Urban Transport Energy Use in the APEC Region

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Urban Transport Project Team
Presented by Naoko Doi
Asia Pacific Energy Research Centre
Contents

- Characterisation of transport energy use in the major cities of APEC

- Evaluation of urban transport system and energy efficiency levels

- Analysis of policy/ economic instruments

- Drawing policy implications for enhancement of energy security and sustainable development
Continued Dependence on Oil Products

- The transport sector will continue to drive up oil demand barring a major technological breakthrough.
  - By 2030, the transport sector will lead about 70 percent of incremental oil demand growth.
  - By 2030, oil is expected to continue to be the major energy source for the transport sector.
  - By 2030, road transport is projected to account for about 80 percent of total transport energy demand.

Continued Rapid Urbanisation

- By 2030, 26 million people per year will migrate from rural areas into urban areas.
  - Urban population is likely to need more transport energy than rural population.

(Source) Asia Pacific Energy Research Centre (2006), “APEC Energy Demand and Supply Outlook”
Urbanisation in APEC
Urban-Rural Population in APEC

Energy Consumption in Beijing, Shanghai, Seoul and Tokyo

Per capita Energy Consumption (1985-2000)

Sectoral Share in Energy Consumption (1998)

(Source) Dhakal (2004)
Characterisation
Coverage of the Cities in APEC

- **Shanghai**
  - Pop: 17.8 millions
  - Income: 27466 US$, 2000PPP
  - Cars/1000 Pop: 36

- **Beijing**
  - Pop: 15.38 millions
  - Income: 19920 US$, 2000PPP
  - Cars/1000 Pop: 117

- **Tokyo**
  - Pop: 12.3 millions
  - Income: 52197 US$, 2000PPP
  - Cars/1000 Pop: 117

- **Beijing**
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- **Tokyo**
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- **San Francisco**
  - Pop: 7.02 millions
  - Income: 43420 US$, 2000PPP
  - Cars/1000 Pop: 364

- **Hong Kong**
  - Pop: 6.85 millions
  - Income: 34170 US$, 2000PPP
  - Cars/1000 Pop: 59

- **Mexico City**
  - Pop: 19.41 millions
  - Income: 9064 US$, 2000PPP
  - Cars/1000 Pop: 164

- **Bangkok**
  - Pop: 5.48 millions
  - Income: 27560 US$, 2000PPP
  - Cars/1000 Pop: 323

- **Singapore**
  - Pop: 4.35 millions
  - Income: 28653 US$, 2000PPP
  - Cars/1000 Pop: 101

- **Hanoi**
  - Pop: 3.18 millions
  - Income: 6157 US$, 2000PPP
  - Cars/1000 Pop: 48
Cities’ income represent substantially higher level than that of national average.

(Source) APERC Analysis (2007) based on data from various sources
Historical Trends in Passenger Vehicle Stocks (1990-2005)

Cities represent higher level of passenger vehicle stocks per 1,000 population than that of national average.

(Source) APERC Analysis (2007) based on data from various sources
Historical Trends in per capita Gasoline Consumption (1990-2005)

China and SEA to represent higher per capita gasoline consumption than economy average.

(Source) APERC Analysis (2007) based on data from various sources
Evaluation of Urban Transport System in Asia
Gasoline Consumption per Capita in the Cities of Asia (1980-2004)

(Source) APERC Analysis (2007) based on data from various sources
Income and Gasoline Consumption per Capita in the Cities of Asia (1980-2004)

(Source) APERC Analysis (2007) based on data from various sources
Income Normalised per Capita Gasoline Consumption in the Cities of Asia

(Source) APERC Analysis (2007) based on data from various sources
Urban Transport Indicator: Asia

■ Creation of two indicators

■ Road indicator
  - Weighted average of the below indicators
    ■ Vehicle ownership
      ➢ Passenger vehicles/1,000 population/Income
    ■ Length of road
      ➢ Length of road/Population/Income
    ■ Distance Traveled

■ Offset indicator
  - Weighted average of the below indicators
    ■ Energy efficiency improvement
      ➢ Annual growth rate of gasoline consumption/vehicle between 1995 and 2005
    ■ Accessibility to rail and subway
      ➢ the number of subway and rail stations/urban land area
    ■ Governance
      • World Bank’s Worldwide Governance Indicators
**Urban Transport Indicator – Ranking**

<table>
<thead>
<tr>
<th>City</th>
<th>Vehicle Stocks (Tokyo = 10)</th>
<th>Road</th>
<th>Vehicle Mileage</th>
<th>Road Indicator</th>
<th>City</th>
<th>Vehicle Efficiency</th>
<th>Access to Rail and Subway</th>
<th>Governance</th>
<th>Offset Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jakarta</td>
<td>22.0</td>
<td>95.4</td>
<td>59.4</td>
<td>47.9</td>
<td>Hong Kong</td>
<td>0.0</td>
<td>45.4</td>
<td>94.7</td>
<td>46.6</td>
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<tr>
<td>Bangkok</td>
<td>23.2</td>
<td>33.1</td>
<td>74.0</td>
<td>40.4</td>
<td>Tokyo</td>
<td>-6.1</td>
<td>42.8</td>
<td>86.6</td>
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<tr>
<td>Seoul</td>
<td>22.1</td>
<td>41.7</td>
<td>41.9</td>
<td>31.9</td>
<td>Seoul</td>
<td>4.6</td>
<td>43.4</td>
<td>74.4</td>
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<td>Beijing</td>
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<td>Taipei</td>
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<td>36.6</td>
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<td>Hanoi</td>
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<td>Singapore</td>
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<td>24.4</td>
<td>56.4</td>
<td>25.1</td>
<td>Bangkok</td>
<td>5.0</td>
<td>5.9</td>
<td>61.1</td>
<td>22.5</td>
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<tr>
<td>Taipei</td>
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<td>32.9</td>
<td>26.1</td>
<td>22.0</td>
<td>Shanghai</td>
<td>3.7</td>
<td>14.4</td>
<td>45.8</td>
<td>20.6</td>
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<tr>
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<td>31.2</td>
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<td>Beijing</td>
<td>1.9</td>
<td>5.1</td>
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<tr>
<td>Hong Kong</td>
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<tr>
<td>Shanghai</td>
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<td>Jakarta</td>
<td>-6.3</td>
<td>5.1</td>
<td>31.4</td>
<td>9.6</td>
</tr>
</tbody>
</table>

(Source) APERC Analysis (2007) based on data from various sources
Cities in Group I represent relatively high accessibility to subway/rail stations – key to offset growth in road energy consumption.

Cities in Group II have relatively high vehicle stocks compared with income levels, while accessibility to subway/rail is low.

Cities in Group III are at the early stage of development.

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(Source) APERC Analysis (2007)
Findings

- Accessibility to rail/subway is the key.
  - Hong Kong, Tokyo, Seoul and Taipei

- Development of rail/subway infrastructure needs proper governance.
  - Hong Kong, Tokyo, Seoul and Singapore

- Urban dwellers depend heavily on vehicles unless accessibility to rail/subway is ensured.
  - Bangkok

- Increase in distance traveled offsets the impact of vehicle efficiency improvement.
  - Income growth (Bangkok and Beijing)
  - Road infrastructure development (Beijing and Hanoi)
  - Suburbanisation (Seoul)
Measures to Curb Road Energy Consumption
Assuming 9 years’ ownership of 1800 cc car, we obtained substantial difference in the cost of vehicle ownership across the cities.
**Prices and Taxes of Oil Products in Asia**

Gasoline and diesel prices show substantial difference across the countries, reflecting different pricing and tax.

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Ex-Tax Price</th>
<th>Tax</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thailand Diesel</td>
<td>2005</td>
<td>7% on Retail Margin</td>
<td>49%</td>
<td></td>
</tr>
<tr>
<td>Thailand Gasoline</td>
<td>2005</td>
<td>7% on Retail Margin</td>
<td>49%</td>
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<td>Korea Diesel</td>
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<td>17%</td>
<td>50%</td>
<td></td>
</tr>
</tbody>
</table>

(Source) APERC Analysis (2005) from various sources.
Transport Policy Issues

- **Bangkok**
  - More than 10 organisations under different ministries/agencies are responsible for transport planning.
  - No mechanism is in place to realign different policy goals.
    - Promotion of automobile industry
    - Mitigation of traffic congestion

- **Shanghai**
  - Central government plans to ban “license plate auctioning” to foster automobile industry.
Implications

- Passenger transport energy consumption results from diverse socioeconomic factors.
  - Income, Length of road
  - Accessibility to alternative transport modes
  - Urban form, population density

- Accessibility to rail/subway is the key component that can reduce passenger vehicle dependence and improve energy intensity of the urban passenger transport sector in Asia.

- Proper governance is needed to support rail infrastructure development

- City planners, especially at the early stage of development, need to appropriately assess their future transport requirements and plan appropriate timing in investment towards rail/subway infrastructure.
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Urban Transport Energy Use in the APEC Region (2007)

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APERC Presentation 2007

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APERC Presentation at the 5th APEC Energy Ministers' Meeting, 2007, Dawna, Australia

**NEW!**
APEC Energy Demand and Supply Outlook 2006