DEVELOPING DIESEL POLLUTION REDUCTION STRATEGIES FOR CITIES

BACKGROUND AND PROBLEM IDENTIFICATION

Burgeoning urbanization and motorization in megacities of Asia and Latin America has led to urban air pollution with substantial health consequences. Diesel combustion is a significant source of harmful pollutants that are damaging to human health in urban areas. While diesel engines are more efficient than gasoline engines, they are a disproportionate contributor to exposure of people to fine particulate matter (PM), the pollutant of primary concern in Asia and in the majority of Latin American cities.

Diesel emissions are complex, containing fine particulate matter, toxic organics, and harmful gases including precursors for secondary particulate and acid rain formation (e.g., NO_X and SO_X). A key air quality concern in developing countries is the health impact of fine and ultra-fine particulate matter. Millions of people in developing countries are exposed to concentrations of small particulate matter that far exceed internationally acceptable health-based standards. The PM emitted by diesel engines is very small, predominantly sub-micron in size which is the size fraction considered most damaging to health. These particles have hundreds of toxic chemicals adsorbed onto their surfaces, including many known or suspected mutagens and carcinogens leading to cancer, pulmonary and cardiovascular diseases. A large number of studies, in industrial and developing countries, have linked exposure to elevated levels of small PM to premature deaths, hospital admissions, and acute and chronic illnesses (Borja-Aburto et al., 1997; Castillejos et al., 2000; Cropper et al., 1997; Ostro, et al., 1996; Dockery et al., 1993; Dockery et al., 1992; Egger, M. and G. Davey Smith, 1997; Ostro, 1995; Pope et al., 2002; Pope et al., 1995; Samet et al., 2000).

Diesel emissions, and their corresponding health effects, are higher in developing countries than in industrial countries due to poor or lack of vehicle maintenance, improper vehicle repair, use of older vehicle technology, low fuel quality, fuel adulteration, lack of monitoring and enforcement of standards, and poor institutional capacity for coordination of policies across sectors that affect diesel emissions.

WHY FOCUS ON IN-USE DIESEL VEHICLES?

Diesel vehicles are normally not the largest component of a city fleet. However, despite often smaller in number than gasoline vehicles, diesel vehicles contributions to PM emissions from mobile sources. In Bangkok, it is estimated that diesel vehicles, while comprising less than 10% of the vehicle fleet, contribute 89% of emissions of PM_{10} (particles smaller than 10 microns) from vehicles. Data from other

PM_{10} from Vehicles in Bangkok, 2000

Diesel vehicles	**(89%)**
Light duty trucks	(31%)
City buses	(30%)
City trucks	(23%)
Long haul trucks and buses	(5%)
Gasoline vehicles	**(11%)**
Motorcycles	(10%)

cities shows a similar pattern. The health impact of PM emissions is determined by exposure to elevated ambient concentrations of small PM, to which diesel emissions are a significant contributor. To the extent that fuels and new vehicles are getting cleaner, diesel emissions in the future are expected to decline on a per vehicle basis. However, emissions from in-use diesel vehicles continue to remain high, and low vehicle turnover rates in developing countries mean that in-use vehicles will contribute significantly to urban particulate air pollution. The combination of existing vehicle fleet characteristics, robustness of diesel engines, and low tax on diesel fuel are most likely to ensure that diesel will continue as the engine of choice for a large fraction of vehicles well into the 21st century.

In the area of air pollution from mobile sources, many cities have taken some significant steps to improve urban air quality—particularly with regard to banning lead in gasoline and tightening standards for two-stroke engines across Asia. As such, emissions from diesel vehicles are probably the most important next challenge facing cities with serious particulate air pollution in developing countries today. There have been moves to replace diesel with CNG, but almost universally not on a scale large enough to make a significant impact on particulate air pollution. Aside from such fuel switching, efforts have not been directed at addressing diesel emissions, especially from in-use vehicles among which all gross polluters are found. Therefore, measures to address emissions from in-use diesel vehicles are of increasing importance in urban air quality management.

Relationship to the Millennium Development Goals (MDGs)

International agencies have agreed to work together on specific goals to be accomplished by 2015. Resolving the issues and externalities related to diesel vehicle use in cities would contribute to the achievement of these goals in developing country cities. The effects of urban air pollution, including that from diesel emissions, disproportionately affect the poor who spend more time outdoors and often live along the traffic corridors. The health impacts of fine particulate matter, mentioned earlier, contribute to infant and adult morbidity and mortality. At the same time, affordable urban transport systems are essential for the access of poor to livelihood opportunities and basic services in cities. Environmental sustainability in the urban transport sector will need to be achieved by reducing its negative externalities while improving the affordability of the system to protect the poor. This program will build effective partnerships with other development agencies and local stakeholders to achieve these goals, and enhance the understanding and capacity of the involved agencies.

Previous Knowledge and Experience

In developing country cities, the available information on overall fleet characteristics, fuel use, emissions, and PM impact on health is limited, making it difficult to assess alternative policy and technical control measures. Traditional analysis and interventions, with partial data, have all too often focused on technical control options without due attention to cost-effectiveness, minimal conditions needed for successful implementation, stakeholder acceptability, or broader policy issues. In order to obtain cost-effective and sustainable results, linkages between, and pre-requisites for, the policy and technical options need to be established. There is a need to develop a better understanding of the factors that influence the emissions

and selection of control options in the context of the political economy of developing countries. This proposal aims to fill this critical knowledge gap to assist cities in making more informed, effective, and sustainable decisions. Such a comprehensive approach is needed to avoid the narrow and *ad-hoc* selection of options that appears to be prevalent today.

Swisscontact's Clean Bus Program in Jakarta during 1999-2000 documented the impact on emissions of vehicle maintenance, mechanics training, and driving habits prevalent in developing countries. They reported 30% average opacity reduction after vehicle service. Average fuel savings based on regular maintenance alone were 5%, rising to 15 to 30% when driver training benefits were added. Most (83%) of the corrective actions did not result in additional out-of-pocket expenses, except labor cost for such steps as cleaning air filters, adjusting injection nozzle pressures and correctly setting injection timing. In addition, regular maintenance contributed to improved vehicle performance including extension of the lifetime of the engine (Swisscontact Final Report Clean Bus Program 2001). The positive impact on emissions of fleet and engine replacement has been demonstrated by the New York City Transit (Lowell 2002).

A survey of over 400 Bangkok buses by Kasetsart University during 2001 indicated that a large number required overhauling of the injection pump and replacement of the injection nozzle which would result in significant emissions reduction. A small percentage required an engine overhaul in addition. The extent to which these repairs reduced smoke emissions was not evaluated. Pollution Control Department in Bangkok is planning to conduct further studies to document benefits of maintenance and diesel emissions control devices. Similar benefits for maintenance and repair of diesel vehicles have been observed and documented in Australia (www.nepc.gov.au/pdf/diesel_01/Pilot_Study.pdf & www.nepc.gov.au/pdf/diesel_01/Pilot_Study_Appendices.pdf).

A recent study by Clark et al. (2002) in the United States showed that vehicle age and driving cycles have a larger influence on emissions from diesel vehicles than other factors such as exhaust treatments and fuel quality (Remember: the study is based on existing US diesel quality and technology). Further information is needed to represent real-world operation, as well as the expected contribution of older diesel technologies currently in use in most developing countries. The implementability of these measures and the impact of different policy options to reduce emissions from the overall fleet in a city were not discussed in this study. However, the results of the study seem to indicate that traffic management policies such as giving priority to buses through dedicated bus lanes, or measures that accelerate fleet renewal and lower the average vehicle age, can reduce emissions substantially.

OBJECTIVES

The overall objective of this program is to gain a better understanding of factors affecting in-use diesel vehicle emissions, quantify them where possible, and assess alternative mitigation options to assist decision making in developing countries. To this end, the program seeks to:

1. obtain city-specific data related to diesel emissions;

3. identify and evaluate control options for in-use vehicle and new vehicles;
4. develop analytical and information tools to assist decision making; and
5. develop and implement a dissemination strategy to enable replication of the methodology and lessons learned to other cities.

Diesel management strategies and action plans will be developed with local and international expertise, recognizing the local political, social, and implementation realities in developing countries. They will provide a basis for launching a longer-term integrated air quality management program in a selected city. To achieve these objectives, it is critical that an extensive and appropriate knowledge base, along with analytical tools, be developed to evaluate key technical and policy interventions.

Diesel-focused analytical and information tools will be developed under this project that incorporate the institutional framework and capacity, regulatory and economic instruments, and technical and transport management measures. These tools should help decision makers assess economic, financial, environmental, and political implications and feasibility of different strategies.

Effective implementation of the program results will require building capacity among counterparts at all levels, having them gather data and information, and perform systematic analysis. The databases created for this program will also be made available to other projects and programs to maximize their use and encourage collaboration among sectors and agencies.

BENEFICIARIES

City, regional, and national agencies in developing countries that face diesel emission problems will be the direct beneficiaries through an enhanced knowledge-base and access to expertise under this project. The analysis of cost-effective solutions and affordable measures for addressing diesel vehicle emissions would lead to a more holistic and integrated approach, increasing chances of successful implementation in developing cities. The capacity building of individual staff, through face-to-face training, distance learning programs, participation at the city-specific workshops, and the networking opportunities will engender greater knowledge and capacity-building for the city government. Other city governments will also have access to the outcomes and tools developed by the study, allowing innovative thinking for sustainable solutions for air pollution from diesel emissions in their own cities.

Collaboration will be established with other organizations that are working on related issues. As an example, the Health Effects Institute (HEI) will start a program on health impacts of fine particulate matter in selected Asian cities, which will be linked to the Clean Air Initiative and this program.

The World Bank and other development agencies will also benefit through a better understanding of the key issues that need to be addressed for greater internal cross-regional and cross-sectoral communication on diesel pollution management, enabling the shared knowledge and lessons learned to be incorporated into current and new Bank projects, programs, and other analytical and advisory activities.

SCOPE OF WORK

The scope of work for this program includes the selection of a city followed by development of city-specific databases relating to diesel emissions from in-use vehicles (component 1), analysis of policy and technical options to reduce these diesel emissions (component 2), and stakeholder evaluation, development of action plans and dissemination (component 3).

City Selection

The program selected Bangkok for the first pilot. Primary data and information will be gathered by conducting surveys and studies in three main sectors (transport, environment and energy). These will be carried out in the context of active Bank and other donor and local programs in the Bangkok.

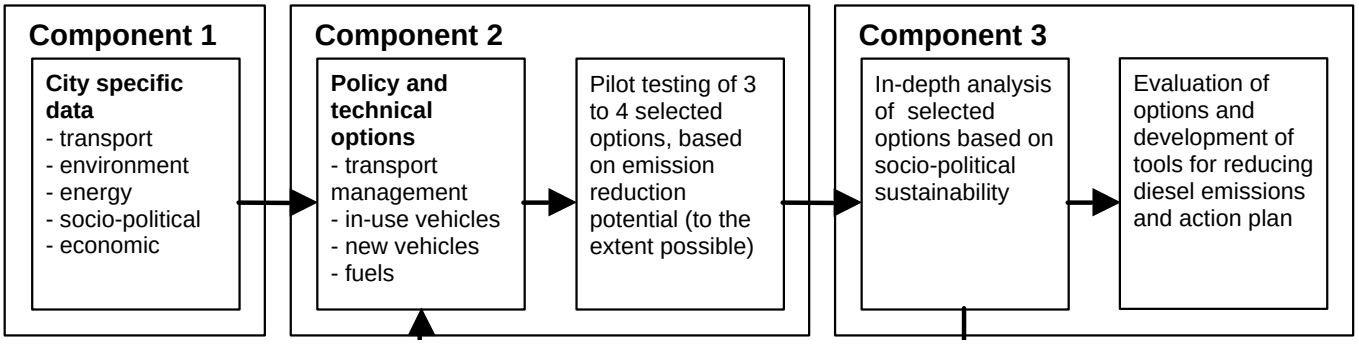
The selection of Bangkok and possibly other cities in the future, includes the following criteria:

- Air pollution is a serious concern and monitoring data is available
- Transport is a significant contributor to air pollution
- Diesel is a significant contributor to particulate emissions from mobile sources
- Some basic information exists on air quality data, emissions inventory, vehicle fleet characteristics and traffic patterns
- The World Bank or other agencies are engaged in active policy dialogue in the transport, environment, or energy sector
- ESMAP source-apportionment and other studies are being undertaken by partners
- Local knowledge and capacity exists to assist the project team in gathering and analyzing data, and studying affordable and effective options to abate diesel emissions within the local context
- Local champions (technical, government, NGOs, etc.) exist that are willing and committed to resolve the diesel emissions and air quality management issue
- Local government capacity and willingness exists to absorb the policy, technical and financial assistance effectively (*this would be considered a key for success*)
- The city is suitable to be a prototype for other cities in Asia and Latin America

The program will focus on making appropriate institutional arrangements in the selected city to carry out the activities. Once the city is selected, local government and relevant agency commitments, including co-financing, will be obtained in writing.

The program will consist of three main components (see below):

Developing Diesel Pollution Reduction Strategies for Cities



Component 1: City-Specific Database

The first component of the program will focus on gathering existing information and data relating to diesel emissions. The program will assemble databases covering the following three sub-components: (1) collect data on ambient fine particulate matter ($PM_{2.5}$); (2) quantify factors that affect mass PM emissions from diesel vehicles, with the data to be used later to develop an emission inventory; (3) assess the current transport, environment and energy policy framework that affects diesel vehicle emissions in the selected city. The 3 sub-components are somewhat independent, can be undertaken in parallel, and will be started as soon as possible.

Sub-component 1. Collect data on ambient fine particulate matter ($PM_{2.5}$)

The objective of this component is to verify the level of ambient $PM_{2.5}$ and PM_{10}. $PM_{2.5}$ is preferred since PM_{10} often contains a significant fraction of geological matter which is likely to have a much smaller health effect. In contrast, $PM_{2.5}$ is dominated by anthropogenic sources of particulate emissions. This will be accomplished by gathering and reviewing existing data and where needed, collecting additional data in partnership with local institutions and other programs.

Sub-component 2. Estimate diesel vehicle emissions

The objective of this sub-component is to estimate PM emission factors for different diesel vehicle types under conditions more representative of “real-world” conditions with the objective of estimating overall emissions. To this end, the following tasks will be performed:

- Collect and evaluate existing data on the modal share of different vehicle types, age and mode of operation.
- Conduct surveys on vehicle fleet utilization by type, by fuel, by age, and by mode of operation to supplement the existing data. The magnitude and scope of the survey will depend on what data are already available. The information on vehicles not registered in the city, but that spend a fair amount of time in the city (such as delivery trucks), is unlikely to be available and will most probably require a survey.
- Establish a limited number of diesel vehicle emission factors. Obtaining statistically significant emission factors for use in an emissions inventory will be time-consuming so that parameters to be tested need to be selected carefully and minimized in number. The important parameters include:
    1. Vehicle categories: passenger cars, vans, small delivery vans, heavy duty trucks, heavy duty buses. Coverage will be limited to the two or three categories that are most prevalent.
    2. Vehicle model year (MY): different MYs will correspond to different vehicle technologies. About 3 different vintages will be selected.
    3. Tuning and condition of different vehicle parts: vehicles will be tested out of tune (e.g., incorrect injection timing, air-to-fuel ratio, injector pressure setting) and after tuning. For this, only one vehicle in each category will probably be selected.

- Based on the work already done worldwide, assess how best to identify gross PM polluters. Carry out a limited amount of additional work, if that could answer specific questions leading to a more refined recommendation. To this end, quantify the variation across different testing technicians, test centers and instruments (of the same make, and of different makes if different makes are used). Make recommendations for improving reproducibility.
- Identify large fleets and the potential for emissions reduction through improved maintenance.
- Develop an emissions inventory for diesel vehicles, and feed the results back to a larger program building a city-wide emissions inventory working in partnership with the environment agency.

Sub-component 3. Current Policy Framework which Affects Diesel Vehicle Emissions

The objective of this sub-component is to understand the policy backdrop for the three sectors (transport, environment, and energy) that affect current diesel vehicle emissions and help understand -- and ultimately recommend -- the most viable options for the future. The following tasks will be carried out:

- Collect information on the state of the public transport sector, traffic management, demand management, regulation of transport operations, urban planning and mass transit policies as they relate to diesel vehicle emissions, and possible reduction options;
- Collect information on the current vehicle taxation policy which may be encouraging diesel vehicle ownership;
- Collect information on the pricing structure of gasoline, diesel, kerosene and natural gas, and the causes of diesel fuel adulteration if it exists;
- Collect information on the supply of lubricants and diesel fuel;
- List alternative vehicles and fuels policies under consideration.

Each of the above five tasks in this sub-component in turn are largely independent, so that they can be carried out in parallel. The information and data will be used as an input to analyze various feasible strategies for reducing emissions from diesel vehicles.

Component 2: Analysis of Policy and Technical Options to Reduce Diesel Emissions

The second component of the program will study the emission reduction potential of a number of policy and technical options. Case studies which would be useful to decision makers will be identified. A few policy options will be analyzed in detail for their implementability and their emission reduction potential. In addition, in consultation with local stakeholders, a few technical options will be selected for pilot testing, to the extent possible. The pilot tests will quantify the costs and scope for emission reduction, and assess the operational challenges under real-world conditions. Although technical options are important, experience in industrial countries shows that reforming the regulatory structure for transport and energy may be the most effective approach.

The following list of options will be analyzed:

Overall Regulatory Regime

- Public transport sector reforms (e.g. alternatives for licensing public transport fleets, bus fares, separation of regulating function from operations)
- Traffic and demand management.
- Options for more rigorous enforcement of relevant laws and regulations concerning diesel vehicles.
- Emission standards for new and in-use vehicles. This is covered in the following two sections.
- Methods to identify gross polluters, and options for dealing with them. This is closely linked to sub-component 2 of component 1.
- Fiscal incentives to promote the use of clean vehicle and fuel technology

In-Use Vehicle Options

- Establishing emission standards that can realistically be met by about 80% of all diesel vehicles with reasonable efforts, and the likely scenario for further tightening. This would require (1) identifying reasonably reproducible procedures for measuring emissions; (2) carrying out a fleet-wide study to estimate current emission levels, (3) pilot testing to see if the standards were set to enable about 80% to pass, (4) revising the standards after pilot testing as needed
- Studying the feasibility and cost-effectiveness of establishing a targeted system of emissions inspection and certification for diesels: include requirements for administrative control, likely test costs, total number of test lanes required, frequency of testing, management of test centers
- Vehicle upgrade and scrappage requirement policies (age or emissions based)
- Costing corrective measures for operational misuse (e.g. over fuelling, over loading, wrong lubricants, aggressive driving) and market-based approach to promoting correct operation and maintenance of vehicles
- Pilot testing the corrective measures in one or two commercial fleets to identify benefits and implementation problems
- Retrofit programs to meet tighter emission standards (such as addition of oxidation catalysts, and engine upgrade/replacement)

New Vehicle Options

- Timing of phasing in of more stringent standards

Fuel and Lubricant Options

- Quality improvement needed to match new vehicle emission standards

Training and Awareness Programs

- Drivers training on optimal operation (acceleration, overloading, etc) of vehicle and maintenance

Supplementing Other On-Going Studies

In addition, this program will take the results of on-going studies in related fields, and do a limited amount of desk studies in these additional areas.

The information gathered by the analysis and possible pilot testing of options will support the development of a city-specific decision support system to evaluate and compare the cost-effectiveness of different options. Such an analytical toolkit, if it can be developed, would enable evaluation of scenarios and help develop action plans as discussed in the next component.

Component 3: Stakeholder Evaluation, Development of Action Plans and Dissemination

The pollution reduction options identified under Component 2 can achieve their intended results only if they are accepted and implemented by stakeholders. The selected options will be analyzed and discussed from economic, environmental, technical, stakeholder, social, and sustainability perspectives. Only those options that are widely accepted have a real chance to succeed and an action plan around those options will be implemented. To accomplish this, the following tasks will be undertaken:

- Engage in policy dialogues among stakeholders to discuss selected options using the analytical and informational tools developed
- Discuss social, economic, and political difficulties vs. environmental benefits of different options and decide on options to be implemented
- Develop action plans for options to be implemented

Dissemination

The outcomes of the study (and outputs including the knowledge base and analytical tools) will be discussed in expert panels and disseminated through the Clean Air Initiative? Network to a number of partner cities in developing countries. Throughout the project, city-specific workshops and thematic discussion groups and relevant stakeholders will be organized to raise awareness and to discuss different policy and technical options, and the social, political, and institutional requirements for the successful implementation of the measures proposed.

At the end of the project, a major event will be organized to bring together leading experts, key companies, and decision makers to communicate the outcomes of this project. Furthermore, a section of the Clean Air Initiative's website will be dedicated to the program, and the Clean Air Initiative's distance learning courses will be used to disseminate the information worldwide.

Deliverables

The following are the expected outputs from this project:

- Inception report

- Database on the selected city: Key environment, energy and transport information will be compiled in reports.
- Analytical and informational tools to analyze technical and policy options
- Six-monthly progress reports
- Action plans for the selected city to address the diesel emissions (to be used by the city with possible support from donors, development agencies)
- Assessment of potential for follow-up or scale-up with indicative funding requirements
- Assessment of replication potential of this program by other cities in Asia and Latin America
- Draft final and final report
- Thematic and city specific workshops, proceedings, recommendations, and agreements reached
- Website/CD-ROM
- Distance learning course to disseminate lessons learned

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BENEFITS AND RISKS

Benefits from this program can be realized only if the selected city is willing to assess all realistic options, and are serious about following up with reform measures or investments to manage diesel emissions. The real key is that the decision makers in the selected city feel that diesel pollution is a high priority problem, and that this program will substantially complement their efforts to address the problem. Since responsibilities and information sources are often fragmented across different sectors and organizations, it is important to have the buy-in from all relevant stakeholders, especially in areas of overlapping responsibility, to achieve sustainable results on the ground. Sustainability will be ensured by careful selection of the city, focusing away from expensive technical options, and seeking solutions that are locally designed and tested.

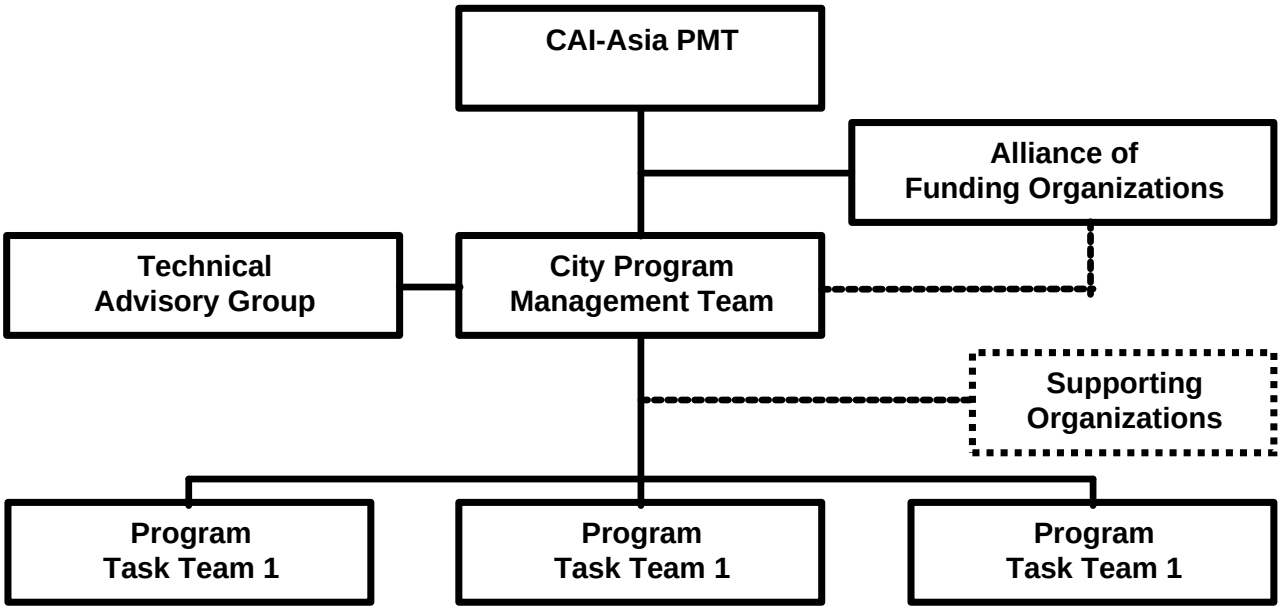
Risks that the project might face are partial buy-in from stakeholders in the selected city, lack of consistency of counterpart teams, lack of adequate capacity, inadequate information flow and other collaboration across agencies, and lack of transparency. This program will minimize these risks through a careful city selection process, evolving implementation arrangements, and seeking broad buy-in from key decision makers and other stakeholders. Procurement would be carried out using Bank guidelines to improve transparency. To avoid the risk of poor program sustainability due to lack of local capacity, local stakeholders will be fully involved in all implementation steps of the program and, where needed, their capacity will be enhanced. Adequate supervision arrangements are also planned to ensure that the activities are on track and are restructured as appropriate.

The indicators of project success include the development of the city-specific knowledge bases, analytical toolkits, strategies and action plans, and dissemination products (training programs, distance learning, websites, CD-ROMs and publications). Independent evaluations will also be conducted midway through and at the end of the project. The indicators and monitoring sources are further elaborated upon in the

ORGANIZATIONAL STRUCTURE AND GOVERNANCE FOR THE DIESEL PROGRAM

The organization structure for the program shown below consists of the following:

1. Clean Air Initiative for Asian Cities (CAI-Asia) Pilot Project Management Team (PMT)
2. Alliance of Funding Organizations (Alliance)
3. Technical Advisory Group (TAG)
4. City Program Management Team (CPMT)
5. Supporting Agencies (if applicable)
6. Program Task Team (PTT)



The **Clean Air Initiative for Asian Cities (CAI-Asia)** will provide strategic guidance and supervision of the program activities. A Pilot-project Management Team (PMT) consisting of technical and policy experts from CAI-Asia organizing committee will be formed. It will solicit co-financing, agree on the membership of the Alliance and ensure that the program follows a neutral and comprehensive approach. It will review and consent on activities proposed by the Alliance. The CAI-Asia will also ensure the regional dissemination of lessons learned and coordinate regional capacity building activities of the program. The CAI-Asia will draw on the expertise of the Technical Advisory Group for specific technical issues.

The **Alliance of Funding Organizations (Alliance)** will assist with the review and design of activities of the program, identify consultants, review progress reports and provide regular comments on the program. The Alliance will guide the City Project Management Team in the implementation process. The Alliance consists of organizations that:

- contribute US$ 100,000 or more annually to the project, of which cash should be at least 50%. Five percent of the total resources will be used for overall coordination and program management activities;
- agree to work on a comprehensive and unbiased approach that studies a wide-range of in-use diesel vehicle emission control options;
- respect the priorities set by the Alliance and agreed by the CAI-Asia;
- recognize the City Project Management Team as the overall implementing agency of project activities; and
- take care of the contractual agreements following their own internal procedures.
- To assure full ownership, the proposed activities should be reviewed and discussed with a broad range of local stakeholders before submission by the Alliance to the CAI-Asia for approval.

The **Technical Advisory Group (TAG)** will develop the indicators of expected outputs and outcomes for the studies. It will advise the CMPT, Alliance and the CAI-Asia on the different activities that are being undertaken. The TAG will consist of a selected number of experts from international agencies and research institutes, local agencies and the private sector involved in development of improved diesel technologies and transport emission reduction policies. It will be co-chaired by a representative of the CAI-Asia Secretary and a local organization.

The **City Project Management Team (CPMT)** will be responsible for the actual implementation of the program in the selected city. It will consist of a Project Manager and representatives of local stakeholders. The Project Manager will be hired to manage city level activities, and coordinate the different program activities, regardless of the funding source, and ensure timely implementation and reporting. The Project Manager will coordinate the monthly progress briefs by the program activity units and prepare semi-annual progress reports, including financial statements. The documents will be submitted to the Alliance and the CAI-Asia, and shared with the Technical Advisory Group.

At the city level, **Program Task Teams (PTT)** will be established to carry out sub-project activities as needed. They will, preferably, consist of local representatives and the contractors hired to conduct specific activities. The PPTs will submit monthly progress briefs and, if needed, financial statements to the CPMT. They will regularly meet with the Project Manager for guidance and timely implementation. Semi-annual meetings between the city project management team and all PPT should be organized to share information and ensure comprehensive implementation. *Note: Contractual agreements and requirements of consultants/experts carrying out activities should be handled separately by the parties involved.*

Organizations willing to contribute less than US$ 100,000 annually or less than 50% in cash to the program will be considered **Supporting Organizations**. These organizations can either submit a proposal for a specific task to the Alliance who will, after review, submit it to the PMT??, or support one of the proposed activities by the Alliance and agreed by the CAI-Asia. Supporting Organizations can only advise the Alliance and the CAI-Asia. They will take care of their own contractual agreements and agree to work under the framework and rules of the program. Again, 5% of the Supporting Organizations' contribution should support overall program management.

Funding Needs

The Pilot Project concept was officially launched during the Diesel Days on January 17, 2003. Several agencies will be involved in the funding and execution of the project. The proposed budget for the overall pilot is estimated at US$1.5 to 2 million. The Energy Sector Management Assistance Programme (ESMAP) has agreed to finance US$250,000, and the local government is funding a similar amount and have already started their studies. The Bank has agreed to support this Program through staff time and CAI-Asia in the amount of $250,000. We are now beginning to look for co-financing from private sector and donor agencies.

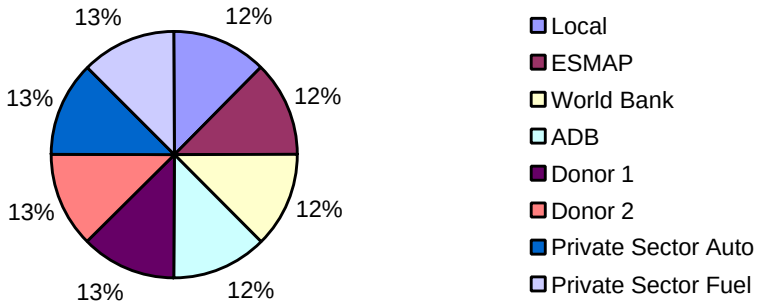


Figure 1. Potential Sources of Funding for Diesel Program

Implementation Process: A two-year program requiring close supervision and monitoring of various activities is proposed. We anticipate co-financing from local agencies, donors and CAI partners. Potential bilateral funders include: Australian, Canadian, Dutch, Norwegian. and US aide agencies along with private sector partners such as Shell, BP, ExxonMobil, Lubrizol, DaimlerChrysler, Volvo, Scania, WRI/EMBARQ, and others. Initial indications from potential funding partners are positive and encouraging. National and international organizations already involved in similar activities will be consulted for collaboration.

IMPLEMENTATION STEPS

The following implementation steps are anticipated. They will be expanded in consultation with the city, PMT, Alliance and TAG once they are formed and functional.

1. Prepare inception report elaborating on the scope of work, funding arrangements, detailed project design in partnership with the city and other funding organizations; identify and coordinate synergistic activities.
2. Elaborate on the project design in partnership with the city and other funding organizations.
3. Secure co-financing required before proceeding further.

4. Make institutional arrangements, draw up agreements, and execute contracts to carry out the activities in the selected city.
5. Organize a cross-sectoral Steering Committee in the city.
6. Obtain existing local data and hold initial brainstorming workshops.
7. Finalize the design, and draft TOR for various policy and technical studies.
8. Select and contract consultants to carry out studies.
9. Begin studies and data gathering activities by city agencies.
10. Identify all policy and technical options possible in the city.
11. Identify linkages between and pre-requisite conditions for the technical and policy options.
12. Perform scenario analysis.
13. Evaluate options for their implementability and develop action plans.
14. Prepare interim reports and obtain expert panel guidance.
15. Hold workshops regularly to review and get feedback on pilot studies, assess and formulate future action plans.
16. Identify projects to implement recommendations of the program in the city.
17. Prepare draft and final reports.
18. Evaluate and disseminate tools for its application to other cities.

IMPLEMENTATION SCHEDULE:

Component	Activity	Year 1				Year 2			
		Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
1. City-Specific Data Base	Selection of a city, institutional arrangements	■							
	Data base development activities		■	■	■				
	Finalization of knowledge base				■	■			
2. Analysis of Options	Outlining of all options				■	■	■		
	Analysis of linkages and prerequisites					■	■		
	Tools and methodology to support decision- making						■	■	
3. Evaluate Options and Develop Action Plans	Evaluations					■	■	■	
	Action plan development						■	■	
	Reports			■		■		■	■

	Final workshop in Asia								

PROJECT DESIGN SUMMARY

Region:	East Asia	Country:	To be Selected
Title of Proposed Activity:	Developing Diesel Pollution Reduction Strategies for Cities		

Narrative Summary	*Key Performance Indicators*	*Monitoring and Evaluation*	*Critical Assumptions*
1. Strategy-related Goal			
To reduce impacts of urban air pollution to health and environment due to diesel combustion	▪ Urban ambient air quality improves (especially decreased particulate concentration) ▪ Impacts of air pollution on morbidity and mortality decrease	▪ Air quality data from monitoring networks ▪ Epidemiological studies on respiratory diseases ▪ Emission inventories from diesel combustion sources	▪ Diesel pollution contributes significantly to urban air pollution and degradation of human health ▪ Addressing the diesel pollution problem is one of the cost-effective measures to deal with urban air pollution ▪ Commitment from local authorities, national authorities, private sector partners, NGOs, and civil society to address this issue
2. Project Development Objective:	**2A**	**2B**	**2C (Objective to Goal)**
Develop a comprehensive diesel pollution management strategy and action plans for a city in Asia	▪ City selected for Project ▪ Diesel Pollution Management Task Force formed for the selected city	▪ Official designation of the Diesel Pollution Management Task Forces ▪ Local agencies web-sites and published reports ▪ Technical legislation and standards	▪ Adequate technical and financial resources would be available to implement the action plans ▪ Substantial lessons for diesel pollution management would be learned for application to other developing country cities in the world
3. Expected Outputs:	**3A**	**3B**	**3C (Outputs to Objective)**
▪ Improved awareness of diesel pollution and its management ▪ Networks of stakeholders and experts formed to address diesel pollution problems ▪ An adequate knowledge base and analytical toolkits to support technical and policy decision-making on	▪ City-specific strategies and action plans for addressing diesel developed ▪ Workshops held ▪ Website and CD-ROMs developed ▪ Distance Learning Course developed ▪ Analytical tools for assessing mitigation measures developed	▪ Minutes of Task Force meetings ▪ Workshop materials, Final Reports and publication of city Action Plans ▪ Studies published and on the web; “Hits” on website; Participation of the city in DL courses	▪ Appropriate city is selected where there is local interest in addressing the problem and where there is an adequate knowledge-base ▪ Local, national, international, public, private stakeholders willing to collaborate

diesel pollution ▪ Integration of diesel pollution management into overall air quality management in the selected city	imparted		
4. Project Components/ Activities:	**4A** **Inputs (budget for each component):**	**4B**	**3C** **(Components to Outputs)**
1. City-specific Database ▪ Air quality monitoring data ▪ Emission factors for human health related pollutants (especially fine particulates) due to diesel combustion from each major source ▪ Ambient concentrations monitored ***2. Analysis of options*** ▪ In-use vehicle options ▪ Policy options ▪ New vehicle standards ▪ Enforcement mechanisms ▪ Fuel and lubricant options ***3. Evaluation of Options and Action Plans*** ▪ Access to expertise ▪ Workshops ▪ Other knowledge management (Websites, CD-ROMs, Distance Learning Module, etc.)	**TOTAL (US$)** 1. 550,000 2. 400,000 3. 330,000 ***Total: 1,630,000***	▪ Yearly program reports ▪ Progress reports ▪ Independent evaluation ▪ Clean Air Initiative published annual reports ▪ Progress reports to private sector and bilateral donors	▪ Data required is available and accessible ▪ Experts are available as required ▪ Appropriate team in the city to participate in this Project ▪ Financial & technical support secured for the preparation of the Action Plans