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Megacity Initiative - Local and Global Research Observations

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Air Quality Management

Challenges for Developing Air Pollution Control Strategies

- Exploding demand for private automobile ownership
- Excessive age of vehicle fleet
- Quality of fuels
- Limited availability of technical and analytical skills
- Institutional capacity

Air Quality Assessment Tools for Megacities

- Air quality monitoring networks
- Emission inventories
- Air quality standards
- Air quality forecasting
- Air quality simulation models

Emission control strategies

- Technology-based regulations
- Economic instruments, including
  - Emission trading
  - Emission taxes
  - Road pricing
- Policy adaptation, including
  - Land use planning
    - Infrastructure development
    - Traffic management

Examples of air quality management programs

Some cities have designed some of the strategies mentioned above for the improvement of their air quality. In some other cities, these strategies are being implemented currently.

Strategies based on available technologies

Bangkok, Thailand: DIESEL Project

Developing Integrated Emission Strategies for Existing Land-Transport (DIESEL). All Asian cities are experiencing serious PM pollution, including Bangkok. The CAI-Asia conducted the DIESEL pilot project in Bangkok.

With 5.8 millions inhabitants, high population density and large vehicle fleet, the air quality in Bangkok has deteriorated over the past few years. The major sources of PM are from diesel vehicles resulting from very old age, high daily operation, poor maintenance, aggressive driving behavior and traffic congestion.

The ultimate goals of the DIESEL project are to gain a better understanding of factors affecting in-use diesel vehicle emissions; to assess alternative mitigation options to assist decision making in developing countries. The project consists of three scope of work: a) Gather city-specific data, including fuel quality, vehicle fleet operation, validation and emissions, health effects and air quality; b) Evaluate the technical and policy options to reduce diesel pollution, including better inspection and maintenance program, alternative fuel, clean fuel and new vehicle technology; c) Expected output: database, diesel pollution reduction strategies, dissemination of possible strategies to other cities.

Strategies Based on Sustainable Transportation Systems

Today, Bogota is an example of a successful implementation of sustainable transportion. Travel time has been reduced by 12%, traffic deaths by 21%, and the city consumes less energy, is less polluted, and is less segregated, both socially and in its use of public space and transit.

Rather than focusing only on vehicle technology, the city adopted measures to increase the share of walking, biking, and transit, and reducing the use of private automobile. The strategy includes extensive construction and recovery of pedestrian areas (sidewalks, plazas, walkways); the construction of separate facilities for bicycles (a 200-km network already built), restriction of 40% of the private vehicles during the peak periods using the plate numbers, and the introduction and expansion of a full-scale BRT system, the TransMilenio. The system was based upon successful experiences in Brazilian cities and Quito, Ecuador.

One of the most important features of the TransMilenio BRT System is the innovative institutional scheme of public and private involvement based on binding performance contracts. The public sector is in charge of planning, developing and maintaining its infrastructure, and controlling service delivery. Private companies, through concession contracts, acquire equipment and provide the operations of trunk line and feeder bus services and fare collection. It is important that these contracts are based on open bidding, and that they include ways to fire the contractor if they fail to perform. Competition for the individual passenger is being replaced by competition for the market.

This system has improved quality of life in many ways. Impacts include reductions in travel time, operational costs, accidents, and emissions; furthermore, there is a sentiment of pride and belonging among the residents. Although air quality was not at the top of the agenda for the system, it has improved. Emission reductions come from replacement of obsolete transit fleet, more efficient bus transit operations, and modal shift from less efficient modes.

Strategies based on Court-Mandated Regulation

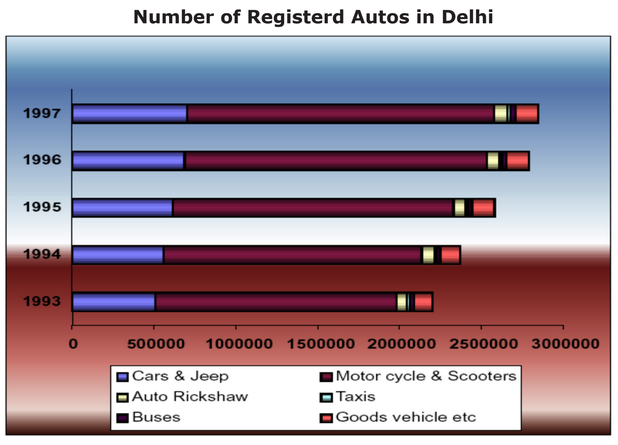
Delhi, India: CNG Conversion Program

Between 1971 to 2001, the population in Delhi grew from 4M in 1971 to 14M in 2001, while the vehicle fleet grew from 0.2M to 3.5M. The vehicular emissions have increased considerably during the last decade (2x for SO2; 6x for NOx; 12x for PM). Various transportation control measures have been implemented to improve the air quality.

Finally, in 1998, the Supreme Court of India ruled, in an ongoing public interest litigation on air pollution in Delhi, that the public transport bus fleet of Delhi should be increased from approximately 3000 to 10,000 by April 1, 2001, and the entire bus fleet along with three wheelers and taxis be converted to CNG.

By the end of 2002, the entire city bus fleet in Delhi became diesel free, perhaps representing the largest city CNG bus fleet in the world. There are now more than 77,000 CNG vehicles in the city: 10,000 buses, 5,000 minibuses, 47,000 three-wheelers, 5,000 taxis, and 10,350 cars.

As part of the transportation emissions reduction program, other control measures were also implemented, which include lower the diesel fuel S from 1% to 500 ppm (2001); phase out of lead in gasoline and phase out old transport vehicles (1998); lower gasoline benzene from 5% to 1% and tighten new vehicle standards (2000); and convert all taxis, three wheelers, and buses to run on CNG instead of diesel (2001).



Framework for Air Quality Management

1) Scientific knowledge; 2) Interdisciplinary research; 3) Institutional improvement; 4) Stakeholder involvement 5) Sustainable transportation; 6) Clean vehicle and fuel technology; 7) Inspection and maintenance program.

Scientific Knowledge: Measure pollutants, precursors, and reactive intermediates; Develop improved photochemistry models; Elucidate the processes that lead to the formation, chemical evolution, growth and removal of atmospheric particles; Enhance collaboration between epidemiologists, physiologists and atmospheric scientists; Monitor air pollutant levels routinely in urban centers, especially in the developing nations; Establish long-term measurement programs to characterize air quality on a regional to global scale.

Interdisciplinary research: Addressing air quality issues effectively requires a holistic approach: one that takes into account scientific, technical, existing infrastructure, economic, social, and political factors. There is no single strategy for addressing air pollution problems in megacities. A mix of policy measures best suited for each cities challenges and customs will be needed to improve air quality.

Conclusions

- Megacities present a major challenge for the global environment.
- Well-planned, densely populated settlements can reduce the need for land conversion and provide proximity to infrastructure and services.
- Sustainable development must include:
  1) appropriate air quality management plans
  2) adequate access to clean technologies
  3) improvement of data collection and assessment
- Improving urban air quality requires coordination of policies and actions of many sectors; and stakeholders from local to national and regional/global levels
- While technical solutions are available, political commitment and institutional issues are most critical in generating positive change
- Information and public awareness of urban air pollution levels and impacts are key to support policy change and local action
- "Best" steps must weight: Technical feasibility; Cost-Benefit; Political viability; Financial feasibility; Social Acceptability
- Learning from the experiences and best practices in other regions is important

A successful result will be to arrive at integrated control strategies that are effectively implemented and embraced by the public

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