Challenges of and Opportunities for Developing Sustainable Transportation Systems in Beijing

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Background

- Summarizing China-focused work for SMART as part of the New Mobility Solutions Project supported by Alcoa Foundation Advancing Sustainability Research Program
- The work included literature review, air quality report monitoring, and SMART-led focus groups and workshops
- CAR’s efforts were focused on providing background information about Beijing to support the above activities
Center for Automotive Research (CAR)

CAR conducts leading-edge research that impacts the future of the global automotive and transportation industry. CAR enables private- and public-sector decision-makers to foster a sustainable and viable industry.
Population and Economic Growth in Beijing

Population (millions)

- 2000: 13.6
- 2001: 13.8
- 2002: 14.2
- 2003: 14.6
- 2004: 14.9
- 2005: 15.4
- 2006: 15.8
- 2007: 16.3
- 2008: 17.0
- 2009: 17.6
- 2010: 19.6
- 2011: 20.2
- 2012: 20.7

GDP per Capita (USD)

- 2000: $1,520
- 2001: $1,714
- 2002: $2,005
- 2003: $2,310
- 2004: $2,586
- 2005: $2,914
- 2006: $3,260
- 2007: $3,713
- 2008: $4,202
- 2009: $4,943
- 2010: $5,615
- 2011: $6,488
- 2012: $7,903
- 2013: $9,286
- 2014: $9,799
- 2015: $10,910
- 2016: $12,643
- 2017: $13,797
Motor Vehicle Growth and Ownership Rate

- Total Vehicles (thousands): 1,343, 1,612, 1,928, 2,289, 2,818, 3,566, 3,897, 4,075
- Light Passenger Vehicles: 228, 352, 612, 850, 1,289, 1,818, 2,366, 2,897

- Beijing: 52, 850
- China: 228, 850
- World Average: 128, 850
- US: 850, 500
- Developed Country Average: 850, 500

Vehicle Ownership per 1,000 People

- Total
- Light Passenger Vehicles
- Beijing
- China
- World Average
- US
- Developed Country Average

2005: Beijing, China, World Average, US, Developed Country Average
2006: Beijing, China, World Average, US, Developed Country Average
2007: Beijing, China, World Average, US, Developed Country Average
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2009: Beijing, China, World Average, US, Developed Country Average
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2011: Beijing, China, World Average, US, Developed Country Average
2012: Beijing, China, World Average, US, Developed Country Average
Possession of Passenger Cars vs. Disposable Income at Provincial Level in China (2010)

Source: Ministry of Transport and BBVA Research, 2012
Transportation Mode Share in Beijing

Source: Beijing Transportation Research Center, 2011
## Commuting by Different Mode of Transportation

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<th>Mode</th>
<th>Travel Distance (km)</th>
<th>Travel Time (minutes)</th>
<th>Travel Speed (km/h)</th>
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*Source: Beijing Transportation Research Center, 2011*
Monthly Average of Air Quality Index in Beijing
(2012 annual average: 148; 2013: 162)

Source: U.S. Embassy in Beijing & CAR
Monthly Average of PM2.5 Index in Beijing
(2012 annual average: 92; 2013: 102)

Source: U.S. Embassy in Beijing & CAR
### Average Air Quality Index by Month and Hour in Beijing

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What Are the Emission Sources?

- The unfavorable weather patterns
- Heavily-industrialized areas surrounding Beijing
- Heavy reliance on coal power
- Automobile use and truck traffic
- Urban construction
- Cooking fumes (?)
Three Dimensions of Sustainable Transportation Systems

- **Economic**: efficient and reliable movement of people & goods
- **Social**: transportation options, safety and security
- **Environmental**: reduced emissions

“Meeting, and sometimes re-defining, the mobility needs of the present without compromising the ability of future generations to meet their needs”

*ITS America Position Statement on ITS and Sustainable Transportation (2012)*
Reducing Transportation GHG Emissions

“4-Legged Stool”

- **Policy & Planning**
  - Sustainable transportation options
  - Vehicle purchase/use limitations
  - Land use/Urban planning policies and practices

- **Attitudes & Behavior**
  - Less auto dependent life style

- **Improve Operational Efficiency of Transportation Network**
  - Intelligent transportation systems (ITS)
  - Advanced traveler information system to help mode choice and other travel decisions
  - Integrated multi-modal fare payment

- **Vehicles & Fuels**
  - Lightweighting
  - Electrification, natural gas, and bio fuels etc.
Sustainable Transportation in the Context of National Energy Consumption and CO2 Emission

China's Energy Consumption by Fuel Type


Energy-related Carbon Dioxide Emissions by Sector: China and US

Note: “Industry” on the chart includes manufacturing, construction, and agriculture
Source: Lawrence Berkeley National Laboratory, 2012
Summary: The Challenges

- Concentration of government activities and other urban functions in central Beijing lead to high travel demand.
- Skyrocketing housing prices and emerging disparities in mobility access.
- Unsustainable public transportation subsidy (more than three billion USD in 2013, increased from 2.1 billion or by 45% from 2010).
- Air pollution is a huge issue. Transportation related influence will increase largely due to the growing mobility needs and higher vehicle ownership and use.
- Very limited understanding of the relationship between transportation and air quality, including impacts of freight movements.
- Significant efforts are needed to collect the necessary data and develop useful tools to evaluate and forecast policy impacts.
Summary: Opportunities for Beijing

- Top down strategic planning and huge public sector commitment to build multimodal transportation systems
- Strict regulations on auto use and ownership
  - Registration limitations: slash new car registration quota by 40% (from current 240,000 each year to 150,000 in 2014)
  - Driving limitations: 20% of vehicles are not allowed on the roads weekdays; the driving ban increased to 50% of vehicles in severe smog days.
  - Fuel quality improvement and Implementing European emission standards
  - Vehicle inspection and retrofit programs, including commercial vehicles
- Increasing applications of ITS and information technologies
  - Traffic monitoring
  - Traveler information/hotline
  - ITS for public and multimodal transportation (e.g., Didi Taxi)
Thank You!

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