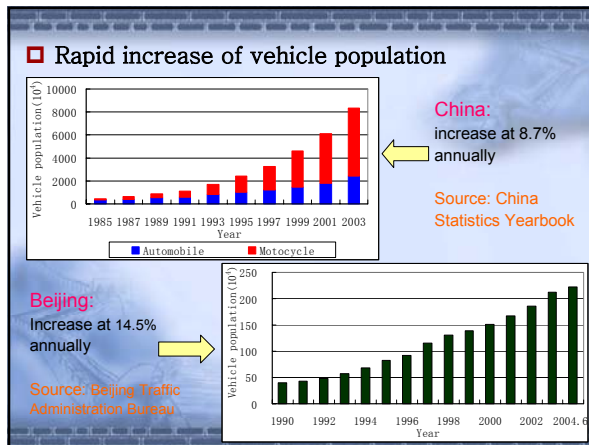


Progress of Beijing in Control of Vehicular Emissions

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Dec. 2004



□ Air pollution caused by vehicular emissions

- ✓ Contribution to air pollution in Beijing (urban area, 1999)
 - PM₁₀: Exhaust PM₁₀ — 7.0%
 - Road re-suspended PM₁₀ — 32.8% } 39.8%
 - NO_x: 68.4%
 - CO: 76.5%
- ✓ More significant contribution to fine PM (PM_{2.5}), which has greater adverse effects than PM₁₀
- ✓ Potential cause of photochemical smog

□ Control strategies and measures

- ✓ Land use and traffic planning
- ✓ Emission control of in-use vehicles
- ✓ Emission control of new vehicles
- ✓ Fuel quality improvement
- ✓ Clean Fuel vehicle technology
- ✓ Fiscal Incentives

Land use and traffic planning of Beijing

- ✓ Proper land use can decrease the traffic demand, so as to reduce the vehicular emissions



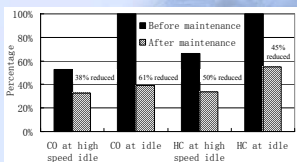
Land use map up-to-date vs. the new city planning in Beijing

- ✓ To accelerate the conversion of personal trip mode by increasing the share of public transportation
 - Subway & light railway in Beijing: to reach 300 km before 2008
 - Bus population per 10,000 persons will increase to 12+
 - Bus Rapid Transit (BRT) systems are under construction
- ✓ Enhancement of the construction of minor arterial roads, branches and intersections, to distribute the traffic volumes, is also important in Beijing

Emission control of in-use vehicles

- ✓ Inspection/Maintenance (I/M) Program

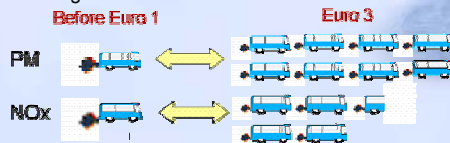
- 1995: preliminary I/M with two speed idle tests
- 1999: basic I/M with two speed idle tests, CO and HC emissions were significantly reduced
- 2003: enhanced I/M with ASM tests, to control NO_x emissions



Note: Accumulative concentrations of CO emissions and HC emissions of 2452 tested vehicles at idle tests are set as 100%, respectively.

Reduction rates of CO and HC emissions by I/M programs with two speed idle tests in Beijing

- ✓ To accelerate the retirement of old in-use vehicles that have high emissions



- Heavy-duty vehicles: 160 new diesel buses (Euro 3) introduced replacing the old ones in 2002, with low sulfur diesel supplied
- Light-duty vehicles: vehicles before Euro 1 are required to be inspected biannually and since late 2003 they are banned to run within the 2nd ring expressway

- ✓ To enhance the emission control of frequently used vehicles: faster retirement or retrofit program

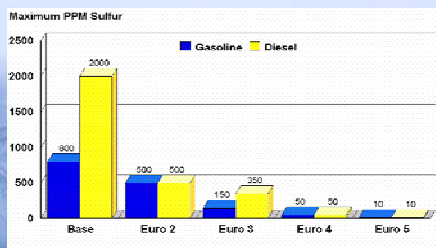
Emission control of new vehicles

- ✓ Introduction of more stringent emission standards step by step

- Euro 1: Beijing — 1999
China — 2000
- Euro 2: Beijing — 2003
China — 2005
- Euro 3: Beijing — 2005?
China — 2008?
- Euro 4: Beijing — 2008?

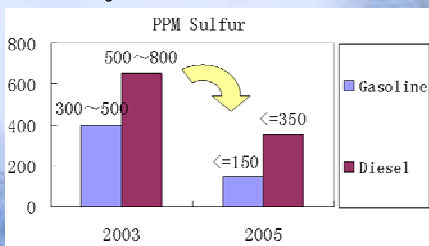
Fuel quality improvement: a close relationship with emission control technologies

- ✓ Fuel sulfur content will decrease with more stringent standards



- ✓ The fuel quality in Beijing

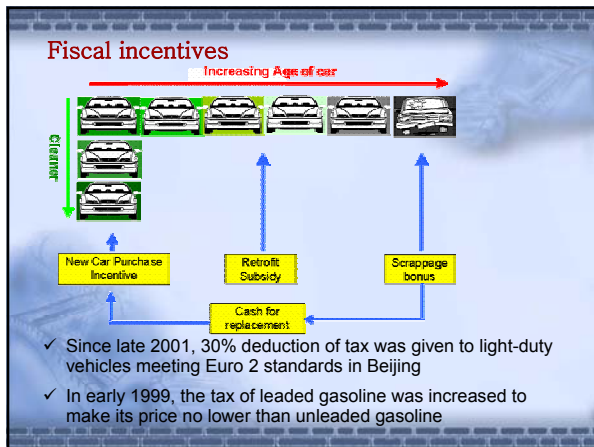
- Sulfur content in the fuel will decrease further with Euro 3 standards for gasoline and diesel vehicles



- Olefins in the gasoline will also decrease
- leaded gasoline was successfully phased out in Beijing during 1997~1998

Clean fuel vehicle technology

- Vehicles meeting the emission standards more stringent than current, no fuel limitation
- **Cleaner gasoline or diesel powered vehicles are encouraged**
- CNG/LNG vehicles: obvious lower PM emissions than current similar diesel vehicles, and less emissions of toxics and smog-producing substances
Beijing has the largest CNG bus fleet all over the world with about 2000 dedicated CNG buses
- LPG vehicles: almost same regulated emissions as the gasoline vehicles with current similar technologies, while less emissions of toxics and smog-producing substances
There are 600 dedicated LPG taxis and about 32,000 gasoline & LPG bi-fuel taxis in Beijing
- **There are also about 20 pure electrical buses**



□ Air quality in Beijing

- Since 1999, NO₂ annual average concentration remained at 0.07~0.08 mg/m³, while that of CO slowly decreased
- Ozone violation hours in Beijing fell since 1999, but rebounded in 2003, suggesting ozone pollution is still a serious concern

Source: Gazettes of environmental conditions in Beijing

