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Emission Modeling as a Decision Support Instrument

— Strategy for Vehicle Emission Control

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A Case Study on Strategy for Vehicle Emission Control

1. Introduction



2. Vehicle Driving Cycles and Emission Factor

3. Vehicle Emission Modeling

4. Existing Problems and Approach to solve Problems

Strategy for Vehicle Emission Control

5. Scenario Analysis by using Vehicle Emission Modeling

6. Modeling Results - Strategy for Reducing Vehicle Emission in Shanghai, China

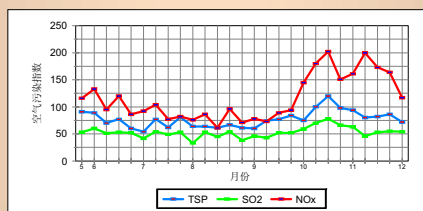
7. Example for Scenario Analysis

8. Vehicle Emission Control Strategies

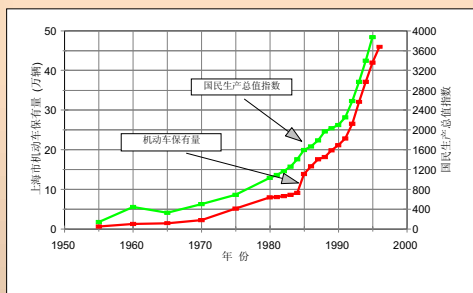


Introduction

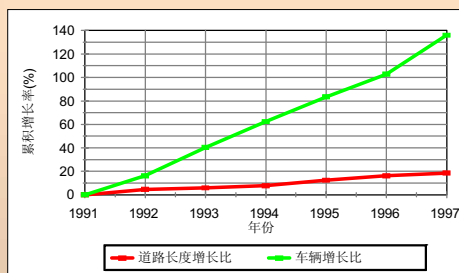
- Shanghai is the most active city in the economic development
- Air pollution are closely related to the fast growth of vehicle population



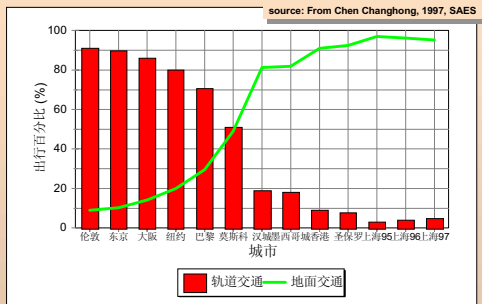
Vehicle Population vs GDP Index



The Difference of vehicle growth rate and road construction



Transportation Mode in Different Cities



Vehicle Driving Cycles

- Vehicle Driving Cycle was tested in the city center in 1996 before the operation Inner Ring Road, and
- was tested on the same roads in 1997 during the operation Inner Ring Road

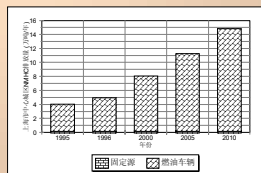
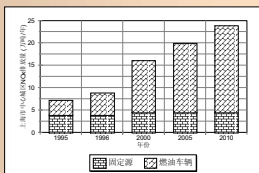
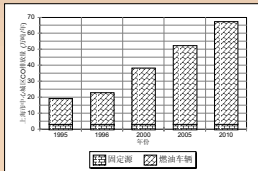
Test Vehicle Emission Factor

- Tested on dynamometer following the actual driving cycle
- 195s per cycle, four cycles in total
- Max. Speed 50 km/hr.
- Avg. Speed 17 km/hr.

Elements to Be Considered in Vehicle Emission Modeling

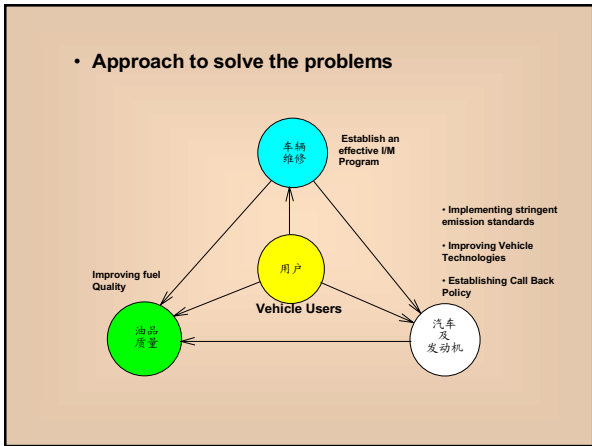
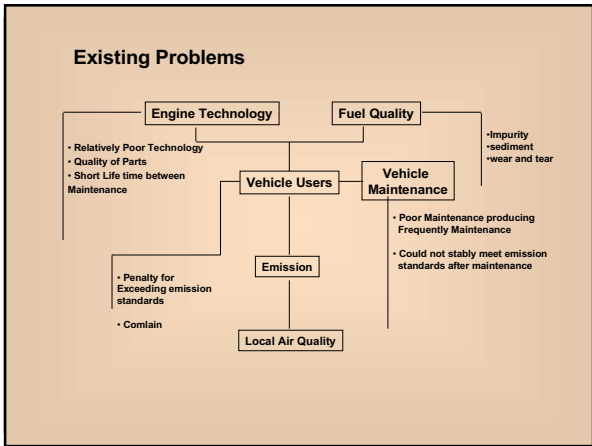
- Vehicle population
- Vehicle Category
 - LDDV, LDGV, HDDV, LDGV, MC, and mopeds
- Region Category
 - Urban, sub-urban, counties
- The Profile of vehicle transportation in time difference and in regional difference, e.g. odd and even policy, distribution of on road vehicle in day and night

Vehicle Emission in the City Center, 1995-2010



Vehicle Emission In City Center

	CO		NOx		NMHC	
	Emission kt	Contribution %	Emission kt	Contribution %	Emission kt	Contribution %
1996	196	86	49.6	56	47.7	96
2000	346	92	115	72	78.1	97
2005	489	94	153	77	111	98
2010	642	95	191	81	148	98



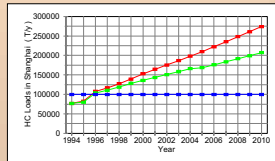
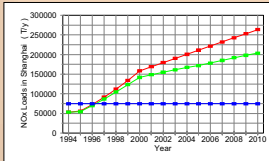
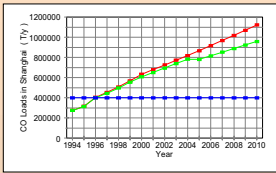
- ### Scenario Analysis by Using Vehicle Emission Modeling
- Phase out leaded gasoline
 - New vehicle emission standards
 - Effectiveness of I/M program
 - Scrapping heavy polluted vehicles
 - public transit policy
 - private vehicle driving permission in city center
 - Fuel substitute, and etc.

- ### Strategy for Reducing Vehicle Emission in Shanghai, China
- (1) Phasing out Leaded Gasoline;
 - (2) Implementing New Emission Standards;
 - (3) Improving Fuel Quality;
 - (4) Carrying out an Effective I/M Program;
 - (5) Scrapping Heavy Pollution Vehicles;

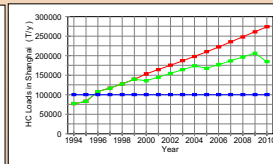
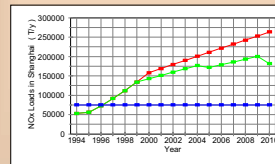
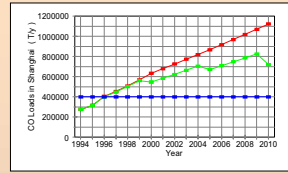
- (6) Improving Vehicle Technologies and Reducing Vehicle Emission;
- (7) Establishing Public Transit Policy in Shanghai;
- (8) Environmentalist and Planner works together in Transportation Planning;
- (9) Developing Clean Fuel Vehicles; and
- (10) Others

Example for Scenario Analysis

Implementing New Vehicle Emission Standards

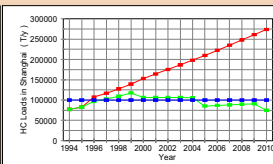
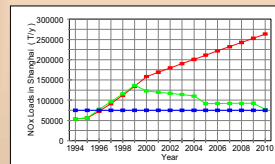
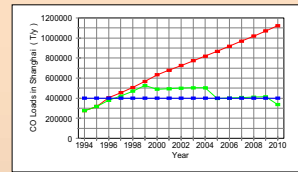


Carry out an Effective I/M Program



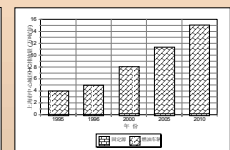
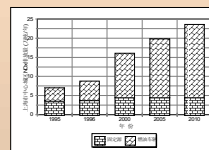
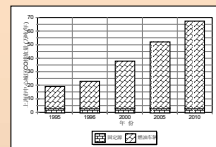
Effectiveness of Implementing Integrated Policies in Shanghai

Implementing Integrated Policies

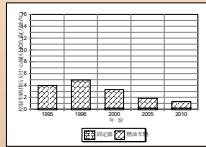
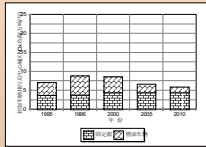
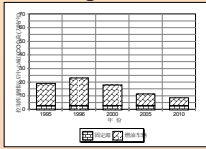


Results Comparison of BAU and Strategic Policies

Emission Projection under BAU Scenario



Vehicle Emission with Integrated Strategic Policies



Thank you!