Decarbonization of the Transport Sector and Urban Form

Sustainable Transportation System and Carbon Emission Peak

- Hangzhou as an example
Decarbonization Strategies

**Strategies for demand side**

Reduce the demand of oil consumption in urban transportation sector by introducing and implementing related policies (prioritize public transport, NMT).

**Strategies for supply side**

Provide and promote clean energy (electrification, hybrid) to fulfil travel demand by introducing and implementing related policies.
Decarbonization Strategies

Transit Oriented Development
Promoting high density and mixed use development, better transit and NMT network, compact urban form to reduce car use along high capacity transit corridors.

Shared Mobility
Promote shared mobility develop with new energy vehicles. Provide sound policy to the efficient and sustainable development.
Public transportation and electrification

- 615 Bus routes;
- 82km metro lines;
- 151km BRT network;
- 500 service radius, covered 96% the urban area;
- Daily ridership: 4.1 million;
- Public transport mode share: 39.8%
- Bus fleet: 4974 in urban area;

Bus fleet

<table>
<thead>
<tr>
<th>Type</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid</td>
<td>856</td>
</tr>
<tr>
<td>CNG</td>
<td>1604</td>
</tr>
<tr>
<td>Electric</td>
<td>2312</td>
</tr>
<tr>
<td>Oil</td>
<td>2020</td>
</tr>
</tbody>
</table>

Percentage

- Hybrid: 4.1%
- CNG: 17.2%
- Electric: 46.5%
- Oil: 32.2%
Non-motorized transportation development

• 2028km greenway;
• 1030km urban greenway;
• 3833 public bicycle station with 89,600 public bicycles;
• Till August 2017, 420,000 dockless bikeshare bikes in Hangzhou;
• Walking environment improvement
Traffic demand management - Parking

<table>
<thead>
<tr>
<th>Area</th>
<th>Parking fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core area</td>
<td>5 RMB/half hour</td>
</tr>
<tr>
<td>Level 1 region</td>
<td>3 RMB/half hour</td>
</tr>
<tr>
<td>Level 2 region</td>
<td>2 RMB/half hour</td>
</tr>
<tr>
<td>West lake area</td>
<td>10 RMB/h (work day)</td>
</tr>
<tr>
<td></td>
<td>20 RMB/h (private vehicle, vacation)</td>
</tr>
</tbody>
</table>

**Additional hour**

<table>
<thead>
<tr>
<th>Area</th>
<th>Parking fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core area</td>
<td>6 RMB/half hour</td>
</tr>
<tr>
<td>Level 1 region</td>
<td>4 RMB/half hour</td>
</tr>
<tr>
<td>Level 2 region</td>
<td>3 RMB/half hour</td>
</tr>
<tr>
<td>West lake area</td>
<td>10 RMB/h (work day)</td>
</tr>
<tr>
<td></td>
<td>20 RMB/h (private vehicle, vacation)</td>
</tr>
</tbody>
</table>

**Over 24 hours**

<table>
<thead>
<tr>
<th>Area</th>
<th>Parking fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core area</td>
<td>147 RMB/d</td>
</tr>
<tr>
<td>Level 1 region</td>
<td>99 RMB/d</td>
</tr>
<tr>
<td>Level 2 region</td>
<td>75 RMB/d</td>
</tr>
</tbody>
</table>
Traffic demand management – License plate limitation and traffic control

License plate limitation

From 2014, Hangzhou issued passenger car license plate control regulations, to set a limitation on annual car ownership growth. 80,000 license plates will be issued annually in Hangzhou via auctions and lotteries.

Traffic control

From 2014, Hangzhou issued traffic control regulations in urban area:

- 7:00am-9:00am, 16:30pm-18:30pm
- Everyday private vehicle license plate with designated ‘two numbers’ will be forbidden to drive at certain time in urban area.
Shared mobility

**Online car-hailing service Caocao**

Caocao is the biggest online car-hailing service provider in Hangzhou. Caocao owns 3,286 vehicles, all are electric vehicles. Caocao provides online car-hailing service to more than 23 Chinese cities.

- 3,286 electric vehicles, adding another 1,500 vehicle in 2018
- 1.86 million registered users
- 30,486 average daily effective orders

12 other online car-hailing services existed in Hangzhou.
Transit Oriented Development

New town development:

Qi Bao TOD Urban Complex:

Build around metro line 9 station, high rise, mix use development.

In the complex:
- Residential: 150,000-200,000m²
- Commercial: 80,000-100,000m²
- Office: 50,000-100,000m²
- Hospital: 22,000m²
- Social service: 11,000m²

NMT, parking issue still need to be taken care of.
National policy

In 2012, the State Council issued documents on new energy vehicle subsidy policy, to stimulate new energy vehicle research and development and also encourage consumption.
### NATIONAL POLICY (NATIONAL SUBSIDY IN 2015)

<table>
<thead>
<tr>
<th>Vehicle type</th>
<th>Driving mileage R (km)</th>
<th>Subsidy (unit: RMB/vehicle)</th>
<th>Subsidy (USD/vehicle)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure electric passenger car</td>
<td>80 &lt;= R &lt; 150</td>
<td>31,500</td>
<td>4,984</td>
</tr>
<tr>
<td></td>
<td>150 &lt;= R &lt; 250</td>
<td>45,000</td>
<td>7,120</td>
</tr>
<tr>
<td></td>
<td>R &gt;= 250</td>
<td>54,000</td>
<td>8,544</td>
</tr>
<tr>
<td>Hybrid passenger car</td>
<td>R &gt;= 50</td>
<td>31,500</td>
<td>4,984</td>
</tr>
<tr>
<td>Pure electric special vehicle</td>
<td>1800 RMB/kwh base on the battery capacity, The total amount of subsidies each vehicle cannot exceed 135,000 RMB</td>
<td>21,360</td>
<td></td>
</tr>
<tr>
<td>Fuel-cell passenger car</td>
<td>180,000</td>
<td>28,418</td>
<td></td>
</tr>
<tr>
<td>Fuel-cell business car</td>
<td>450,000</td>
<td>71,202</td>
<td></td>
</tr>
</tbody>
</table>

The subsidy from national government will last till 2020, but subsidy from national government will reduce annually from 2017:
- Compare to 2016, subsidy in 2017-2018 will reduce 20%.
- Compare to 2016, subsidy in 2017-2018 will reduce 40%.
Electrification

National subsidy for charging infrastructure (for heavy pollution cities)

<table>
<thead>
<tr>
<th>Year</th>
<th>Threshold of subsidy (unit new energy vehicle)</th>
<th>Subsidy(Million RMB)</th>
<th>Additional reward</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>30,000</td>
<td>90</td>
<td>7.5 million RMB for every additional 2,500 vehicles, maximum subsidy 0.12billion RMB</td>
</tr>
<tr>
<td>2017</td>
<td>35,000</td>
<td>95</td>
<td>8 million RMB for every additional 3,000 vehicles, maximum subsidy 0.14billion RMB</td>
</tr>
<tr>
<td>2018</td>
<td>43,000</td>
<td>104</td>
<td>9.5 million RMB for every additional 4,000 vehicles, maximum subsidy 0.16billion RMB</td>
</tr>
<tr>
<td>2019</td>
<td>55,000</td>
<td>115</td>
<td>10 million RMB for every additional 5,000 vehicles, maximum subsidy 0.18billion RMB</td>
</tr>
<tr>
<td>2020</td>
<td>70,000</td>
<td>126</td>
<td>11 million RMB for every additional 6,000 vehicles, maximum subsidy 0.2billion RMB</td>
</tr>
</tbody>
</table>

Local subsidy for new energy vehicle

Local government required to provide corresponding subsidy to new energy vehicle produce company or consumer, but the local subsidy for a single vehicle can’t exceed 50% national government subsidy.

Each city can set up different subsidy policy.
Electrification

Policy support

Financial support:
• Strong subsidy to new energy vehicle manufactures and consumers
• Subsidy to charging infrastructure construction
• Financial support on battery development
• Financial support to new energy manufactures research and development
• Reduce taxes for vehicle purchase

Traffic management
• No license plate restriction for new energy vehicles
• No traffic control for new energy vehicle
• Some cities provide free parking for new energy vehicle (Shenzhen, Chengdu)
Policy result estimation

**Next step: LEAP model to estimate policy outcomes (Oil consumption):**

Compare different scenarios:

- BAU
- Improved public transportation system and NMT
- More restricted parking management
- TOD strategies
- Shared mobility
- Electrification
- Combined strategies
Policy result estimation: BAU

Oil consumption will arrived at the peak till 2037
Policy result estimation: Combined strategy

Oil consumption will early peak at 2025
Thank you!

Li Shanshan
ITDP 2018.6.27
Key questions to discuss:

- Electrification was mainly driven by policy and market, what can NGOs contribute to electrification?