of Technical Cooperation
HC	Hydrocarbons
HEI	Health Effects Institute
ICCT	International Council for Clean Transport
IPCC	Intergovernmental Panel on Climate Change
LAC	Latin American and Caribbean
NOx	Nitrogen Oxides
O_3	Ozone
PAHO	Pan American Health Organization
PM_{10}	Fine particulates that are 10 microns in diameter or smaller
$PM_{2.5}$	Fine particulates that are 2.5 microns in diameter or smaller
SO_2	Sulfur Dioxide
USA	United States of America
WBCSD	World Business Council for Sustainable Development
WHO	World Health Organization

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Executive Summary

Air pollution in cities throughout Latin America and the Caribbean (LAC) affects the health and well being of hundreds of millions of people as well as the environment. Poor air quality results in thousands of premature deaths, billions of dollars in medical costs, and lost productivity each year. In addition, in the LAC region, the predicted impacts of climate change are severe. In addition to a rise in sea level, water supply shortages, and decreased crop yields, temperature elevation will likely result in an increase in mortality rates and an increase in the occurrence of infectious diseases as well as respiratory diseases linked to air pollution. Climate change could also influence meteorological factors that impact the frequency and duration of poor air quality events.

Current and projected levels of air pollution and emissions rates of greenhouse gases in Latin American and Caribbean cities confirm that there is a critical need for integrated, forward-looking, comprehensive measures to improve air quality and minimize risks associated with climate change at the local, national, regional, and international levels. As the impacts of air pollution and climate change on public health and the environment are better understood, the need to adopt strategies that recognize the importance of effectively integrating air quality and climate change considerations into social and economic development planning becomes more apparent.

CAI-LAC is a multi-stakeholder partnership that seeks to bring together and expand distinct collaborative efforts focused on improving air quality in urban areas and addressing climate change into coherent and integrated approaches. Improved cooperation at the LAC regional level can help identify and disseminate good practices, avoid repetition of mistakes, promote efficiency among efforts, and save time and resources. The CAI-LAC partnership aims to build self-sustaining clean air programs and projects by promoting common goals and measures, supporting policy development and implementation, enhancing information sharing, strengthening capacity through training workshops, building support of the local and international communities and other stakeholders, and facilitating the optimum use and leveraging of resources.

The CAI-LAC partnership supports multi-benefit approaches in light of the common sources of air pollutants and greenhouse gas emissions and the opportunities associated with addressing them in tandem. The Clean Air Initiative Strategy for Latin American and Caribbean Cities (Strategy) aids the process by fostering a common understanding and providing a framework for

About CAI-LAC

The CAI-LAC is a multi-stakeholder partnership of government agencies, non-governmental organizations, academic institutions, development agencies, and the private sector, dedicated to addressing environmental and health concerns related to air pollution in Latin American and Caribbean cities and the Region's contribution to and impacts from global climate change. CAI-LAC serves to:

- Support common goals for improving air quality and reducing greenhouse gas emissions in LAC countries.
- Through the Clean Air Initiative Strategy for Latin American and Caribbean Cities, provide a framework for identifying, implementing, monitoring and evaluating policy options and measures.
- Facilitate information sharing, dissemination of good practices, and alliance building.
- Build institutional and technical capacity.
- Increase access to and leveraging of resources.
- Enhance opportunities for innovative solutions.

planning and implementing air quality management and greenhouse gas emissions reduction activities. A fundamental objective of the Strategy is to achieve a fair balance among economic growth, social development, and environmental and health protection.

The Strategy identifies an approach, key elements, priority areas, and financing opportunities, which together provide a framework for advancing improvements in local air quality in Latin America and the Caribbean and reducing risks from global climate change. The Strategy is intended to evolve as new information emerges, projects are implemented and other issues arise. The Strategy also identifies mechanisms to aid the implementation of CAI-LAC efforts. Combined with other services and resources provided by the Clean Air Institute (Institute), which manages the partnership, these implementing mechanisms will help build financial, technical, and political support and capacity for CAI-LAC projects, as well as promote information sharing and facilitate coordination and communication across efforts.

Key Elements

The Strategy recognizes the following key elements for effecting positive change through the CAI-LAC partnership:

- ***Fostering a Common Understanding Among All Stakeholders:*** There are important linkages between the management of both air pollution and greenhouse gases and the broader issues of urban transport, land use, industrial production, and energy generation, all of which have impacts on human health, the environment, and the economy. Developing a common understanding about these connections is key to guiding decisions related to urban air quality management and promoting sustainable development. Informed by the challenges and experiences of LAC cities, the region, and other parts of the world, this common understanding will help support the development of policies and measures that take into account the interrelatedness of air pollution, climate change, and quality of life.

- ***Supporting the Development and Implementation of Action Plans and Projects:*** CAI-LAC will promote and support the development and implementation of action plans to define goals for reducing emissions of conventional pollutants and greenhouse gases as well as local, national, and regional projects. These action plans and projects will include specific abatement strategies, timetables, and resource commitments. They will be designed with a common methodology that includes a framework for monitoring and evaluation. They could ultimately serve as the basis for the development of regional strategies and future policy decisions.

- ***Assessing Strategies and Opportunities for Integration:*** CAI-LAC will encourage that all action plans and projects be based on a complete assessment of policy and technological options as well as the economic, environmental, and public health costs, benefits, and co-benefits of reducing both air pollution and greenhouse gas emissions. Each assessment will target efforts to strengthen key management tools, such as emissions inventories for conventional pollutants and greenhouse gases, air quality data, a sound monitoring and evaluation framework, and an internationally recognized set of integrated assessment methodologies. By helping to identify and prioritize emissions reduction opportunities, these assessments and tools will serve as the basis for the formulation and introduction of more efficient and effective policies.

- ***Conducting Benchmarking:*** Benchmarking serves two main purposes. First, it enables the results of efforts implemented by CAI-LAC members to be quantified so that the effectiveness of those efforts can be evaluated and compared. Second, it identifies and highlights successful practices that can serve as models for programs in other cities or regions. Benchmarking will define consistent methodologies for establishing baseline information as well as indicators for measuring air quality improvements and GHG emissions reductions and the associated economic, public health, and environmental benefits.

- ***Fostering Collaboration through Networking:*** In cooperation with CAI-LAC partners, the Institute will organize and facilitate a variety of networking opportunities to foster linkages between members and potential collaborators. The Institute will serve as an important liaison by helping to partner member cities and countries with participating institutions and by disseminating information about pilot project opportunities and needs.

- ***Promoting Information Sharing and Training Activities:*** Through publications, regional conferences, workshops, and other fora**,** CAI-LAC will provide opportunities to share experiences and best practices, in particular, those identified through the benchmarking, and to develop additional capacity for the design and implementation of successful strategies and projects. In particular, the biennial Regional Forum provides an excellent opportunity for information sharing and technical capacity development. The Regional Forum brings together industry representatives, regulators, and technical experts, among others, and includes plenary sessions, professional development courses, tours, and other events.

Priority Areas

Cities in Latin America and the Caribbean are facing serious challenges related to rapid urbanization and the associated needs for improvements in transportation systems, energy production and use, and energy efficiency. Opportunities exist to develop and implement measures that address these critical needs while at the same time addressing local and global environmental and health concerns. The Strategy strives to achieve benefits by supporting sustainable policies and programs that promote clean and efficient transportation and energy generation and use. The priorities identified by the CAI-LAC partnership are as follows:

- ***Advancing Sustainable Transport by Transforming the Movement of People and Goods in Cities:*** The advancement of sustainable transportation in Latin America and the Caribbean requires that cities prioritize the development and/or improvement of urban motorized, non-motorized, and freight transport systems, and the integration of transportation and land use planning. Decisions regarding these priorities must be based on a scientifically sound, objective, and transparent assessment of the existing transportation system and viable options for making the system more environmentally, socially and economically sustainable**.**

- ***Accelerating the Development and Use of Clean Vehicle Technologies and Fuels:*** The strengthening and reinforcement of frameworks that consist of regulatory, compliance and incentive programs, as well as the harmonization of these frameworks at the LAC regional level, is fundamental to combating air pollution from mobile sources. In particular, the shift to low sulfur vehicle fuels in combination with advances in vehicle technologies and emission standards will significantly reduce air pollutants, improve fuel efficiency, and limit the growth of greenhouse gas emissions, among other benefits. In addition, the use of

alternative fueled vehicles and technologies, such as compressed natural gas, fuel cells, and electric vehicles, should be promoted based on an integrated assessment of their environmental, social, and economic viability.

- ***Catalyzing the Sustainability of Energy Sources, Uses, and Practices:*** To address its critical energy situation, LAC countries need to mobilize and integrate efforts focused on energy generation and energy consumption across sectors**.** Optimizing these efforts to produce positive environmental results is critical to their long-term sustainability.

Financing Opportunities

To ensure the implementation and financial sustainability of the CAI-LAC partnership, the framework aims to coordinate local, national and international efforts and resources by:

- Recognizing air quality, climate change and related issues as high priorities in local and national agendas;
- Promoting the development of regulatory and institutional capacity as well as an appropriate policy framework to enhance compliance and enforcement;
- Developing pilot projects and business models aiming to foster private involvement;
- Supporting the efforts of cities and countries to maximize funding opportunities and generation of resources by using both regulatory and economic instruments and fostering public-private partnerships; and
- Fostering coordination among international donors to promote complementarities and efficiencies, avoid duplication, and ensure better use of resources.

The Clean Air Initiative Strategy for Latin American and Caribbean Cities provides a framework that will help foster a common understanding about addressing air pollution and climate change, promote partnerships among stakeholders, and identify opportunities for stakeholders to actively advance policy dialogues, technical capacity development, and on-the-ground projects.

1. The Clean Air Initiative for Latin America and the Caribbean

History

The initial phase of this effort, known as the Clean Air Initiative in Latin American Cities, was launched in 1998 by the World Bank to establish a comprehensive approach to addressing air quality challenges in Latin America. This initial phase supported the development and enhancement of clean air action plans in large urban areas throughout Latin America, enhanced scientific knowledge and understanding of urban air quality and its associated impacts on human health, and provided decision makers with tools for assessing policy options.

After more than 6 years of functioning as the Technical Secretariat, the World Bank sought to build on the efforts of the initiative by broadening its geographic and thematic scope as well as its membership and financial base. In 2006, the World Bank, in partnership with Breakthrough Technologies Institute, jointly announced the establishment of a new, independent, nonprofit organization, the Clean Air Institute, along with the expansion of the partnership into the Clean Air Initiative for Latin America and the Caribbean (CAI-LAC).

The restructuring of the original phase of the initiative was envisioned to revitalize efforts by, among other things, creating a forum for strategy and project development, as well as for channeling training, technical assistance, and information exchange at a regional level. The new governing structure of the CAI-LAC partnership comprises the following four bodies:

- ***Clean Air Institute:*** Led by an Executive Director, the Clean Air Institute is responsible for managing the operations of the partnership. The Institute ensures implementation of the Strategy through the development and execution of the annual work plan and budget, promotion of member participation, and coordination of the biennial Regional Forum.
- ***Board of Directors:*** As the governing body, the Board of Directors sets general directions and policies for the Institute and outlines future priorities for the partnership. The Board approves the work plan and oversees and helps ensure the financial sustainability of the Institute. The first Board of Directors is headed by Dr. Mario Molina, Dr. Alan Lloyd, and Dr. Richard Ayres. The board meets at least once a year.
- ***CAI-LAC Members:*** Latin American and Caribbean cities and other local, regional, and national government agencies, international development agencies, non-governmental organizations, academic institutions, social and professional organizations, private foundations, and the business community comprise the CAI-LAC membership. Guided by the Regional Strategy, the members implement collaborative efforts consistent with the CAI-LAC mission.
- ***Advisory Committee:*** Member representatives comprise the Advisory Committee, which is responsible for providing guidance and expertise to the partnership. The Advisory Committee meets annually.

> *"The Clean Air Institute will play a pivotal role in helping cities reduce greenhouse gas emissions and clean the air. The Institute will serve as an important bridge between cities seeking solutions, and donors, government agencies, and solution providers from the private sector."*
>
> Dr. Mario Molina, 1995 Nobel Laureate in Chemistry, and Chairman of the Clean Air Institute's Board of Directors

CAI-LAC Mission and Objectives

CAI-LAC is a multi-stakeholder effort dedicated to addressing the environmental and public health concerns associated with air pollution in large cities throughout the region as well as the region's contribution to and impacts from global climate change. Building on the significant achievements realized under the first phase of cooperation, CAI-LAC seeks to bring together and expand distinct collaborative efforts into coherent, integrated, and self-sustaining approaches.

CAI-LAC members form the nucleus of the effort, carrying out the Initiative's objectives by partnering with other members. The Institute serves to mobilize the expertise, authorities, and resources represented by the diverse membership to:

- Advance common goals for protecting the health of people exposed to air pollution, improving air quality, and reducing greenhouse gas emissions in LAC countries;
- Through the Clean Air Initiative Strategy for Latin American and Caribbean Cities, provide a framework for identifying and evaluating policy options and measures;
- Facilitate information sharing and alliance building;
- Build institutional and technical capacity;
- Stimulate innovation regarding the development and use of low-emission, low-carbon technologies;
- Foster support of local and international communities and other stakeholders; and
- Increase access to and leveraging of resources.

> *"The World Bank will continue to be engaged with the Clean Air Initiative agenda through investment operations related to urban transport, energy, and environment, and through development policy lending operations directly related to enhancing air quality management in the region."*
>
> World Bank, 2007/15/LAC, July 2006

Benefits of CAI-LAC Participation

The success of CAI-LAC is grounded in the active participation of stakeholders from the public, private and non-profit sectors as well as from academic institutions and international development organizations. Participation in CAI-LAC provides many benefits:

- ***Governments:*** CAI-LAC enhances the ability of governments to protect public health and overall quality of life, by advancing efforts to address pressing development challenges. CAI-LAC promotes integrated approaches for addressing air pollution and slowing the growth of greenhouse gas emissions based on the environmental, social and economic objectives of LAC countries. Participation in CAI-LAC helps municipal, state, and national governments encourage development of markets, mobilize resources, and strengthen scientific, technical, and institutional capacity. Through CAI-LAC participation, governments can increase their ability to build support for policies and regulations, expand access to best practices and other information, and enhance visibility of their local and national initiatives.

- ***Private Sector:*** Participation in CAI-LAC can help the business community gain insight into policy developments in Latin American countries, gain market knowledge and opportunities, and build relationships with government agencies. CAI-LAC helps the private sector by supporting the development of new markets and enhancing access to existing ones. CAI-LAC also encourages and helps form public-private and private-private partnerships. Consequently, CAI-LAC participation can facilitate the deployment of innovative technologies, systems, and services. Through the Clean Air Institute, the partnership also serves as an information clearinghouse, disseminating information not

only about project needs and opportunities, but also about the environmental stewardship efforts of the business community.

- ***Non-Governmental Organizations (NGOs):*** CAI-LAC reinforces the role and effectiveness of NGOs by promoting a common understanding about environmentally sound and sustainable development, and by facilitating NGO access to key stakeholders and decision makers. Participation in CAI-LAC helps NGOs build support for their public service missions and programs, expand their capacity for mobilization, and disseminate their expertise and experience.

- ***Development Organizations and Agencies:*** CAI-LAC supports the work of international development organizations and agencies by advancing their economic, environmental and public health goals. The partnership promotes air pollution and GHG emissions reduction projects that are technically and financially sound, supports activities aimed at developing capacity for managing air quality and climate change, and provides opportunities to highlight best practices. Participation in CAI-LAC can help development organizations and agencies leverage private sector resources by facilitating the establishment of strong public-private partnerships with local buy-in. The participation of these entities can help build support for and leverage investment programs and other efforts that are consistent with CAI-LAC's mission.

- ***Private Foundations:*** CAI-LAC advances the objectives of private foundations by identifying and developing projects to build capacity for addressing air quality and climate change, encourage investment, and advance educational outreach. Participation in CAI-LAC can help foundations shape the development, demonstration, and implementation of new policy options and measures by promoting integrated and collaborative approaches, leveraging resources through partnerships, and improving access to innovative programs, ideas, and people.

- ***Academic and Research Institutions:*** CAI-LAC supports the need for science-based policy and program decisions and works directly with decision makers to help identify not only gaps in knowledge, but also the institutions that can help address those gaps. Through participation in CAI-LAC the scientific community will gain better access to and improved communication with decision makers. Because the Clean Air Institute is uniquely positioned to highlight the capacity of member institutions to design and conduct studies and to advance technology through research, CAI-LAC can help encourage the use of research to inform decision making. CAI-LAC also recognizes the important role that the research community plays in increasing the knowledge base about the broader social, economic, and political dimensions associated with air pollution and climate change. As the research institutions consider their priorities, CAI-LAC can help raise their awareness about the need to advance this knowledge.

The Clean Air Initiative Strategy for Latin American and Caribbean Cities (Strategy) has been developed to guide implementation of the CAI-LAC partnership. With a focus on key elements, priority areas, and financial opportunities, the Strategy advances an integrated approach to air quality and greenhouse gas emissions. The Strategy and its components are detailed in Chapters 3-5.

2. Air Pollution and Climate Change in Latin America and the Caribbean

Challenges

There is compelling evidence that the societal costs --- in the form of health and economic impacts --- associated with air pollution in the Latin American and Caribbean (LAC) region are high and will continue to present an enormous challenge to LAC countries. In the LAC region, air pollution affects the health and well-being of hundreds of millions of people, many of whom live in large urban centers. In Mexico and Central and South America, over 100 million are exposed to air pollution above World Health Organization (WHO) standards[1]. In assessing air pollution impacts in LAC countries such as Bolivia, Guatemala, Ecuador, Peru and El Salvador, the World Bank estimates that the portion of the economy affected by such emissions represents up to 2 percent of the Gross Domestic Product (GDP). Although additional studies are necessary to further narrow cost estimates, it is likely that a similar economic impact is felt by most Latin American countries.

> *"Every year, urban air pollution worldwide contributes to approximately 800,000 premature deaths and 4.6 million healthy-life years lost, most of them occurring in the developing world. Given the fact that knowledge of atmospheric pollution and its impact on health are still limited, these may be conservative figures."*
>
> World Health Organization, 2002

Latin America is the most urbanized region in the developing world. The population in Latin America's growing urban centers is expected to increase by nearly 30 percent to 610 million by 2030. Although the most populated cities are in Brazil, Mexico, Argentina, and Colombia, more than 130 cities across the LAC region have populations of more than 500,000, and more than 50 of these have populations of larger than 1 million.

The rapid population growth in these urban areas has resulted in unplanned development, greater demand for energy, and increased traffic congestion, all of which have adversely impacted air quality in LAC cities. Energy demand is expected to double and the vehicle fleet is expected to triple in the next 25 years. Combined with inadequate land use and transportation planning, poor fuel quality, and weak air quality management capacity, these factors contribute significantly to the poor air quality in LAC cities and the associated health impacts. Despite the progress made by several LAC cities to address air quality, air pollution continues to be a serious challenge throughout the region.

At the same time, greenhouse gas emissions are rapidly increasing in the LAC region and are likely to lead to a different yet overlapping set of detrimental impacts. The burning of fossil fuels, whether it be for energy generation, industrial production, vehicular transport, or other sectors, is a common source of both urban air pollution and greenhouse gas emissions.

The transportation and energy sectors tend to be the largest contributors to urban air pollution and greenhouse gas emissions, and the trend indicates that these sectors will continue to be in the lead. For example, the number of vehicles in the LAC region is expected to increase from approximately

[1] This number could be an underestimation, considering that numerous cities in Latin America and the Caribbean do not have a systematic method for air quality monitoring, which limits the possibility of evaluating effects of air pollution on human health.

60 million at present to more than 150 million by 2030, while energy demand will increase two-fold in the region by then. Factors contributing to rising pollution rates from these sources include:

- Inadequate land use and infrastructure planning;
- Persistence in the use of vehicles with limited or no emissions control devices;
- Deteriorating public transportation systems;
- Persistence of low energy efficiencies in the manufacturing sector;
- Increasing energy demand; and
- Limited development and availability of clean energy alternatives.

The burning of fossil fuels in both the transportation and energy sectors contributes significantly to the high concentrations of atmospheric contaminants, such as carbon monoxide, nitrogen oxides, sulfur dioxide, unburned hydrocarbons and fine particulate matter ($PM_{2.5}$) (World Bank, 2007). Ozone, the result of a reaction of hydrocarbons and nitrogen oxides in the presence of sunlight, is another pollutant of concern in LAC cities. Some atmospheric contaminants also play an important role in climate change. Although they are not considered in the Kyoto Protocol, ozone, carbon monoxide, and/or $PM_{2.5}$ have global warming potentials equivalent to carbon dioxide (CO_2), although their lifetimes are shorter.

Impacts of Conventional Air Pollutants

Human exposure to air contaminants such as ozone, sulfur dioxide, particulate matter, and nitrogen oxides may result in a variety of health impacts, including an increase in respiratory illnesses, exacerbation of asthma, and a decrease in lung function. Air pollution also increases premature mortality, morbidity indices, and hospital emissions, and leads to decreased productivity due to absences from school and work.

> *"Air pollution has become one of the main concerns of public health in many Latin American and Caribbean cities, where the particle concentrations and other polluting agents exceed the national standards for air quality. The exposure to the types and concentrations of polluting agents frequently found in urban zones has been related to an increase of the risk of mortality and morbidity due to several conditions, including respiratory and cardiovascular diseases."*
>
> Pan American Health Organization, 2005

Certain populations are more susceptible to the health effects of air pollution, such as children, the elderly, and those with compromised immune systems. Children comprise a large percentage of urban populations in LAC cities, and given their immature organs, are particularly susceptible. For adult populations, air pollution is also associated with lung cancer and cardiovascular problems, both of which are the most fatal of urban air pollutant-related health impacts. Both the Environmental Protection Agency (EPA) and the International Cancer Research Institute have concluded that there is a correlation between exposure to diesel exhaust and an increased risk of cancer. Recent studies conducted by the American Cancer Society (Jerret, 2003) point out the global risks of cardiopulmonary mortality associated with prolonged exposure to $PM_{2.5}$, sulfates, and sulfur dioxide, which are potentially three times greater than what has been estimated in other studies conducted to date. Studies performed in Mexico, Cuba, Venezuela, Brazil, and Chile on air pollution and its impact on health show similar outcomes.

The suite of conventional pollutants has a disproportionate impact on certain sectors of society. The largest of these groups in the LAC region is the poor, the majority of whom are concentrated mainly in the slum and peripheral areas of the cities. These areas often lack basic necessities, such as electricity, water, sewage, public transportation, and other services. Because the poor tend to live closer to industrial areas and highways, where manufacturing and intense heavy-duty diesel

vehicle traffic are concentrated, their vulnerability to the associated negative impacts of air pollution is exacerbated significantly. Furthermore, many of the poor may be more susceptible to health effects of these emissions due to other contributing factors, such as poor nutrition, lack of access to health care, and general unhealthy environments in which they live. In most LAC cities, urban development serves to further contribute to these disproportionate impacts to poor communities. In addition to sitting of highways, industry and waste sites near low-income areas, many poor are disadvantaged by costly and deficient public transportation and other services.

Impacts of Greenhouse Gases

There is overwhelming evidence that global warming is accelerating as a result of the massive increases of greenhouse gases in the atmosphere. Most of these greenhouse gas emissions are believed to be attributed to human activities (IPCC Working Group 1 Report, 2007). During the last century, the global average temperature rose 0.6^{o}C sea level rose 20 cm. During the 21st century, the planet's average temperature could increase by 1.4 to 5.8^{o}C, while the sea level could rise by 20 to 88 cm. Evidence shows that rain patterns are changing, glaciers are retreating, ice sheets over the Arctic Ocean are thinning, and "El Niño" conditions are more frequent, persistent and intense (IPCC 2007, Pachauri, 2006).

Negative effects on agriculture are projected, as are changes in composition and productivity of forests, the supply and quality of water, coastal erosion, and the loss of habitats and species. Changes in rain patterns and glacier retreat could have a significant impact on water availability for human use, agriculture, and electricity generation. Climate change could also influence meteorological factors that affect the frequency, duration, and intensity of atmospheric conditions. These changes, in turn, could catalyze the formation of additional conventional air pollutants.

Projected climate change-related exposures to air pollution are likely to affect the health status of millions of people. Ozone concentrations are exacerbated by climate change and, as previously discussed, can lead to further cardiopulmonary and respiratory risks. Health impacts, including a rise in mortality rates, will vary from one location to another and will alter over time as temperatures continue to rise. Critically important will be factors that directly shape the overall well-being of populations, such as access to and quality of public health.

The CAI-LAC Approach to Addressing Air Pollution and Greenhouse Gas Emissions

Fossil fuel combustion results in both conventional air pollutants and greenhouse gas emissions, mainly in the transportation and energy sectors. In the 2005 article, *Air Pollution and Global Warming: The Seamless Web*, the authors argue that because air pollution impacts climate, while greenhouse gases increase air pollution, the design of programs to address one or the other makes "a distinction where there is fundamentally no difference", and consequently lays the foundation for failure of these programs (Health and Clean Air Newsletter, Spring/Summer 2005, 1). The authors conclude that the reduction of air pollutants could bring great benefits in the near-term with respect to both public health protection and climate change mitigation.

The CAI-LAC approach considers the efficiencies and other benefits that can be achieved by jointly addressing both types of emissions. This approach is discussed in more detail in Chapter 3.

3. The Clean Air Initiative Strategy for Latin American and Caribbean Cities

The Clean Air Initiative Strategy for Latin American and Caribbean Cities (Strategy) has been developed to guide planning and implementation of air quality management and greenhouse gas emissions reduction efforts under the Clean Air Initiative for Latin America and the Caribbean (CAI-LAC). The Strategy, which builds on the success of CAI-LAC's efforts to-date and of initiatives in other countries, is intended to evolve as new information emerges, projects are implemented, and other issues arise. CAI-LAC members and other interested organizations and stakeholders are encouraged to further develop and enrich the Strategy as a framework for setting the direction of CAI-LAC efforts.

What is the Strategy?

The Strategy consists of four components: the CAI-LAC approach, key elements for effecting positive change, priority areas, and resources to help optimize financial opportunities for developing and implementing programs. Together, these four components comprise a framework that is intended to guide the efforts undertaken by CAI-LAC members to address these needs and challenges associated with urban air pollution and greenhouse gas emissions. The framework also underscores the importance of establishing linkages between efforts, so that members can share information, learn from one another, and more efficiently utilize technical and financial resources.

The CAI-LAC Approach

Despite many common sources, air pollution and greenhouse gas emissions are rarely considered jointly. This has made it difficult to identify synergies and to fully realize the associated co-benefits. The CAI-LAC approach is centered on strengthening existing partnerships and inspiring new collaborative efforts to reduce both urban air pollution and greenhouse gas emissions. The driving force behind this approach is integrated planning in support of multiple environmental, economic, and public health benefits. CAI-LAC supports this multi-benefit approach in light of the the numerous opportunities to address air pollution and greenhouse gas emissions in tandem.

Jointly focusing on conventional air pollutants and greenhouse gas emissions is particularly important in Latin American and Caribbean cities, where resources are scarce, and where there are significant institutional and technical barriers. A real need exists to address these barriers and to maximize opportunities for improvement. The integrated, multi-benefit approach has the potential to strengthen local capabilities for development and implementation of sustainable solutions in all sectors, increase access to innovative technologies and systems, and promote investment in both the public and private sectors.

The CAI-LAC partnership aims to build self-sustaining clean air programs and projects by promoting common goals and measures, supporting policy development and implementation, enhancing information sharing, strengthening capacity through training workshops, building support of the local and international communities and other stakeholders, and facilitating the optimum use and leveraging of resources.

Key Elements

The Strategy recognizes the following key elements or courses of action for effecting positive change through the CAI-LAC partnership:

- ***Fostering a Common Understanding Among All Stakeholders:*** There are important linkages between the management of both air pollution and greenhouse gases and the broader issues of urban transport, land use, industrial production, and energy generation, all of which have impacts on human health, the environment, and the economy. Developing a common understanding about these connections is key to guiding decisions related to urban air quality management and promoting sustainable development. The CAI-LAC partnership will help foster this understanding by promoting the use of consistent analytic tools and methodologies for assessments. Informed by the challenges and experiences of LAC cities, the region, and other parts of the world, this common understanding will help support the development of policies and measures that take into account the interrelatedness of air pollution, climate change, and quality of life.

- ***Supporting the Development and Implementation of Action Plans and Projects:*** CAI-LAC will promote and support the development and implementation of local, national, and regional plans and projects to define goals and actions for reducing emissions of conventional pollutants and greenhouse gases. These action plans and projects will include specific abatement strategies, timetables, and resource commitments. They will be designed using a common methodology that includes a framework for monitoring and evaluation. These plans could ultimately help inform future policy decisions.

  The articulation of action plans and projects can also help accelerate deployment of clean and efficient technologies, spur development of voluntary emissions reduction programs, and enhance mechanisms for providing resources to cities for program implementation. Among other things, action plans will establish priority measures as well as the institutional and financial arrangements for their implementations. They will also take into account the involvement of the private sector, social organizations and other key stakeholders, aiming to catalyze investments on clean air programs and projects. The Clean Air Institute will organize and facilitate a variety of networking opportunities to foster linkages between members and potential collaborators. In addition to providing opportunities to demonstrate technologies, pilot projects will help establish and clarify the basis for policy development and implementation. The Clean Air Institute will serve as an important liaison by helping to partner member cities and countries with participating institutions and by disseminating information about pilot project opportunities and needs.

- ***Assessing Strategies and Opportunities for Integration:*** CAI-LAC will encourage that all action plans and projects be based on a complete assessment of policy and technological options as well as the economic, environmental, and public health costs, benefits, and co-benefits of reducing both air pollution and greenhouse gas emissions. Each assessment will target efforts to strengthen key management tools, such as an internationally recognized set of integrated assessment methodologies, emissions inventories for conventional pollutants and greenhouse gas, air quality data, and a sound monitoring and evaluation framework. These tools allow for identification of pollution sources and types, measurement of ambient air quality, modeling of environmental and health impacts, and identification of control options. For this reason, it is critical for cities to have the adequate resources and capacity to utilize these tools, ensure the credibility of the procedures and the data, and complete the associated assessments. These assessments and tools are used to help identify and prioritize emissions reduction opportunities and serve as the basis for the formulation and introduction of more efficient and effective policies.

- ***Conducting Benchmarking:*** Benchmarking serves two main purposes. First, it enables the results of efforts implemented by CAI-LAC members to be quantified so that the effectiveness of those efforts can be evaluated and compared. Second, it identifies and highlights successful practices that can serve as models for programs in other cities or regions. Benchmarking will define consistent methodologies for establishing baseline information as well as indicators for measuring air quality improvements and greenhouse gas emissions reductions and the associated economic, public health, and environmental benefits. To enable compatibility and comparability of information at the regional level, the benchmarking effort will also encourage standardized reporting using common formats.

  Priority benchmarking activities of the Clean Air Institute will include:

  - Developing and publishing a Latin American Sustainable Transportation Index (INSTALA in Spanish) aimed at measuring environmental performance of urban transportation in relation to its environmental, social, and economic dimensions.

  - Creating the Clean Air Index (IAL in Spanish) with the purpose of facilitating the comparison of various air pollution indicators. The design of these indices will be carried out jointly with participating cities. The Clean Air Institute will independently assess these indicators based on atmospheric monitoring data contributed by the cities.

    The indices will be assessed annually and could be used as the basis for international recognition of performance excellence.

  - Creating a database to record the function, energy consumption, and air pollution and greenhouse gas emissions generated by urban transportation, electricity generation, and industry in Latin America. In particular, this database will allow for the generation and dissemination of a series of reports on urban transport. This tool could be used to facilitate strategic assessments, increase public access to information and raise stakeholder awareness.

    As an example, the first in a series of reports known as the *Sustainable Transport and Air Quality Report* (STAQ Report) will focus on

About the STAQ Report

For each participating city, the STAQ Report will include general information as well as detailed indicators, trends, and best practices with respect to air quality improvements and greenhouse gas emissions reductions from the transport sector and urban development.

In collaboration with LAC countries, the Clean Air Institute will develop the software and reporting template. The software will include tutorials and tools to assist the data gathering and quality control processes.

Information collected through the electronic template will be incorporated into the STAQ Information System. Through this system, users will be able to frame customized data enquiries and obtain answers about urban transport and its relationship to air quality and greenhouse gas emissions. The system will be designed to enable different levels of consultation and access, and will incorporate tools for data integration, validation, and comparison across cities and countries.

The report is expected to be available on the CAI-LAC Website by late 2008.

establishing a baseline for the STAQ Project in participating cities, as well as on identifying data availability, reliability, and comparability (Figure 2).

- ***Fostering Collaboration through Networking:*** In cooperation with CAI-LAC members, the Institute will organize and facilitate a variety of networking opportunities to foster linkages between members and potential collaborators. The Institute will serve as an important liaison by helping to partner member cities and countries with participating institutions and by disseminating information about pilot project opportunities and needs.

- ***Promoting Information Sharing and Training Activities:*** Through regional conferences, workshops, and other fora**,** CAI-LAC will provide opportunities to share experiences and best practices, in particular, those identified through the benchmarking process, and to develop additional capacity for the design and implementation of successful strategies and projects.

  In particular, the biennial Regional Forum provides an excellent opportunity for information sharing and technical capacity development. The Regional Forum brings together industry representatives, regulators, and technical experts, among others, and includes plenary sessions, professional development courses, tours, and other events.

  In addition, member cities have expressed a strong interest in improving the capacity of their technical and administrative staff to manage urban air quality and related issues. CAI-LAC members have a wealth of technical and institutional knowledge about air quality management and related issues. The Clean Air Institute will continue to create training opportunities to help strengthen capacity. A number of distance learning courses have been developed under CAI-LAC, which will continue to be delivered. New courses are anticipated and could be delivered using the technologies and networks of partner institutions.

Priority Areas

Cities throughout Latin America and the Caribbean are facing serious challenges related to rapid urbanization and the associated needs for improvements in transportation systems, energy production and use, and energy efficiency. Opportunities exist to develop and implement measures that address these critical needs while at the same time addressing local and global health and environmental concerns. CAI-LAC members strive to achieve benefits by supporting sustainable policies and programs that promote clean and efficient transportation and energy generation and use. The priorities identified by the CAI-LAC partnership are as follows:

- ***Advancing Sustainable Transport by Transforming the Movement of People and Goods in Cities:*** As recognized by the participants of the 2006 Sustainable Transport Conference in Sao Paulo, Brazil, the advancement of sustainable transportation in Latin America requires that cities prioritize the development and/or improvement of urban motorized, non-motorized, and freight transport systems, and the integration of transportation and land use planning (Appendix 1). Decisions regarding these priorities need to be based on a scientifically sound, objective, and transparent assessment of the existing transportation system. Decision makers can then utilize those assessments to consider viable options for making the system more environmentally sustainable**.**

- ***Accelerating the Development and Use of Clean Vehicle Technologies and Fuels:*** The use of low sulfur diesel fuels with a sulfur content of 50 parts per million (ppm) or below

combined with emission standards and advances in vehicle technologies significantly reduces air pollutants, improves fuel efficiency, and limits the growth of greenhouse gas emissions. Additional benefits include lower health costs, increased productivity, and rising tourism.

- ***Catalyzing the Sustainability of Energy Sources, Uses, and Practices:*** To enhance their capacity to address critical energy situations, LAC countries need to mobilize and integrate efforts focused on increasing the supply of clean energy and enhancing efficiency of energy use across sectors (transportation, industry, commerce, and residential users)**.** Access to clean, safe, and reliable sources of energy and adoption of energy saving strategies can help reduce emissions, protect public health, support economic vitality and competitiveness, and spur technological innovation. The Strategy underscores the importance of addressing energy demand and use through true commitments to markets, promotion of technologies and polices to take advantage of alternative energy sources, and encouragement of other energy efficiency and conservation measures.

Each of the three priority areas is discussed in greater detail in Chapter 4.

Financing Opportunities and Resources

The shortage of local government resources to support integrated planning and development and implementation of emissions reductions policies and programs, combined with the lack of incentives to attract investment, create barriers that impede environmental progress in LAC countries. To ensure the implementation and financial sustainability of the CAI-LAC partnership, the framework aims to coordinate local, national and international efforts and resources by:

- Recognizing air quality, climate change and related issues as high priorities in local and national agendas and public budgets;
- Promoting the development of regulatory and institutional capacity as well as an appropriate policy framework to enhance compliance and enforcement;
- Developing pilot projects and business models aiming to foster private involvement;
- Supporting the efforts of cities and countries to maximize funding opportunities and generation of local and national resources by using both regulatory and economic instruments and fostering public-private partnerships; and
- Fostering coordination among international donors to promote complementarities and efficiencies, avoid duplication, and ensure better use of resources.

The CAI-LAC partnership will support its members in exploring financing opportunities, including identifying new and existing funding sources and ways of accessing those resources, assessing opportunities for leveraging resources and efforts, and exploring the use of flexible incentives and instruments that could be used to support improvement efforts. The finance component of the Strategy is discussed in further detail in Chapter 5.

4. Priority Areas

The Clean Air Initiative Strategy for Latin American and Caribbean Cities identifies the following three priority areas, in which numerous opportunities exist, particularly in urban areas, to reduce air pollution and greenhouse gas emissions:

- Advancing Sustainable Transport by Transforming the Movement of People and Goods
- Accelerating Development and Use of Clean Vehicle Technologies and Fuels
- Catalyzing the Sustainability of Energy Sources, Uses and Practices

4.1 Advancing Sustainable Transport by Transforming the Movement of People and Goods

Impacts of Conventional Air Pollutants and Greenhouse Gas Emissions

In LAC cities, cars, buses, and trucks are major sources of emissions that contribute to poor air quality and an increase in the rate of greenhouse gases. The primary challenge to advancing sustainable transportation in LAC cities pertains to the heavy and growing reliance on motorized transportation. Projected increases in demand for and use of motor vehicles will have a significant impact on energy consumption, air quality, and the growing rate of greenhouse gas emissions. They will also have associated health, economic, and social impacts.

> *"… [T]he present mobility system is not sustainable, nor is it probable that it will get to be if present tendencies continue. Societies need to act to change the course."*
>
> The World Business Council for Sustainable Development, 2004

According to the World Business Council for Sustainable Development, the ownership of light duty vehicles in the LAC region could come close to tripling during the period 2000 to 2050, increasing from approximately 1 vehicle per every 11 individuals to more than 1 vehicle per every 3.3 individuals. Today's ratio is even smaller in cities like Sao Paulo and those along the Mexico-US border, where the ratio of 1 car to every 2 people approximates the ratio in developed countries. In some LAC cities, the number of motorcycles is also increasing dramatically, further contributing to air pollution, congestion, and safety concerns.

The rapid increase in road transport has led to, and will further exacerbate congestion and increase travel times. It has been estimated that traffic jams increase transport costs by 10 percent in Río de Janeiro and by 16 percent in Sao Paulo (World Bank, 2002). According to the Center for Sustainable Transport, millions of people in Mexico City spend more than 3 hours in traffic every day. Heightened congestion levels lead to greater and more concentrated emissions. Urban traffic accounts for a significant portion of fine particle pollution, and a large share of carbon monoxide, nitrogen oxides and sulfur dioxide, all of which contribute to ground level ozone formation (World Bank, 2002).

Motor vehicle emissions are associated with serious health problems such as asthma and respiratory illnesses, as well as with poor visibility in LAC cities. Health impacts associated with vehicle emissions are expected to be greater than those associated with stationary source emissions in these countries. Compounding these impacts is the fact that vehicle emissions tend to be released close to the ground and in highly populated areas, thereby contributing to direct human exposure.

According to the World Bank, total greenhouse gas emissions in the LAC region increased by 20.2 percent between the period 1990 to 2003 (*The 2007 Little Green Data Book*). This increase was 4.4 percent higher than the global greenhouse gas growth rate during the same time period. A recent report generated using the World Resources Institute Climate Analysis Indicators Tool shows that greenhouse gas emissions associated with the transportation sector in the LAC region increased by 40.6 percent during that period (*cait.wri.org*).

Adding to the challenge is that within the next two decades, the transportation sector is expected to continue its dependence on fossil fuels, even though sources of renewable energy are growing. If no significant measures are taken, the increase in emissions associated with the astronomical growth rate of vehicles is expected to outpace the projected decrease in emissions resulting from expanded use of cleaner fuels and vehicles.

Passenger Transportation

Most motorized trips in LAC cities require the use of public transportation systems. It is widely recognized that most of these systems are in crisis, characterized by unreliable and deteriorating services. Public transportation fleets are often obsolete, and there are significant deficiencies in the transfer stations and terminals. Oftentimes, users have little, if any, access to information about available services and service interruptions. In addition, current policies and regulations in many cities tend to discourage private investment to upgrade and expand public transportation systems. Lack of improvements to these systems has impacted user safety, service quality and availability, energy efficiency, emissions of conventional air pollutants and greenhouse gases, and human health. It is not surprising that ridership continues to decline. This decline in ridership results in increased use of personal vehicles and decreased availability of funding to support public transportation improvements. The development of public transportation infrastructure mirrors this trend. In most LAC cities, the development of infrastructure that favors the use of personal vehicles has increased, while investments in public transportation have decreased.

As long as residents of LAC cities increase their dependence on personal transport, congestion and the resulting air pollution will worsen, and mobility and accessibility will continue to decline. However, if more diversified transportation options were available, LAC cities could avoid significant social and economic costs.

While there are opportunities for LAC cities to reduce the use of automobiles and increase public and non-motorized means of transportation --- such as walking and cycling --- there are a number of barriers that first need to be addressed. For example, motorized vehicles are often afforded the right of way over pedestrians and bicyclists. In some cases, policies and regulations restrict the use of non-motorized transportation.

In general, LAC cities do not have adequate infrastructure, in the form of pedestrian zones and dedicated bike lanes and crossings, to support a higher volume non-motorized traffic. Furthermore, infrastructure planning and development does not adequately consider the mobility needs of the elderly and the disabled, among others.

In light of these challenges, a critical need exists for effective policies and regulations that encourage the development of integrated, coordinated, and high quality public transportation systems.

Freight Transportation

Freight transport presents a different, yet related set of issues. The demand for the transport of goods is growing rapidly in Latin America, mainly as a result of increased net per capita income. The majority of in-service fleets in the LAC region consist of trucks that are more than twenty years old. Older vehicles operate with less efficient engines, little or no emissions controls, and high-sulfur diesel fuel, the combination of which results in tremendously high levels of particulates and other pollutants.

Competing demands for road and highway use, coupled with congestion and other logistical issues, also lead to long delivery times for both short-and long-haul freight. Increased congestion requires freight vehicles to operate for longer periods of time. Driving conditions on congested roads requires stop-and-go operation of the vehicles, which results in higher levels of emissions, particularly particulates. In addition, long delivery times can have a negative economic impact on the entire chain, from the manufacturers, shippers, and carriers, to the wholesalers and retailers, which, turn, can impact market predictability and create other barriers to business development. Were these impacts to be long-lasting, they could spill over into the economy at large and ultimately reduce growth in Gross Domestic Product (GDP).

Regulation of freight transport in Latin America is minimal. While the public perceives pollution from freight transport to be a significant environmental problem, many states and localities have not made it a priority, leaving related controls and plans for innovative changes severely lacking.

4.11 Proposed Opportunities and Solutions

To realize the human health, environmental, social, and economic benefits associated with addressing urban transportation problems requires a multi-disciplinary approach in the form of integrated urban, public transportation (both motorized and non-motorized), freight transportation, and related infrastructure development planning. In order to ensure truly sustainable transportation, government officials must make decisions based on rigorous, objective, and transparent assessments of needs, benefits, and realistic options.

CAI-LAC members have identified the following opportunities and solutions to be taken and applied in concert for achieving sustainable transportation in LAC cities:

- ***Favor the Development of Quality Mass Transportation Systems:*** LAC cities urgently need to give greater priority to the development of quality public transportation systems. Ensuring local government investments to support projects that seamlessly integrate motorized and non-motorized transportation infrastructure is the first and most critical step. At the same time, it is necessary to integrate and optimize the many components of public transportation systems, through:
  - Improved organization and management practices;
  - Reasonable fares as well as improved fare collection and integration among different public transport modes;
  - Preferential traffic flow for public transport;
  - Improved vehicle operation safety;
  - Outreach and incentives, such as discounts for frequent users;
  - Clean, energy-efficient, and properly maintained vehicle fleets; and
  - Training for systems operators, managers, traffic police and urban planners, among others.

- ***Establish Integrated Transportation and Land Use Planning Systems:*** LAC cities can ensure a reduction in emissions of both conventional pollutants and greenhouse gases by placing transportation considerations at the center of development. By considering transportation needs and challenges as an integral part of land use planning, cities can avoid unchecked growth, decrease the need for personal vehicles, and allow for low-cost, high-volume alternative transportation options. Among other things, integrated programs would promote:
  - Creation of urban nodes, including central business districts;
  - Development of high-density, mixed-use neighborhoods, with a combination of retail, business, and residential housing;
  - Ready access to mass transit lines;
  - Pedestrian and bike-friendly pathways; and
  - Alteration of traffic patterns to minimize congestion for all modes of transportation.

  The effective integration of land use and transportation planning requires that numerous factors be taken into, such as:
  - Market fluctuations (in land and property prices);
  - Residential needs and preferences of individuals;
  - Per-capita income levels; ,
  - Institutional capacity and resources; and
  - Availability of effective incentives to encourage a better balance between owning and using personal vehicles. Specific incentives are discussed further in Chapter 5.

- ***Expand the Availability and Foster the Use of Non-Motorized Transportation:*** To achieve sustainability**,** LAC cities could significantly benefit from expanded non-motorized transportation infrastructure. Establishing measures designed to encourage walking and cycling is one opportunity that CAI-LAC members have identified. Examples of associated measures are:
  - Building separate bike pathways and parking structures;
  - Construct safe pedestrian walkways that are integrated into the public transportation system;
  - Afford clear right-of-way for bicyclists and pedestrians; and
  - Launch road and public safety campaigns to increase awareness.

- ***Restrict the Use of Private Automobiles in Urban Areas:*** As a complement to improving the public transport systems, LAC cities could restrict the use of private vehicles in urban. Systems that impose one or more of the following measures have been successfully implemented in other parts of the world:
  - Imposing land use planning, zoning, and fees to restrict the number of vehicles allowed within the most congested parts of a city. London is one example of this model;
  - Implementing varied parking rates and availability based on time of day and/or level of projected collective or individual vehicle emissions; and
  - Establishment of traffic abatement measures, such as "intelligent" transit systems[2].

[2] The term **Intelligent Transportation Systems (ITS)** groups information and communications technologies to improve management of transport infrastructure and vehicles. ITS aim to manage factors that are typically at odds with each other such as vehicles, loads, and routes to improve safety and reduce vehicle wear, transportation times, fuel consumption and, therefore, air pollution and greenhouse gas emissions

- ***Improve Freight Transport Systems:*** Raising the priority of freight transportation within local governments, with an associated commitment of funding, is key to improving these systems. Government officials need to factor freight transport into development plans and design and implement related policies and programs to ensure necessary support. Efficient transport of goods in urban areas results not only in emissions reductions, but also in decreased energy use and marked improvement in freight delivery.

Mass Transportation Improvements: Dissemination of Good Practices

LAC cities could take advantage of the experiences of several developed cities that are reducing air pollution and congestion through measures that restrict the use of personal vehicles. London, Paris, Copenhagen, Stockholm, and Manhattan are among the cities that have successfully implemented such measures. There are also several transport programs and projects within the LAC region that could serve as a reference (Figure 4a). The success of some of these efforts was highlighted at the 2006 CAI-LAC Annual Forum, which drew more than 600 participants. CAI-LAC will continue to encourage cities like these to work with other municipalities and regions to transfer their experiences on sustainable transportation programs and strategies.

Sustainable Transport Efforts in LAC Cities

- ***Curitaba, Brazil,*** has been a world pioneer in the development of Bus Rapid Transit Systems and the coupling of transport and land use planning.
- ***Bogotá, Colombia,*** has implemented the Transmilenio project, resulting in emissions reductions from the scrapping of over 2,109 old public-service vehicles. In addition, the construction of bicycle pathways and pedestrian facilities along with other mass transportation system improvements have enhanced access to public transport and reduced private vehicle use.
- ***Guyaquil, Ecuador,*** was presented with the Sustainable Transport Award at the Transport Research Bureau, in Washington, DC, in 2007, for its innovative Bus Rapid Transit (BRT) design.
- ***Mexico City, Mexico,*** has targeted the construction of 200 km of additional BRT corridors in the next 5 years. The additional corridors will complement the current 50 km BRT system.

Figure 4a

4.2 Accelerating Development and Use of Clean Vehicle Technologies and Fuels

Clean Vehicles and Fuels Standards, Incentives, and Programs

Typically, standards are necessary to effectively move a country toward clean vehicles, both existing and new, along with the attendant clean fuels. Standards must be effectively implemented and enforced if a program is to be successful in reducing pollution from vehicles. Several LAC countries and cities have made great strides in adopting stringent standards to move toward low-sulfur fuels and clean vehicles (Figure 4b). Additionally, many cities have successfully demonstrated voluntary retrofits of diesel trucks and buses, and simultaneously provided the necessary low-sulfur fuels. Making low-sulfur fuel available in these areas also opens their markets to the newest cleanest vehicles. Having adopted clean vehicle and fuel standards and/or having established successful voluntary programs, these countries/cities can share their experiences with others in the LAC region, providing workshops and training to foster initial development.

Despite the achievements made by many LAC countries and cities, old technology and high polluting vehicles persist in the regional fleet, causing the vast majority of today's emissions. With the dramatic increase in new car sales, if those vehicles do not comply with the most stringent standards, they could become the gross polluters of the future.

Clean Fuels and Vehicles Successes in LAC Cities

Projects

- ***Santiago, Chile,*** has introduced natural gas buses and retrofitted numerous trucks with diesel particulate filters. The city requires 50 ppm sulfur content in diesel fuel.
- ***Mexico City, Mexico,*** achieved 98 percent reduction of fine particulates in its retrofit of city buses, using 15 ppm diesel fuel.

Standards

- ***Chile*** is operating under Euro III* standards.
- ***Brazil and Argentina*** under Euro II* and moving to Euro III.
- ***Mexico*** has adopted clean diesel and fuel standards comparable to the United States under an extended schedule, to be phased in.
- ULSD is now available in ***Mexico's*** northern border region.

* See Summary of Euro and EPA Standards in Appendix II

Figure 4b

Ultra-Low and Low-Sulfur Fuels

Fuel specifications relative to sulfur levels vary widely among LAC countries and are still not sufficiently regulated in most. For example, the sulfur content of diesel in Latin America varies widely from 5,000 ppm in Venezuela to 15 ppm in the northern border cities of Mexico (PCFV 2007). Cities offering low-sulfur fuel take recognize that new clean and retrofitted vehicles are dependent upon low-sulfur fuel to operate cleanly. The critical need to couple clean vehicles with clean fuels is underscored by the Partnership for Clean Fuels and Vehicles adoption of a world-wide target of 50 ppm in 2005 (Figure 4c).

With regard to older diesel vehicles, several LAC cities have been successful in demonstrating impressive reductions from diesel vehicles that have been retrofitted. Equipping these vehicles with sophisticated control technologies (such as diesel particulate filters), coupled with the use of ultra-low or low-sulfur fuel, can reduce fine particulates by up to 90+ percent. Successful demonstrations can provide the catalyst for expanding retrofit programs where low-sulfur fuel has been made available.

The Clean Vehicles and Fuels Connection

Diesel vehicles retrofitted with, and new vehicles that contain, advanced emissions control systems, such as diesel particulate filters (DPFs), must be fueled with low-sulfur diesel (50 ppm or below).

- These emissions control systems can be severely compromised or made totally ineffective if low-sulfur fuel is not used.
- Fouled emissions control systems on diesel vehicles can emit fine particulate matter in the same volume as an older uncontrolled vehicle.
- From the transportation sector, emissions of fine particulate matter pose the greatest health concern.

The newest gasoline vehicles are equipped with control systems for NOx, a precursor to ozone, which causes serious respiratory illnesses. These control systems can be significantly damaged by fuel with higher than an average of 30 ppm sulfur.

Figure 4c

Alternative Vehicle Technologies and Fuels

A variety of clean vehicles and fuels, whether conventional or alternative, are either available today or anticipated in the relatively near future. For example, fuels containing low- and ultra-low sulfur levels and ethanol are currently being used in many countries, as is natural gas. Other biomass and innovative alternative fuels, such as used cooking oil, are being tested, many with promising results.

Hybrid vehicles, as well as fully electric cars, are seen in greater numbers on the roadways, achieving significantly greater miles/liter than conventional vehicles. Decreased miles per liter translate to fewer emissions. The United States Environmental Protection Agency (USEPA) is currently road-testing its hydraulic hybrid, expected to realize even greater efficiency. Alternative clean diesel engines are being developed, designed to burn fuel more cleanly. Many laboratories continue working to make fuel-cell and other advanced technology vehicles viable.

4.21 Proposed Opportunities and Solutions

CAI-LAC members have identified the following potential opportunities and solutions for improving the use of clean vehicle technologies and fuels in LAC cities.

- ***Upgrade and Enhance Existing Fleets:*** The reduction of emissions from in-service vehicle fleets requires a combination of practices, including proper inspections and maintenance, installation of emissions control systems where appropriate, modernization of the fleets, transition to cleaner fuels, and implementation of control measures related to imported used vehicles, all of which are discussed below.
  - Promoting the establishment of regulations and incentives to require and/or encourage the modernization of existing vehicles is needed to achieve low emissions and high efficiency. Development of detailed mechanisms and instruments is necessary to make the retrofitting and/or upgrading emissions control systems of existing vehicles viable. The experiences in Mexico, Chile, and Brazil indicate that relatively newer (model year 1994 and later in the United States) diesel trucks and buses with electronic emissions control systems can reduce 90 percent or more of particulate matter emissions after retrofitting with Diesel Particulate Filters (DPFs) and using low-sulfur diesel fuel.

  - Development of regulations and appropriate incentives is the first step in supplying low-sulfur fuels to countries or localities. Making low-sulfur diesel and gasoline fuels available will require capital upgrades of refineries in most cases. While upgrades are in progress, fuels may need to be imported from countries already supplying low-sulfur fuels. It is important to work closely with refiners and distributors to ensure that dedicated clean pipelines and trucks are used to transport the low-sulfur fuels, and that fuel is tested at its final destination. Service stations where consumers purchase their fuel need to segregate low-sulfur fuels from others in clearly labeled pumps. Once vehicles with the new emissions control devices enter the market, compliance assistance, close scrutiny, and active enforcement are necessary to ensure that these vehicles are fueling only with low-sulfur fuels.

  - For existing vehicles to achieve an appropriate level of environmental and energy efficiency performance, they must be properly maintained. This involves implementing a system for vehicle emissions inspections, which uses high-volume, centralized installations exclusively for vehicle inspection. Mexico City, Quito, and Santiago, among others, have successfully carried out such programs. These cases serve as examples of systems that include design, operation and evaluation of

vehicle inspection and maintenance in the LAC region. Detailed information derived from their experiences, such as technological factors, measurement methods, testing procedures, and compliance with and enforcement of established norms, will further inform other countries and provide models for consideration when developing similar systems.

- The unchecked importation by LAC countries of vehicles that are discarded by developed countries constitutes one of the most serious emerging air quality problems in the region. These vehicles, which are often older and have not been well maintained, emit high levels of conventional air pollutants and greenhouse gases and add to the ever increasing number of vehicles in LAC cities. Consequently, the strengthening of regulatory and economic instruments is necessary to ensure that the imported vehicles conform to the emissions requirements of the respective countries and localities.

- ***Phase-in Clean and Efficient New Vehicles:*** Latin America can take advantage of economies of scale in the automobile and oil industries through the introduction of advanced and more energy efficient emissions control systems and technologies. The phase-in of clean and efficient new vehicles and the accompanying clean fuels can be accomplished by:
  - Introducing cleaner and more efficient new motor vehicles that conform to world-class standards in combination with clean fuels. This entails commitments by manufacturers throughout the LAC region to ensure that all new vehicles will meet emissions standards under normal operating conditions. Establishing a methodology aligned across the LAC region for the certification of new vehicles, based on a maximum emissions level, will augment those commitments. Given the health risks associated with fine particulate matter, it would be prudent to focus initial efforts on heavy-duty diesel vehicles. In developing the methodology, air quality officials could benefit from reviewing and considering aspects of the emissions regulations of Mexico, the United States, Canada, the European Union, Japan, and other countries.

  - Introducing diesel fuels with a maximum sulfur content of 50 ppm throughout the entire LAC region by 2010 at the latest, in accordance with the conclusions and recommendations of the Conferencia de Azufre en Combustibles (Conference on Sulfur in Fuels) held in Quito, Ecuador in March 2007, and sponsored by Alianza de Combustibles y Vehículos Limpios (the Partnership for Clean Fuel and Vehicles, or PCFV). Appendix III contains a summary of the outputs and recommendations from this conference. See also the discussion under the previous section on upgrading and enhancing existing fleets regarding the availability of low-sulfur fuel, CAI-LAC is a PCFV member.

  - Establishing requirements for fuel conservation in new vehicles sold in LAC countries. Standards could call for a visible manufacturer's label identifying average fuel consumption, energy efficiency, and tailpipe emissions of new vehicles. Educating and providing incentives to the public regarding choices in modes of transportation and on energy efficient, low-emitting driving habits is an important aspect of advancing vehicle efficiency.

  - Supporting the evaluation of technical, environmental, economic, and social viability of using bio- and synthetic fuels, and hybrid, electric, and hydrogen fuel-

cell vehicles. This includes assessing life cycle impacts of employing the particular technology/fuel and the potential for domestic and regional markets, in addition to considering the costs and benefits to the country or locality. Widespread fuel supply and repair/maintenance support are integral factors in making a decision to adopt an alternative fuel and/or technology.

- Participating in technical and financial assistance programs supported by various donors and international development organizations and agencies to broaden the effective use of more appropriate and advanced technologies, and expand capacity building. This could in turn help to remove barriers and introduce financial means and attendant policies that could facilitate the development of markets, while preventing and mitigating potentially adverse environmental and social impacts. The priority objective in collaborations between international development organizations and countries and/or localities is to build capacity and support policy building and implementation in such a way as to make the supported programs self-sustaining.

- Creating consortia to combine the purchasing power of cities can help reduce the prices of clean and efficient technologies and accelerate development of these markets.

4.3 Catalyzing Sustainable Energy Sources, Uses and Practices

In addition to sustainable transportation and clean fuels and vehicles, CAI-LAC has placed energy efficiency, access to low-carbon energy alternatives, and the acceleration of clean electricity generation on its agenda. Below is a discussion of the energy issues facing the LAC region, and potential opportunities and solutions for providing clean energy, while continuing to build a robust economy.

Demand-Side Issues

In developing countries, energy demand has been rising dramatically, driving an increase in power generation, accompanied by associated environmental and health impacts. At present, LAC countries depend heavily on oil and coal resources to fuel approximately 70 percent of their energy production. Based on current trends, by 2030, energy use in LAC countries is expected to double. Despite anticipated advances in alternative fuels and efficient technologies, an estimated 90 percent of the LAC region's energy supply is likely to come from fossil fuels in 2030 (IEA, 2005). Continued heavy reliance on these fuels makes LAC countries highly vulnerable to market variations. Moreover, growth in energy consumption leads to increases in emissions of air pollutants and greenhouse gases. These impacts take a heavy toll on the health and well-being of the population, as well as on the environment and the economy.

Supply-Side Issues

To meet the burgeoning energy demand of LAC countries, electrification (expressed as a percentage of households) increased from roughly 70 to almost 90 percent between 1990 and 2003, (IEA, 2002 & 2005). This figure, however, is not consistent across the LAC region, as 30 to 50 percent of the population in the poorest countries still lacks modern electricity services.
A large proportion of facilities that supply the electric power demanded in the LAC region use conventional technologies, such as coal or oil boilers. When not controlled, sulfur dioxide (SO_2), nitrogen oxide (NOx), particulate matter (PM) and mercury emissions from these boilers have serious impacts on human health and the environment. Furthermore, it is estimated that these

conventional power plants lose between 40 and 65 percent of energy generated as heat, exacerbating production inefficiencies.

Numerous combinations of technological controls and fuel choices can minimize emissions, both in new plants and in the retrofit of existing facilities. However, only a small number of electric utilities in LAC countries have installed such control equipment. Furthermore, very little knowledge exists regarding current power plants, such as types of boiler and fuel, capacity, emissions, etc. A comprehensive inventory is necessary to understand the status of these plants and to establish accurate baselines. These baselines can then provide the foundation from which decision makers can identify the heaviest polluting facilities and determine the optimal technologies for controlling emissions.

A recent study carried out in Canada, the United States, and Mexico concluded that power plants using state-of-the-art emissions control equipment are achieving greater than 90 percent reductions of NOx and SO_2, and significant reductions in mercury, demonstrating that the power industry in North America has the capacity to achieve substantial improvement in environmental performance while meeting the energy needs of a growing economy.

Emissions of CO_2, a greenhouse gas released during fossil fuel combustion, pose a difficult challenge for government and industry. To reduce these emissions requires a combination of strategies that take into account clean and efficient fuels and technologies, such as combined cycle units and renewable power sources like wind, solar, landfill gas, and small hydro.

Proposed Opportunities and Solutions

Market policies that favor the use of clean energy, improvement of energy efficiency, and commitment to conserving energy are keys to ensuring the most environmentally sound and cost-effective electricity generation. Equally important is the consistency of government policies associated with pollution from utilities at the national, state, and local levels. Increased access to clean energy and the promotion of energy efficient practices could allow for large savings in LAC economies, all the more so as countries gain greater competitiveness and, thus, stimulate their economic growth. CAI-LAC and its members have identified the following potential opportunities and solutions for addressing these challenges:

- ***Increase Energy Efficiency:*** Significant potential exists for conserving energy in LAC countries, by employing a variety of technological solutions. LAC cities need to broaden information access related to energy efficiency. Additionally, technical and financial assistance is often necessary to allow for optimal improvements in efficiency in LAC priority sectors. LAC countries need to:

  - Develop and implement standards for energy efficiency; institute efficiency ratings and labels for consumer goods, and provide tax and other economic incentives.
  - Improve efficiency options, methodologies, and applicable practices.
  - Increase voluntary energy efficiency assessments on new projects or current energy-intensive sectors.
  - Obtain voluntary commitments to increase efficiency from the industry sector;
  - Increase research and development and foster cooperation on developing energy efficiency programs.
  - Increase consumer and industry energy conservation awareness campaigns.

These efforts could constitute the basis of a LAC regional action plan for energy efficiency, while catalyzing better environmental performance within industry.

- ***Increase Access to Low-Carbon Energy Alternatives:*** International cooperation plays an important role in terms of securing clean, safe, and accessible energy. The following activities can be carried out jointly with international development organizations and interested countries to expand the use of efficient, clean energy across the LAC region:

    - Facilitate consensus-building to encourage transition to a low-carbon economy, along with mobilization of necessary funds.
    - Share information among stakeholders in LAC and other countries on current information pertaining to the use and benefits of alternative energy sources (bio-fuels, hydrogen, natural gas and liquid propane, and electric and hybrid vehicles, to name a few).
    - Explore the potential for using renewable resources to meet energy needs in Latin American countries. Related policy instruments that could be considered are: reduction in regulatory, institutional, and financial barriers for the use of alternative energy; establishment of incentives; and improvement of the policy framework to attract and increase such investments in renewable options.
    - Provide tools with which to conduct life cycle analyses to assess costs, benefits, and risks of various alternative options. Comparative assessments would consider the life cycle results associated with each option being explored, along with economic viability at all levels.
    - Promote and strengthen the political and institutional framework for long-term development plans, including the formulation of laws and regulations that encourage and/or reward the use of renewable energy and energy efficiency.
    - Develop training programs, guidance manuals, and analytical tools to support the operational implementation of renewable energy projects in the region.

- ***Accelerate Clean Electricity Generation:*** With the significant increase in electricity demand over the next several years in LAC countries, it is extremely important that nations and cities:

    - Ensure that power plants minimize emissions and maximize efficiency from the planning and design phase forward.
    - Develop an inventory of all existing power plants in the LAC region, to include information on type of facility, capacity, fuel use, emissions control equipment, and associated emissions by pollutant/greenhouse gas, etc., which would not only provide a full picture of the state of the LAC region's power plants, but also aid in establishing clear baselines from which to reduce emissions.
    - Explore, among pollutant control technologies, the capture and geologic storage of carbon to reduce CO_2 emissions associated with the use of fossil fuels in electricity generation. This technology, one of several means of carbon sequestration, redirects the CO_2 that would normally be released to the air into underground repositories, where the greenhouse gases will be contained.

These opportunities and potential solutions do not constitute an exhaustive list. However, they do provide an initial guide for addressing the challenges of decreasing emissions and increasing efficiency while meeting the tremendous projected growth in energy demand. The Clean Air Institute aims to serve as a resource by offering both policy and technical assistance and by facilitating collaborative and productive partnerships to plan, develop, and implement viable energy solutions.

5. Financing Opportunities and Resources

Sustained efforts to improve air quality and reduce greenhouse gas emissions face a number of financial barriers, among others, in the LAC region. Governments, both local and national, juggle numerous competing demands in the face of scarce resources. Because air quality and greenhouse gas emissions reductions are not viewed as top priorities by local and national governments, sustainable transportation, clean fuels and vehicles, and clean, efficient energy issues are often given minimal recognition when developing their budgets. Therefore, incentives to improve transportation and energy sustainability and to provide clean fuels and vehicles are rarely available in LAC countries.

Private investors are often reluctant to take the financial risks often associated with such projects. At the international level, coordination is often limited among development organizations and bi-lateral donors, and in many cases, resource allocations do not complement one another across organizations. Proper coordination will ensure better use of resources, higher levels of funding, and development agendas that maximize project success and ultimately lead to significant environmental, health and economic benefits.

The Clean Air Institute will serve as a convener and facilitator in promoting better coordination among the various stakeholders in the LAC region. Moreover, by bringing together appropriate experts, fostering the establishment of networks, developing guidance, and sharing a variety of tools, CAI can assist LAC cities, not only in securing program funding, but also in working toward program self-sufficiency. To play an effective role in assisting LAC countries and cities to accomplish the objectives outlined in this strategy, it is critical that the CAI also be financially sustainable.

Facilitating Financial Sustainability of CAI-LAC Efforts

The Clean Air Institute will provide guidance to governments in working toward self-sustaining air quality and greenhouse gas emissions reduction programs by:

- Fostering the development and implementation of integrated, cost-effective pollution control strategies and action plans.
- Promoting tools for development of business models to accelerate clean and efficient technologies.
- Promoting an increase in understanding of the LAC market.
- Enhancing transparency and competitiveness in related policy, programs and projects.
- Encouraging public-private partnerships to effect air quality and greenhouse gas emissions reductions at the local level.
- Facilitating the pursuit of innovative financing mechanisms, such as local and national revolving loan funds, low-interest loan programs, matching grants, tax and other incentives, etc.
- Fostering effective leveraging of resources from other donors and investors.
- Strengthen existing CAI-LAC networks and establish new lines of communication.

Figure 5

Opportunities

To ensure the sustainability of the CAI-LAC efforts, the Clean Air Institute aims to improve coordination of local, national and international efforts and resources by:

- Promoting the development of regulatory and institutional capacity, which will afford governments the necessary policy framework within which to plan, budget, and implement effective programs, as well to ensure enhanced compliance and enforcement;
- Recognizing air quality, climate change and related issues as high priorities in local and national agendas, which must be the first step in attracting funding assistance;
- Developing pilot projects and business models, with a dual focus on ensuring viable projects, best practices and successful results, and fostering outside investment that will facilitate achievement of those results;
- Supporting the efforts of cities and countries to maximize funding opportunities and generation of resources (Figure 5).
- Fostering coordination among international donors to promote complementarities and efficiencies, avoid duplication, and ensure better use of resources.
- Facilitating movement toward self-sustaining air quality and greenhouse gas emissions reduction programs.

Articulation of the CAI-LAC Strategy is a first step in identifying the myriad roles that CAI-LAC and the Clean Air Institute could play, each of which provides tremendous benefit to those with a stake in reducing air pollutant and greenhouse gas emissions in LAC countries and cities. To effectively implement the strategy, the CAI must achieve financial sustainability. The Clean Air Institute will work closely with CAI-LAC members and potential donors from all relevant sectors to explore, among others, collaborations, networks, programs, and financial and in-kind resource support.

As discussed in Chapter 1, stakeholders serve to benefit from their support and partnership in numerous ways. City governments and others will benefit directly through the services and products of the CAI-LAC, which will provide greater knowledge and capacity for municipalities as a whole. Development banks, foundations and interest groups will benefit from collaborations with the Clean Air Institute by addressing unmet demands for investments in infrastructure and interventions that lead to cleaner air in LAC urban areas. The private sector will benefit from broadened visibility, an improved business environment, and increased demand for goods or services associated with reducing these emissions in the LAC region. Academic institutions benefit through robust research opportunities and networks and fora in which to share research results.

Appendix I

Declaración de Sao Paulo

Los integrantes de la Iniciativa de Aire Limpio para las Ciudades de América Latina, formada por gobiernos, iniciativa privada, instituciones de investigación, organizaciones no gubernamentales y agencias internacionales de desarrollo, se reunieron en Sao Paulo para compartir información y experiencias sobre los profundos desafíos enfrentados por el sector transporte y la relación con la calidad del aire urbano y el fenómeno mundial de cambio climático.

La circulación de bienes y personas es esencial para el desarrollo económico y el bienestar social de las ciudades. Pero demanda grandes cantidades de energía y espacio y contribuye para los graves problemas de contaminación atmosférica urbana y el cambio climático mundial, con la participación mayoritaria de los automóviles de uso particular. Los habitantes de las ciudades latinoamericanas constantemente manifiestan la legítima aspiración de mejorar su calidad de vida. Uno de los primeros pasos para enfrentar ese desafío es la adopción de un sistema de transporte público de alta calidad, eficiente y limpio que permita reducir el tiempo de traslado, aumentar la seguridad pública, mejorar el paisaje urbano y disfrutar de aire limpio. Actualmente, un 75% de la población de América Latina ya vive en ciudades. Se estima que en el 2030 casi un 90% de la población de la región será urbana. América Latina ya posee la experiencia acumulada de proponer una reconfiguración urbana sustentable donde la calidad de vida de las personas y la preservación del medio ambiente sean un eje central del desarrollo.

Diversas ciudades, zonas metropolitanas y megalópolis de América Latina han creado sistemas integrados de transporte y programas de combate a la contaminación del aire que han sido ejemplares a nivel mundial, cuya reproducción y expansión enfrentan hoy nuevos desafíos debido a la creciente densificación urbana y del cambio climático. Por este motivo declaramos:

1. Las ciudades de América Latina necesitan orientar su planeación urbana para alcanzar una ordenación territorial que facilite la circulación de bienes y personas, evitando la expansión desarticulada y fomentando una densidad sustentable.
2. Desarrollar sistemas de transporte masivo que logre posicionarse como una alternativa de movilidad atractiva.
3. La utilización del sistema vial de las ciudades debe dar prioridad de circulación al transporte masivo, para hacer un uso más eficiente de la energía y una mayor agilidad al desplazamiento de grandes volúmenes de pasajeros.
4. Todos los sectores de la ciudad se benefician con un transporte ambientalmente sustentable, por lo que los costos necesarios para la modernización y mejoría tecnológica deben ser repartidos por toda la sociedad.
5. Es fundamental la coordinación de las políticas de inversión definidas por las esferas de gobierno a nivel nacional y local, de tal forma que se garantice la maximización de los recursos. Esta integración debe extenderse a los diferentes sistemas de transporte público y privado, asegurando conexiones física, operacional y tarifaria, de tal forma que se reduzca tiempo, distancia y costos de los trayectos. El aumento de la eficiencia del transporte público reducirá el uso del automóvil individual, disminuyendo la contaminación ambiental y las enfermedades relacionadas.
6. Los sistemas de transporte deben utilizar combustibles y tecnologías progresivamente más limpias, haciendo un uso cada vez mayor de energías renovables para reducir simultáneamente las emisiones de gases de efecto invernadero. Los combustibles con bajo contenido de azufre constituyen la puerta de acceso a vehículos más limpios, lo que hace urgente su disponibilidad y distribución a gran escala, comenzando por el abastecimiento controlado de las flotas de transporte público que operan con unidades movidas por diesel.
7. El establecimiento de normas más rigurosas de emisión de gases y partículas contaminantes para vehículos automotores nuevos y en circulación, asociado a acciones de fiscalización para su cumplimiento, con programas eficientes de inspección y mantenimiento, así como la definición de metas claras de calidad del aire y de su control, son indispensables para que las ciudades de América Latina puedan superar sus problemas de contaminación.
8. Los habitantes de las ciudades de América Latina quieren caminar y andar en bicicleta de una forma segura en un ambiente sano; los gobiernos locales requieren redoblar los esfuerzos para fomentar y apoyar los medios de transporte no motorizado.
9. Los efectos comprobados de la contaminación atmosférica sobre la salud pública y el cambio climático asociado a ella, requieren la construcción de un banco de datos conteniendo buenas prácticas de gestión de la calidad del aire que pueda propiciar una transferencia de experiencias exitosas para ciudades que buscan superar problemas semejantes.
10. Los mecanismos de flexibilidad del Protocolo de Kyoto, por el cual es posible obtener créditos de carbono que apoyan el financiamiento de proyectos de transporte sustentable, son alternativas que los gobiernos de las ciudades deben explorar con mayor intensidad.
11. Las ciudades de América Latina deben estimular y apoyar la participación de la población respectiva para incorporar y desarrollar las propuestas de la Iniciativa.

Las ciudades y organizaciones reunidas en Sao Paulo apoyan a la Iniciativa de Aire Limpio para las Ciudades de América Latina, pues ésta constituye un espacio de intercambio de información y experiencias que nos permiten trabajar de manera conjunta y ampliar la capacidad de respuestas regionales.

Queremos que la Iniciativa sea efectiva, referencia de buenas prácticas en políticas de movilidad principalmente en transporte y tránsito, intensifique la colaboración técnica existente y establezca indicadores de desempeño que permitan en un futuro próximo la definición de una estrategia común para asegurar aire limpio en todas las ciudades de América Latina. Igualmente proponemos la creación de un mecanismos de reconocimiento internacional – por ejemplo, instituyendo un premio de excelencia ambiental en movilidad – que estimule el esfuerzo que realizan nuestras ciudades y sus habitantes para alcanzar la sustentabilidad urbana de la región.

Sao Paulo, 27 de julio de 2006.

Summary of European and U.S. Emission Level Comparison Sheet

Part I. Light Vehicles

Reference emission level	Engine type	Europe						United States						
		Related standard No.	Period of application	Pollutant level				Related standard No.	Period of application	Pollutant level				
				Measuring unit: grams per km						Measuring unit: grams per mile				
				CO	CnHm	NOx	Particles							
Euro 1	Gasoline	ECE 83-02; EC 93/59	1993-1996	2.72	0.97		-							
	Diesel			2.72	0.97		0.14							
Euro 2	Gasoline	ECE 83-03-04; EC 94/12*96/69*98/69	1997-2000	2.2	0.5		-			CO	THC	NMHC[3]	NOx	Particles
	Diesel			1.0	0.7		0.08	Tier 1[4]	1994-2004[5]	3.4	0.41	0.25	0.4	0.08
Euro 3	Gasoline	ECE 83-05 (level A); EC 1999/102	2001-2004	2.3	0.2	0.15	-						1.0	
	Diesel			0.64	-	0.50	0.05			CO	NMOG	HCHO	NOx	Particles
Euro 4	Gasoline	ECE 83-05 (level B); EC 1999/102*2001/100	From 2005	1.0	0.1	0.08	-	Tier 2[6]	From 2004[7]	3.4	0.075	0.015	0.08	0.01
	Diesel			0.5	0.1	0.25	0.025							

Part II. Heavy Vehicles

Reference emission level	Engine type	Europe						United States						
		Related standard No.	Period of application	Pollutant level				Related standard No.	Period of application	Pollutant level				
				Measuring unit: grams per kW-h						Measuring unit: g/bhp·hr				
				CO	CnHm	NOx	Particles			CO	HC	NMHC	NOx	Particles
Euro 1	Diesel	ECE 49-02 (level A); EC 91/542	1994-1996	4.9	1.23	9.0	0.4							
Euro 2	Diesel	ECE 49-02 (level B); EC 91/542*96/1	1997-2001	4.0	1.1	7.0	0.15	US HD98	1998-2003	15.5	1.3	- - -	4.0	.10
Euro 3	Diesel	ECE 49-04 (level A); EC 1999/96	2002-2004	2.1	0.66	5.0	0.10	US HD04	2006-2006	15.5	1.3	NMHC+NOx 2.4/2.5		0.10
Euro 4	Diesel	ECE 49-04 (level B1); EC 1999/96*2001/27	2005-2007	1.5	0.46	3.5	0.02	US HD07	2007-2009	15.5	- - -	0.14	0.20/1.2	0.01
Euro 5	Diesel	ECE 49-04 (level B2); EC 1999/96*2001/27	From 2008	1.5	0.46	2.0	0.02	USHD10	From 2010	15.5	- - -	0.14	0.20	0.01

[3] NMHC = non methane hydrocarbons
[4] Standards in this line are Tier 1 50,000 miles over 5 years for passenger cars, other light-duty vehicles have slightly different standards
[5] Tier 1 Standards were phased in during 1994-1997
[6] Standards in this line are Tier 2 50,000 miles over 5 years, permanent bin 5 average. Standards have small differences between bins.
NOTE: Tier 2 standards also have sulfur requirements for both gasoline (30 ppm from 2005) and diesel (15 ppm from 2006).
[7] Tier 2 Standards are being phased in over 2004-2009. There are eight emission bins that make up the overall Tier 2 requirements.

Appendix III

Highlights of the South America Sulphur in Vehicles Fuels Conference

Organized by the Partnership for Clean Fuels and Vehicles and CORPAIRE
February 13-14, 2007

Outcomes

Major decisions from the conference include:

- Consensus by participants from Argentina, Brazil, Chile, Colombia, Ecuador, Uruguay, Venezuela, Suriname that a subregional target of 50 parts per million sulphur diesel is attainable by all countries by 2010–2012;
- Agreement to bring cleaner fuels and vehicles to the attention of regional political processes (including the Forum of Ministers of the Environment and regional mayoral summits);
- Continuation of the collection of clear and updated information on fuels and vehicles along with national plans and relevant stakeholders for dissemination to relevant institutions and forums; and
- Commitment to continued regional and national activities to develop specific timelines and plans for low sulphur fuels and vehicle standards (along with specific technology recommendations and research) in South America.

Recommendations and Actions

- Seek formalization of the subregion 50 ppm target, and cleaner vehicle standards and technology, through the next Forum of Ministers of the Environment Meeting and mayoral summits;
- The PCFV Clearing-House will cooperate with the UNEP regional office in Latin America to disseminate the outcomes and recommendations from the conference in regional forums, via communication to ministers and formal inputs from UNEP;
- CORPAIRE and UNEP will further update country information on fuel quality and vehicles and disseminate PCFV guidance on technical solutions for emissions control (including case studies);
- The PCFV will continue to expand its cooperation with ongoing initiatives in the region - including the Clean Air Institute/Clean Air Initiative for Latin American Cities (formerly of the World Bank), the International Council on Clean Transport (ICCT), and the Mario Molina Centers; and
- The PCFV will continue to support concrete and strategic cooperation projects in countries for low sulphur fuels and cleaner vehicles (for example, ongoing work in Colombia for low sulphur targets and further work in Ecuador).

Appendix IV

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