

# Update on Air Quality and Transport in Asia and China, 亚洲及中国的空气质数和运输数据更新

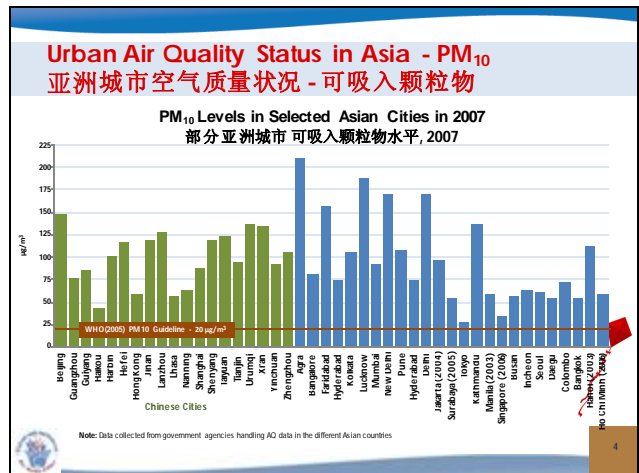
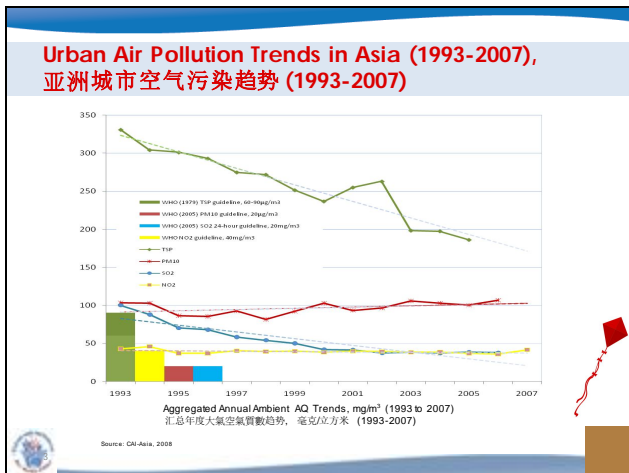
CAI-Asia Center

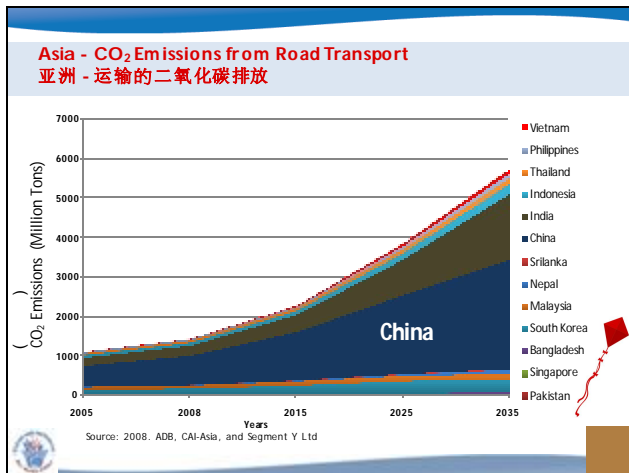
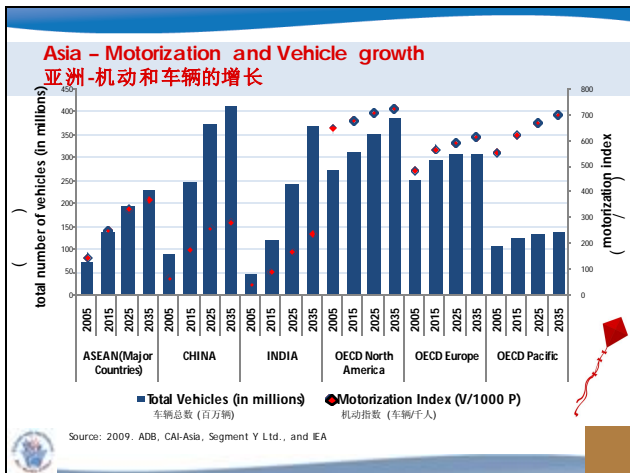
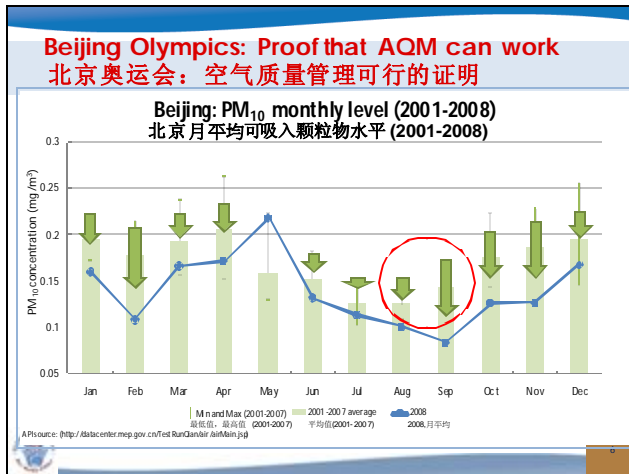
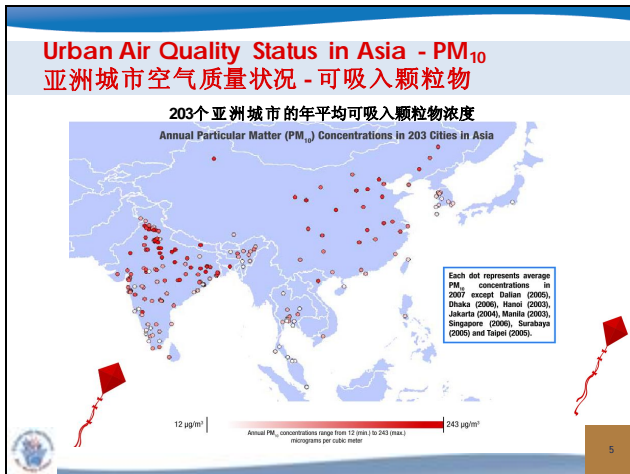
Fourth City Workshop of CAI-Asia China Network  
Guangzhou  
5 August 2009  
With appreciation to support from ADB and Sida through the Sustainable Urban Mobility in Asia (SUMA) program



## Outline 大纲

- Trends in air quality and transport in Asia and China, 亚洲及中国空气质数和运输数据的趋势分析
- CAI-Asia activities in China 亚洲城市清洁空气行动在中国的活动
- Road Map for Cleaner Fuels and Vehicles in Asia 亚洲清洁燃料和车辆的路线图
- Outputs of the Sustainable Urban Mobility in Asia (SUMA) 亚洲城市可持续交通项目的数据 (SUMA)





### Asia - Emission Standards New Light-Duty Vehicles 亚洲 - 新轻型车辆的气排放标准

| Country          | 95                                  | 96     | 97 | 98 | 99 | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 |
|------------------|-------------------------------------|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| European Union   | Euro 1                              | Euro 2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Bangladesh*      |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Bangladesh*      |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Hong Kong, China | Euro 1                              | Euro 2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| India*           |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Indonesia*       |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Indonesia        |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Malaysia         |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Nepal            |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Pakistan         | No conclusive information available |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Philippines      |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| PRC*             |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| PRC*             |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Singapore*       |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Singapore*       |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Sri Lanka        |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| South Korea      |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Taipei           |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Thailand         |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| VietNam          |                                     |        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

Source: CAI-Asia, 2008, Emission standards for new vehicles (light duty). Available: [http://www.cleanairnet.org/asia/1412/articles/58969\\_resource\\_1.pdf](http://www.cleanairnet.org/asia/1412/articles/58969_resource_1.pdf)

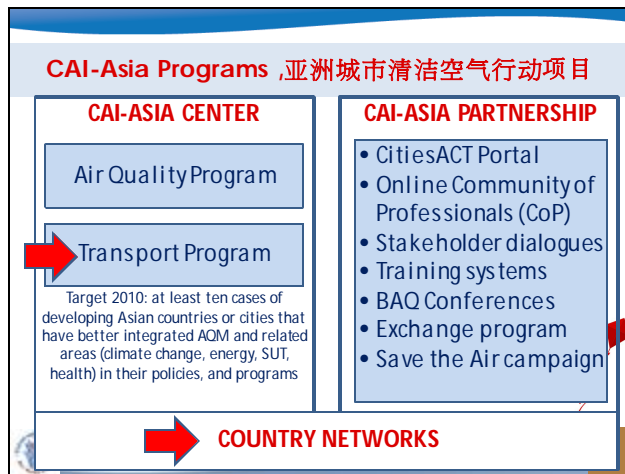
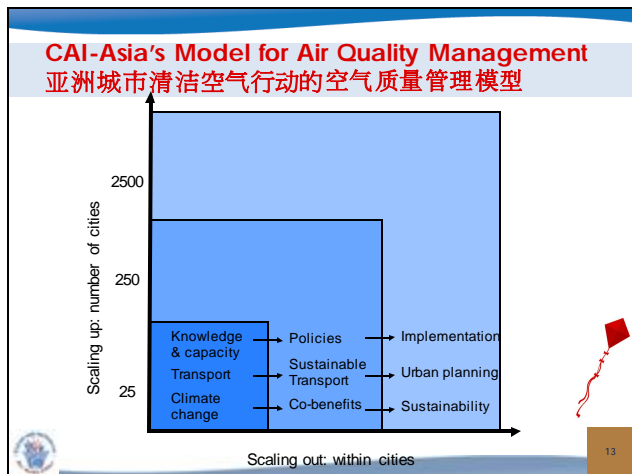


### Our mission 使命

"The Clean Air Initiative for Asian Cities promotes and demonstrates innovative ways to improve the air quality of Asian cities through sharing experiences and building partnerships" 亚洲城市清洁空气行动, 通过交流经验和建立伙伴关系, 促进和示范创新办法改善亚洲城市的空气质量

CAI-Asia began as a multi-stakeholder initiative by ADB, WB and the United States - Asia Environmental Partnership (a project of USAID), 本中心的成立为多方利益行动, 由亚洲开发银行, 世界银行, 美国(亚洲环境合作)支持

The CAI-Asia Center was incorporated in 2007 as a non-stock, non-profit corporation in the Philippines, 从2007起, 本中心是非上市, 非营利机构, 总部为菲律宾



- ### CAI-Asia Activities in China
- Weekly newsletter
  - City Workshops
  - Training of Chinese NGOs on co-benefits of air quality, climate change, energy and transport
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### Beijing Olympics page on AQ 北京奥运会的空气质量管理网页

- News, actions, data, 新闻, 活动, 数据
- Analysis of AQ information, 空气质量管理分析资料
- Face-to-face interview with Director Shi Han Min, Shi Han Min 主任采访

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### Blue Skies Shanghai EXPO 2010 蓝天2010年上海世博会



- Support SEPB with air quality management in preparation for Shanghai EXPO 2010  
支持SEPB,筹备有關空氣质量管理
- Workshop held in July 2009 with representatives from other mega-event cities: Beijing, Qingdao, Atlanta, London  
研讨会於2009年7月举行,有北京,青岛亚特兰大,伦敦代表
- Two areas:
  - Communicating on air quality with media, visitors and public  
於媒体,游客和市民的空气质量沟通
  - Regional approach for air quality management for YRD  
對於长三角的区域空气质量管理办法

With support from Fu Tak lam Foundation,  
項目由Fu Tak lam Foundation 支持




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### Green Trucks Pilot Project 绿色卡车试点项目

#### Objectives 试点目的

To develop a "proof of concept" by June 2009 for a truck program in Guangzhou and PRD that aims to:  
试点项目的目的是在2009年6月前验证项目概念,从而为广州及珠江三角洲地区设计一个绿色卡车大项目,该大项目的主要目标有三:

- Enhancements of the fuel economy of the truck fleet in PRD
- Reduce black carbon and other air pollutants from trucks
- Consequently obtain GHG emission savings
- 改善广州及珠江三角洲卡车的燃油经济性
- 削减卡车的炭黑与其他污染物排放
- 带来温室气体(GHGs)排放的减少

With support from World Bank 世界银行




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### Green Trucks Pilot Project 绿色卡车试点项目

#### Activities 活动内容

- Pilot testing & further analysis of technologies/strategies  
试点测试,并进一步分析所用技术和对策
- Maintenance for fuel efficiency  
通过维护保养节油
- Driver training for fuel efficiency  
驾驶员节油培训
- Surveys of truck industry  
卡车行业调查





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### Road Map for Cleaner Fuels and Vehicles in Asia 亚洲清洁燃料和车辆的路线图

- Objective: to provide guidance to Asian governments to raise fuel and vehicle emissions standards  
目的:为亚洲各国政府,提供燃料和车辆废气排放标准指导
- CAI-Asia collaboration between 本中心与以下机构合作
  - Oil companies and car manufacturers 石油公司和汽车制造商, e.g. Shell
  - Government agencies 政府机构, e.g. US EPA
  - Development agencies 发展机构, e.g. ADB
  - Non-governmental agencies 非政府机构, e.g. Health Effects Institute
  - International experts 国际专家
- Financial and process support from ADB, 亚洲开发银行财政支持
- Published in November 2008, 发表于2008年11月




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## Road Map for Cleaner Fuels and Vehicles in Asia 亚洲清洁燃料和车辆的路线图

Background information and guidance on 背景信息和指导:

- Fuels and Vehicles, 燃料和车辆
- Producing clean fuels in Asia, 亚洲清洁燃料生产
- Enhancing octane in gasoline, 提高汽油辛烷值
- Pricing, taxation, and incentives for cleaner fuels, 清洁燃料的定价, 税收和奖励
- Timing and approach in the introduction of cleaner fuels in Asia 介绍亚洲清洁燃料的时机和方式



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## Road Map for Cleaner Fuels and Vehicles in Asia 亚洲清洁燃料和车辆的路线图

### Main recommendations 主要建议

- Clean fuels are essential for cleaner air, 清洁燃料對於清洁空气是不可缺的
- A systems approach is essential, fuel quality and vehicle emission standards should be regulated together 系统方法是必不可少的, 燃料质量和车辆废气排放标准应同时管制
- Reducing sulfur is essential and the benefits of reducing sulfur are clear 减硫是必要的
- There are no technical obstacles to produce cleaner fuels in Asia 亞洲對生產清潔燃料没有任何技术障碍



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## Road Map for Cleaner Fuels and Vehicles in Asia 亚洲清洁燃料和车辆的路线图

### Main recommendations 主要建议

- Enhancing octane requires careful consideration 仔细考虑提高辛烷值的需要
- Taxing policy and other incentives are effective 税收政策和其他鼓励措施很有效
- Fuel adulteration must be prevented 必须阻止燃料掺假
- All stakeholders should be involved in making decisions 所有利益相关者应参与决策
- It is important to raise awareness about air pollution and vehicle emissions 提高人们对空气污染和车辆排放的废气



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## SUMA Program: objective and partners SUMA 计划: 目标和合作伙伴

### Objective 目标

To accelerate the development of capacity for urban AQM and SUT in Asia through better integration of AQM and SUT in the strategies, policies, programs and projects of developing Asian countries and development agencies

通过空气管理和SUT的战略, 政策, 方案和亚洲发展中国家和发展机构项目的合作, 加快于亚洲城市空气管理和SUT的发展能力

The SUMA program is supported by ADB through a grant from Sida  
<http://www.cleanairenet.org/suma>



SUT Partnership for Asia, 亞洲SUT伙伴



## SUMA PROGRAM – Target all transport components

### SUMA 计划 - 运输组成的目标成分

The infographic is divided into several sections:

- IMPROVING PUBLIC TRANSPORT:** Focuses on providing technical assistance to cities like Ahmedabad, Indore, and Pune to develop Bus Rapid Transit Systems.
- DEVELOP CYCLE INCLUSIVE GUIDELINES FOR ASIAN CITIES:** Aims to create policies for integrating cycling into urban transport systems.
- TRAINING URBAN TRANSPORT PROFESSIONALS:** Provides training for urban transport professionals in various Asian cities.
- SUSTAINABLE URBAN MOBILITY IN ASIA:** The central theme, supported by a diagram showing the integration of different transport modes.
- INSTITUTIONALIZING POLICIES:** Focuses on developing and institutionalizing policies for urban transport.
- PARTNERING WITH CITIES AND CIVIL SOCIETY:** Emphasizes the importance of public participation in transport planning.
- CHANGING MINDS, CHANGING CITIES:** Aims to change public perception and behavior towards public transport.
- REDUCING EMISSIONS:** Focuses on reducing greenhouse gas emissions from urban transport.

Source: ITDP, EMLARO and <http://www.thehindu.com/2009/08/14>

## 1. Improving Public Transport, 改善公共交通

- Providing technical assistance to Ahmedabad, Indore and Pune to develop Bus Rapid Transit Systems, 对艾哈迈达巴德, 印多尔和普纳发展快速公交系统提供技术援助
- Developing Social Impact Assessment guidelines for Urban Transport project with an emphasis on Public Transport 对城市公共交通项目发展社会影响评估准则指导
- Developing policy guidelines for Integrating motorized two and three wheelers in urban traffic and with public transport 对城市机动两轮车和公共交通, 制定政策指导方针

Source: ITDP, EMLARO and <http://www.thehindu.com/2009/08/14>

## 1. Improvement in Public Transport 公共交通的改善

The map shows the status of public transport systems across Asia:

- Operation (Pilot /Phase):** Indicated by blue bus icons.
- Feasibility/Planning /Construction:** Indicated by red bus icons.

In Asia currently - 70 Number of Systems in Planning, Construction & Operation  
目前亚洲有70多项规划, 建设与运行中

Source: 2009-CAI-Asia (Information gathered from various sources overlaid on google map)

## 1. Improving Public Transport: City Survey for India 公共交通的改善: 印度城市调查

- Developing City Transport Indicators for 12 Indian cities, 于12个印度城市发展城市交通指标
- Developing comprehensive indicators for before and after evaluation of BRTS projects in two Cities 于2个城市制定全面的指标, (BRTS项目前及后)

**Figure 3: Average trip length**

| City      | Average Trip Length (km) |
|-----------|--------------------------|
| Ahmedabad | ~8                       |
| Bangalore | ~10                      |
| Bhopal    | ~12                      |
| Chennai   | ~10                      |
| Delhi     | ~10                      |
| Hydrabad  | ~10                      |
| Jaipur    | ~10                      |
| Mumbai    | ~10                      |
| Pune      | ~10                      |
| Rajkot    | ~10                      |
| Surat     | ~10                      |

**Figure 4: Average travel speed**

| City      | Average Travel Speed (km/h) |
|-----------|-----------------------------|
| Ahmedabad | ~15                         |
| Bangalore | ~15                         |
| Bhopal    | ~15                         |
| Chennai   | ~15                         |
| Delhi     | ~15                         |
| Hydrabad  | ~15                         |
| Jaipur    | ~15                         |
| Mumbai    | ~15                         |
| Pune      | ~15                         |
| Rajkot    | ~15                         |
| Surat     | ~15                         |

**Public Transport & Intermediate Public Transport modal share**

| City      | Public Transport (%) | Informal Public Transport (%) | New Lighting (%) |
|-----------|----------------------|-------------------------------|------------------|
| Chennai   | ~10                  | ~10                           | ~10              |
| Delhi     | ~10                  | ~10                           | ~10              |
| Mumbai    | ~10                  | ~10                           | ~10              |
| Ahmedabad | ~10                  | ~10                           | ~10              |
| Bangalore | ~10                  | ~10                           | ~10              |
| Pune      | ~10                  | ~10                           | ~10              |
| Bhopal    | ~10                  | ~10                           | ~10              |
| Indore    | ~10                  | ~10                           | ~10              |
| Jaipur    | ~10                  | ~10                           | ~10              |
| Hydrabad  | ~10                  | ~10                           | ~10              |
| Rajkot    | ~10                  | ~10                           | ~10              |
| Surat     | ~10                  | ~10                           | ~10              |

Source: ITDP, E

### 2. Developing Cycling Inclusive Guidelines 发展自行车准则

- Guiding Pune and Nanded in India in implementing bikeways 执行自行车道(印度城市-印多尔, Nanded)
- Developing a Design Manual on integrating cycling in urban transport for India 制定印度城市自行车交通手册
- Develop Position paper on the relevance of Cycling in Asia 发展相关亚洲自行车的立场文件




Source : ICE

### 3. Training Urban Transport Professionals 城市交通专业人员培训

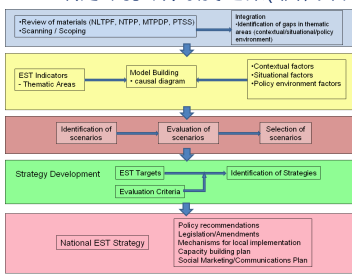
- Training of Master Trainers: 20 urban transport professionals from India & China  
培养导师: 20位来自印度和中国的专业人员
- Development and delivery of SUT training courses: TDM, MRT and NMT,  
发展 SUT 培训班:TDM, MRT and NMT



Source : GTZ SUTP

### 4. Institutionalizing Policies: EST Framework 政策制度化: 环境可持续交通框架

- Formulating Environmentally Sustainable Transportation (EST) Strategies in Philippines and Indonesia  
制定环境可持续交通策(菲律宾和印度尼西亚)



Source: DOTC and UP-NCTS

### 5. Partnering with Cities and Civil Society 城市和民间社会合作伙伴

- Dialogues with development partners, cities and other stakeholders 与发展合作伙伴,城市和其他利益相关者对话
- Road Show for Clean Fuels and Vehicles in Asia in Philippines, Viet Nam and Pakistan (with UNEP PCFV)  
清洁燃料和汽车的展览(菲律宾,越南和巴基斯坦)
- Research, publications and projects on SUT and air quality in Asian cities and countries  
有关亚洲的城市和国家,SUT和空气质量研究,出版物和项目





### 6. Reducing Emissions: Study on E-Bikes in China 减少排放量：中国电子自行车研究

- E-bike emissions per passenger km compared with: 电动自行车排放量(每乘客公里)
  - Bus with 50 passengers: 15% less CO<sub>2</sub>, but more PM and SO<sub>2</sub>  
载50名乘客的大巴：减少15%二氧化碳排放，但增加可吸入颗粒物和二氧化硫
  - Motorcycles: less CO<sub>2</sub>, but more SO<sub>2</sub>  
摩托车：减少二氧化碳排放，但增加可吸入颗粒物和二氧化硫
  - Cars: less CO<sub>2</sub> and less air pollutants (PM, SO<sub>2</sub>, CO, HC, NOx)  
汽车：减少二氧化碳和空气污染物排放
- Reasons for higher SO<sub>2</sub> emissions is coal-fired power plants  
燃煤发电厂导致较高的二氧化硫排放
- E-bikes can result in increased lead emissions –lead acid batteries, however lithium ion battery technology can prevent this  
电子自行车导致高含铅量排放(铅酸电池),但锂离子电池技术抵制

|                  | Energy Use<br>(kWh/100 pax-km) | CO <sub>2</sub><br>(g/pax-km) | SO <sub>2</sub><br>(g/pax-km) | PM<br>(g/pax-km) | CO<br>(g/pax-km)         | HC<br>(g/pax-km)         | NO <sub>x</sub><br>(g/pax-km) | Pb <sup>c</sup><br>(mg/pax-km) |
|------------------|--------------------------------|-------------------------------|-------------------------------|------------------|--------------------------|--------------------------|-------------------------------|--------------------------------|
| Car <sup>d</sup> | 47-140                         | 102-306                       | 0.23-0.69                     | 0.09-0.28        | 3.4-10.1                 | 0.57-1.67                | 0.44-1.32                     | 18-53                          |
| Bus              | 8.7-26.2                       | 24.2-96.8                     | 0.01-0.04                     | 0.04-0.14        | 0.08-0.32                | 0.008-0.030 <sup>e</sup> | 0.14-0.54 <sup>e</sup>        | 1-4                            |
| Motorcycle       | 21-42                          | 64-128                        | 0.04-0.08                     | 0.20-0.40        | 6.9-13.7                 | 1.13-2.25 <sup>e</sup>   | 0.08-0.15 <sup>e</sup>        | 16-32                          |
| Bicycle          | 4-8                            | 4-7                           | 0.01                          | 0.06             | Unkn                     | Unkn                     | Unkn                          | 0                              |
| BSEB             | 3.8-7.6                        | 15.6-31.2                     | 0.07-0.14                     | 0.07-0.14        | 0.007-0.014 <sup>e</sup> | 0.027-0.053 <sup>e</sup> | 0.010-0.020 <sup>e</sup>      | 145-290                        |
| SSEB             | 4.9-9.9                        | 20.2-40.5                     | 0.09-0.17                     | 0.10-0.19        | 0.009-0.017 <sup>e</sup> | 0.032-0.064 <sup>e</sup> | 0.014-0.027 <sup>e</sup>      | 210-420                        |

### 6. Reducing Emissions: Study on E-Bikes in China 减少排放量：中国电子自行车研究

CO<sub>2</sub> Share in PRC (2008)  
中国二氧化碳占有率(2008)

Two Wheelers Share, 两轮车  
Share from Vehicles excluding Two Wheelers, 车辆不包括两轮车

Source: 2009. ADB, CAI-Asia, Segment Y Ltd., and EA

### 6. Reducing Emissions: Air Quality Scorecard (1) 减少排放量：空气质量打分卡 (1)

- Air Pollution and Health Index** –analysis of air pollution levels of cities against WHO guideline values
- 空气污染和健康指数**—以WHO指导值衡量分析城市的空气污染水平
- AQM Capacity Index** –aggregation of indicators under four main categories: measurement, data assessment and availability, emissions inventory, and management
- 空气质量管理能力指数**—四类指标的综合体现，包括测量、数据评估和可用性、排放清单和管理。
- AQ Policies and Actions Index** –aggregation of indicators that assess the existing policies and actions for: mobile, stationary, area and trans-boundary sources
- 空气质量政策和行动指数**—评估现存政策和行动的指标的综合体现，包括移动源、固定源、面源和跨界源

### 6. Reducing Emissions: Air Quality Scorecard (1) 减少排放量：空气质量打分卡 (1)

|   |   |  |   |   |   |  |
|---|---|--|---|---|---|--|
| <b>1. AP and Health</b><br>Healthy AQ<br>Good AQ<br>Moderate AQ<br>Unhealthy AQ<br>Hazardous AQ | + | <b>2. AQM Capacity</b><br>Excellent AQMC<br>Good AQMC<br>Moderate AQMC<br>Limited AQMC<br>Minimal AQMC | + | <b>3. AQ Policies and Actions</b><br>Excellent AQPA<br>Good AQPA<br>Moderate AQPA<br>Limited AQPA<br>Minimal AQPA | = | <b>Overall AQ Score</b><br>Excellent AOS<br>Good AOS<br>Moderate AOS<br>Limited AOS<br>Minimal AOS |
| <b>1. 空气质量和健康</b><br>健康的空气质量<br>良好的空气质量<br>中等空气质量<br>不健康空气质量<br>有害空气质量                          | + | <b>2. 空气质量管理能力</b><br>优秀<br>良好<br>中等<br>有限<br>极低   | + | <b>3. 空气质量政策和行动</b><br>优秀<br>良好<br>中等<br>有限<br>极低   | = | <b>全面空气质量分数</b><br>优秀<br>良好<br>中等<br>有限<br>极低  |


### 6. Reducing Emissions: Air Quality Scorecard (2) 减少排放量：空气质量打分卡（2）

- Development of AQ Scorecard Tool 空气质量打分工具的发展
  - Review of Existing Tools and Literature, Drafting of the AQ Scorecard Tool, Review of the AQ Scorecard Tool 现存工具和文献回顾、空气质量打分工具的起草、空气质量打分工具的回顾和评价
  - Work closely with Stockholm Environment Institute 与斯德哥尔摩环境研究所紧密合作
- Piloting of AQ Scorecard Tool 空气质量打分工具的试点
  - Thailand, Philippines and Indonesia (2010) 泰国、菲律宾和印尼(2010)
  - Chinese cities??? 中国城市???
- Wide implementation of AQ Scorecard Tool 空气质量打分工具的广泛实施
- Across Asia 亚洲实行情况



### Vehicle Emissions Management versus Transport Management 机动车排放管理与交通管理

|   |                             |
|---|-----------------------------|
| Urban planning & transport demand management<br>城市规划和交通需求管理 | <b>AVOID</b><br>避免          |
| Public transport & non-motorized transport<br>公共交通和非机动化交通   | <b>SHIFT</b><br>转变          |
| Clean fuels and vehicles (VEM)<br>清洁燃料和机动车(VEM)             | <b>IMPROVE</b><br>促进        |
| Freight and logistics 运输物流                                  | <b>DON'T FORGET</b><br>别忘了! |




## CAI-Asia Center 中心

[www.cleanairnet.org/caiasia](http://www.cleanairnet.org/caiasia)

**Yan PENG, China Representative**  
彭艳, 中国项目负责人  
[Yan.peng@cai-asia.org](mailto:Yan.peng@cai-asia.org)  
Beijing, China

**苏菲 Sophie Punte, 执行总监 Executive Director**, [sophie.punte@cai-asia.org](mailto:sophie.punte@cai-asia.org)  
**May Ajero, Air Quality Program Manager**, [may.ajero@cai-asia.org](mailto:may.ajero@cai-asia.org)

Unit 3510, Robinsons-Equitable Tower  
ADB Avenue, Pasig City  
Metro Manila 1605, Philippines

