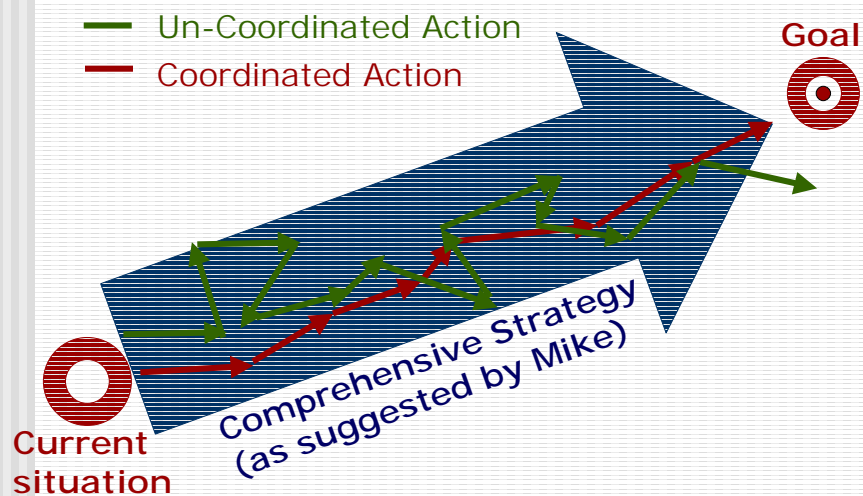


# Diesel Emissions: The “Next” Challenge in Air Quality Management in Asia

Jitendra Shah  
World Bank  
BAQ 2002, Hong Kong  
December 16, 2002

## Achieving Emission Reduction: Action vs. Comprehensive Approach



## Benefits and Drawbacks of Diesel Vehicles

- **Benefits**
  - **Very robust**
  - **good fuel economy/high efficiency**
  - **Well developed fuel distribution & infrastructure**
  - **low “greenhouse gas” emissions: CO<sub>2</sub> & N<sub>2</sub>O**
  - **low hydrocarbon (HC) and carbon monoxide (CO) emissions**
- **Drawbacks**
  - **Emissions of particulate matter (PM) and related exposure**
  - **Black smoke, major nuisance**
  - **High nitrogen oxide (NO<sub>x</sub>) emissions**
  - **Sulfur contributes to SO<sub>2</sub>, PM and acid rain, and prohibits introduction of latest technology**

## Hypothesis

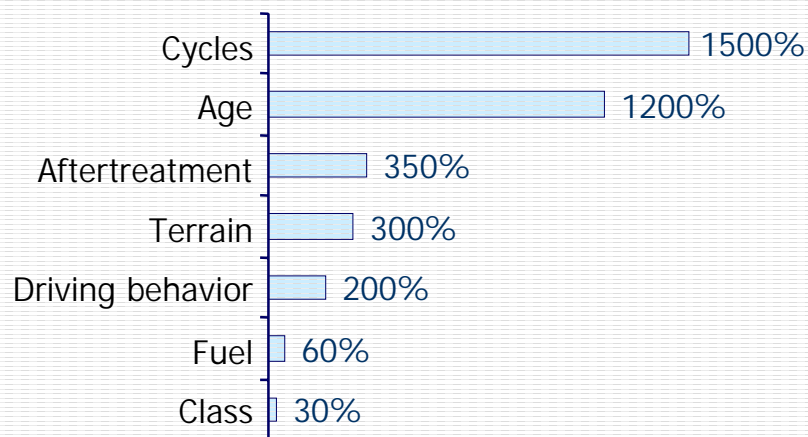
- **Emissions from in-use diesels will be one of the greatest contributors to human exposure to fine PM in the coming decade in many Asian Cities because of:**
  - **poor vehicle maintenance**
  - **inappropriate vehicle operation and heavy use**
  - **longevity of diesel vehicles**
  - **less advanced vehicle technology**
  - **low fuel quality**
  - **inappropriate regulation and governance structure, and**
  - **poor institutional capacity for enforcement and coordination**

## PM10 from Vehicles: Example of Bangkok

■ Diesel vehicles	89%
■ Light duty trucks	31%
■ City buses	30%
■ City trucks	23%
■ Long haul trucks and buses	5%
■ Gasoline vehicles	11%
■ Motorcycles	10%
■ Passenger cars	1%

Source: PCD, 2002

## Variability in PM emissions from heavy-duty vehicles in the US due to varying factors

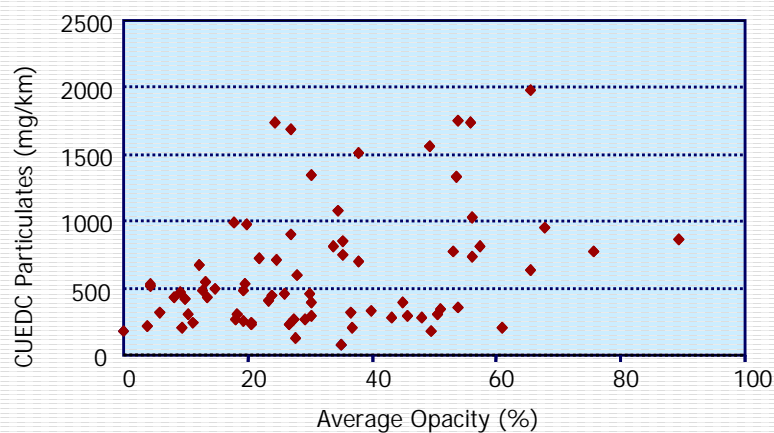


Source: Clark et al., 2002

## Hypothesis

- Lack of information on emissions and emissions management prevents simple and most cost-effective solutions to be tried and implemented:
  - Emissions or exposure estimates not available
  - Simplest vehicle fleet information not available
  - Emissions factors not available
  - Using US, EU or Japan measurements might lead to wrong conclusions
  - Tendency to follow the West
  - Lack of capacity and interest in status-quo

## Identifying Gross Polluters: Better techniques needed?



Source: Study by Parsons

## Hypothesis

- There are significant differences between industrial and developing countries that affect selection of optimal policy towards diesel emissions control
  - **Preventive maintenance is an exception**
  - **Use of sub-standard replacement parts in repair common**
  - **No market demand for service and repair facilities, so shortage of well trained technicians**
  - **Over-loading of trucks is almost universal**
  - **Adulteration of diesel with kerosene common and problem if low-sulfur diesel is introduced**

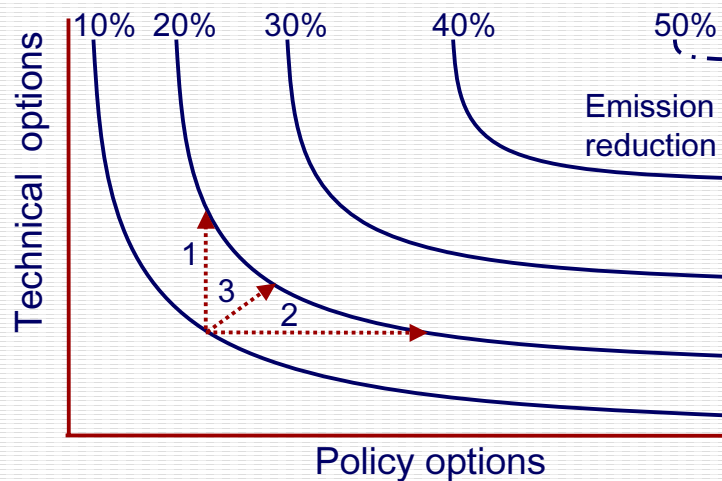
## Hypothesis

- If better information was made available and was marketed, simple, cost-effective, and sustainable solutions can be promoted while formulating long-term solutions.
  - **Decision makers are often not acting because of lack of convincing information or limited budget**
  - **When proper information is made available, they do act quickly. E.g.: leaded gasoline, lube oil, 2 vs 4-stroke, etc.**
  - **Without lack of good information, people look for magic bullets: “special devices”, magic additives, magnets, etc.**

## Emission Control Options

- **Economic:** (differentiated) taxes, subsidies, pricing (congestion, parking)
- **Administrative:** emission, energy efficiency and fuel quality standards, restrictions on operation (vehicles, parking)
- **Technological:** fuel improvements, new technologies, CNG retrofit, control devices
- **Transport policy:** traffic management, public transport, NMT

## Policy and Technology: understanding the linkage



## How to find sustainable action?

---

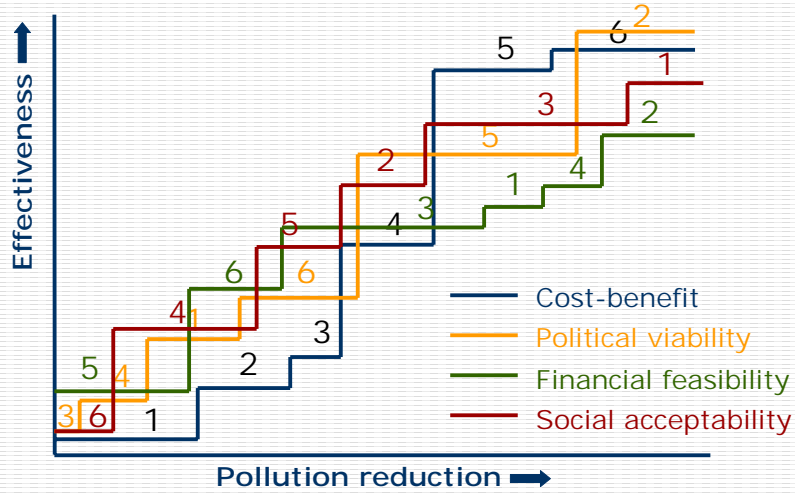
- Compatibility with other sector objectives
  - Do they go against, or reinforce, other sector objectives?
- Political feasibility
  - Are there interest groups that would oppose the proposed measures vigorously?
- Cost of implementation
  - Which measures would be the most cost-effective (Rs / population exposure reduced)?
- Ease of enforcement
  - How difficult would it be to carry out the proposed measures or to enforce them?

## Proposal

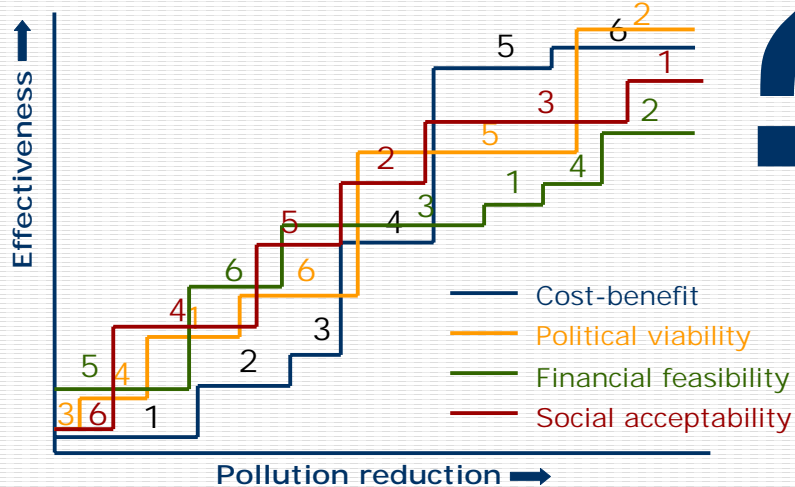
---

- Develop a better understanding of in-use diesel vehicle emissions and control options to assist decision making within the reality of developing country for one city in Asia in “full” partnership with the city based institutions and policy makers
- Look at “locally feasible” policy and technical options for local decision makers

## Achieving Emission Reduction: What is the 'best' option?



## Achieving Emission Reduction: What is the 'best' option?



## In Conclusion

- **In-Use Diesel Vehicle Fleet** represent the largest source of PM exposure
- Look for **gross polluters** (often 10% of the fleet contributes 90% of the pollution)
- **“Best” steps** must weight:
  - **Cost-Benefit**
  - **Political viability**
  - **Financial feasibility**
  - **Social Acceptability**

## Think Big and Take Small Steps

- Long-term Strategy: Integrated Air Quality Management
- Short-term Strategy: Take small steps to show action, create public awareness, and establish political will for long-term strategy
- Unleaded gasoline and two-stroke motorcycles issues are being dealt with successfully in most Asian cities, next big challenge is **Particulate emission from in-use diesel vehicles**

## Advertisement

---

These issue will be discussed during

### **Diesel Days**

January 16 & 17, 2003

WRI and World Bank

Washington, D.C.

USA

(following TRB Annual Meetings)

Visit: [www.nas.org](http://www.nas.org)