LOW-CARBON AND SUSTAINABLE TRANSPORT FOR QINGDAO: A STRATEGIC STUDY

Sustainable and Livable Cities Initiative for Qingdao
SUMMARY

Urbanization has been rapid for the coastal city of Qingdao in China's eastern Shandong Province. The Qingdao Municipal Government has set ambitious goals to reduce carbon emission intensity by 45% by 2020 from 2005. Both the 12th Five-Year Plan and Qingdao's Urban Master Plan portray a drastic transformation that the city will be undergoing: by 2020, the city will have a population of 12 million people, compared to 8.7 million in 2012, and two new urban centers will be created to accommodate the future growth. Rapid economic growth, urbanization, and motorization will fuel a growth in negative externalities associated with urban transport.

- By 2010, the average speed of travel had sunk from 29.7 in 2002 to just 21.7 km/h. Severe traffic congestion was causing annual losses of 1.8 billion CNY (or 3% of the city's GDP). Meanwhile, CO$_2$ emissions from the transport sector made up about 21% of the city's overall CO$_2$ emissions.

- By 2020, the city's travel demand will have risen from 4.7 million person trips per day in 2010 to 9.4 million. Total daily vehicle kilometers traveled will increase from 29.4 million km in 2010 to 90 million km. The mode share of private vehicles will rise to 40% if no intervention measures are taken. By 2020, transport-related CO$_2$ emissions will make up at least 29% of total emissions, becoming the fastest-growing source of emissions. This will make it increasingly difficult for Qingdao to meet its sustainable and low-carbon goals.

Existing problems and those that will arise in the future will pose challenges to Qingdao. How can it strike a balance between economic development and sustainable development?
PROBLEMS

This report assesses Qingdao’s current measures to pursue low-carbon transport in four inter-connected areas: policy, institutional structure, finance, and public perception and awareness. (Figure 1)

Perception and awareness

The World Bank notes that when the annual income per capita falls between USD 3,500 and USD 8,500, cities tend to experience faster motorization rates. With Qingdao’s annual income per capita now at USD 4,761, the income elasticity of private cars rises to 0.88, similar to the figure in the U.S. when motorization reached its peak. The number of private vehicles in the city has risen from around 340,000 in 2006 to more than 1 million in 2012; the annual growth rate has maintained a stunning value of 22%.

Meanwhile, there is little awareness of the problems that unrestricted car ownership growth will bring and the misconception that solutions, such as expanding road networks, will solve any problem is widespread. Furthermore, the public still regard car ownership as an important status symbol, and their desire to own a car is increasing.

Policy

There is a lack of integration between land-use and public transport planning. The study showed that besides rising incomes, poor land use planning and a lack of good public transport are also key drivers behind the growth in car ownership.

First, on the macro level, although land use configuration determines travel pattern and mode choices, land use segregation (such as large gated residential neighborhoods and industrial parks) and spatial separation of living, working, and entertainment activities are prominent in Qingdao. As the typical monocentric city, employment concentrates at the heart of the city, where job density is near 12,000 jobs/km². This means that on average Qingdao residents travel 20 km a day to work, and this number will rise as the city expands from 291 km² in 2011 to reach 560 km² by 2020. On the micro level, the homogenous urban pattern makes it extremely costly to deliver public transit to evenly distributed residential areas. As the car-oriented urban design philosophy prevails, the city is losing the human scale of traditional Chinese neighborhoods and also paving the road for a high GHG emission urban pattern.

Figure 1 | Factors related to urban transport in Qingdao
Second, in a rush to accommodate growing vehicle numbers, Qingdao has emphasized the construction of highways and major roads. The share of the city’s roads made up by highways and arterial roads is 22%, much higher than that of the average city in the U.S. (9%). Qingdao’s road density is just 5 km/km², compared to Tokyo’s 19 km/km². A low road density means that there are few options for journey routes and this discourages public transit, walking and biking.

**Poor public transport.** First, Qingdao’s city center is poorly serviced by the public transportation system (see factsheet) in terms of speed, reliability, comfort and coverage. The road network and the lack of connecting sidewalks make pedestrian travel both dangerous and inefficient the road network and lack of sidewalk connectivity deter a safe and efficient access to transit stops (the average access and egress time is 10-15 minutes). Moreover, travel times by public transport are also long because of poor enforcement and private drivers’ lack of awareness of bus lanes.

Second, there is a big difference between public transport in the urbanized area and that in the newly-built suburban areas. This has made the mode share of public transport in new suburban areas a meager 18% -- that is about half of what it is in the city center. This is also encouraging people to get used to driving their own cars at an early stage.
Institutional structure

**Fragmentation of responsibilities.** The problems with policy are exacerbated by the fragmentation of governing responsibilities. For instance, the planning function is outside the jurisdiction of the transport commission; it has no authority over land use planning. The construction commission handles the building and expansion of urban roads, while the transport commission is only responsible for peri-urban and regional roads. On top of that, four different municipal agencies are responsible for four different areas of transport: private vehicles, buses and taxis, subways, and sidewalks. This fragmentation of responsibility results in poor policy, broken funding, and greatly undermines Qingdao’s ability to make a coordinated effort to solve its transportation challenges.

A lack of common goals, monitoring and evaluation mechanisms to hold decision makers accountable. Creating synergies between departments is also challenging when they have different objectives from the start. Moreover, there is no sound monitoring and evaluation mechanism to assess how policies are working and to hold decision-makers accountable.

**Finance**

**Finance policies favor private cars over public transport.** The funds invested into upgrading the public transport system are dwarfed by the huge amount of funds that go into road building. Between 2007 and 2009, public transport only received 7% of the money invested into transportation. The percentage in Beijing and other second-tier cities in China is 25%.

**Lack of diversified funding sources for public transport.** Like many other Chinese cities, Qingdao relies heavily on lump-sum land concessions and bank loans to fuel infrastructure construction and operation, particularly the metro. This practice tends to drive up the local government’s financial risks and makes it more likely that the city turns into an urban sprawl. Qingdao could sever its reliance on these funding channels by pursuing a number of different and sustainable financial channels.
**RECOMMENDATIONS**

This study has come up with five-step recommendations to help Qingdao achieve the sustainable development of its transportation sector.

**Step 1: Define a common sustainable and low-carbon goal**

Currently, the city has multiple and conflicting goals: it is pursuing GDP growth, a reduction in greenhouse gas emissions, and promoting urbanization. Many of the city's initiatives end up either giving way to the political agendas of certain officials, or they are half-heartedly implemented. What is needed is a clearly-defined sustainability goal to bind the various initiatives together and to back them by a strong united political will. This goal should reflect the vision of the city as held by various stakeholders and should reconcile the conflict of interests between the need for economic growth, environmental protection, and social equity. Only by setting common goals can Qingdao overcome institutional fragmentation and shake up political resolve.

Qingdao also lacks a set of measurable, realistic, and actionable goals. Because the city is pursuing an ambitious urban expansion, it recently set up an objective to establish a "one-hour economic zone" served by a transportation network. However, even with the most optimistic estimates, Qingdao is still very far from attaining this goal.

**Step 2: Deploy a holistic and strategic approach**

The city also lacks a clear roadmap on how to achieve existing and future goals. It does not have an overall framework to help it identify priorities, make sure it has access to the necessary resources (funding and implementation capacity).

The city still largely relies on reactive and supply-side approaches such as expanding the road network, widening streets, and building costly rapid transit systems to achieve low-carbon transport. However, these are not effective solutions, rather Qingdao needs to look for comprehensive and holistic approaches that combine supply side with demand side measures (such as better parking management and fees), and integrated transport planning. Such measures include the following (please see Table 1 for information on how they can be implemented):

- Land-use planning and transit-oriented development:
  - promote regional Transitt-oriented centers based on accessibility, distance, and development potentials; plan public transport routes that connect existing densely-populated areas, important transit hubs, and future growth centers;
To promote the construction of small grids around public transport stations; encourage the mix of different land uses, different social groups;

- use tax credits and other preferential policies to attract jobs and public amenities to residential neighborhoods.

- Improve public transport and non-motorized transport:
  - promote a multi-modal public transport network by improving infrastructure, public information, and fare integration;
  - make public transport and non-motorized transport more convenient by ensuring their right-of-way (for example by creating bus lanes), improving standards of service, and set up monitoring mechanisms.

- Travel demand management:
  - develop parking strategies for the downtown area, top tourist attractions, and high-density transport stations (including parking fees, parking requirements, enforcement and management);
  - introduce traffic calming measures on the historic areas of the city.

**Step 3: Build effective institutions for sustainable transport**

Qingdao will be able to implement sustainable transport policies if it places all tasks related to transport development and management under one central authority. This includes both vertical integration (planning, construction, operation, and enforcement) and horizontal integration (public transport, private vehicles, and non-motorized transport). Currently these are spread around a number of different municipal departments. Qingdao also needs to build capacity in terms of decision-making, policy implementation, and monitoring and evaluation. It should also set up a dedicated research center to advise policymakers, rather than relying on the whims of officials. Decisions should be made based on scientific modeling, evidence and expertise.
Step 4: Explore a number of sources of funding
The city needs to find a number of sustainable and diversified sources of funding to invest in public transport, non-motorized transport and other low-carbon transport. It can also lower the entry threshold for investment for the private sector. Subway construction and operation are capital-intensive, and the local government does not have the resources to recover these costs. The government needs to rely less on revenue from land concessions and government loans and look for other sources of funding such as from advertisers to fund improvements to public transport and railway infrastructure.

Step 5: Establish an effective monitoring and evaluation system
An effective monitoring and evaluation system is needed to guide the transport sector onto a sustainable track and hold decision-makers accountable. This requires evidence-based and outcome-driven performance indicators and a transparent reporting system. The city currently uses input-driven performance indicators such as investment and infrastructure density. It does not assess user experience. Therefore, good evaluation criteria are needed along with a combined top-down and bottom-up monitoring system to make sure both policymakers and transport providers are doing their jobs well.
### Table 1 | **Recommendations**

<table>
<thead>
<tr>
<th>INITIATIVE</th>
<th>SUB-INITIATIVES</th>
<th>MAIN DEPARTMENTS RESPONSIBLE</th>
<th>MAIN OBSTACLES</th>
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</thead>
<tbody>
<tr>
<td>1. Integrated land use and transport planning</td>
<td>1. Public transport-oriented development</td>
<td>Planning bureau, the Qingdao Metro</td>
<td>Long implementation time, involves multiple stakeholders and requires top-down intervention.</td>
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<td></td>
<td>1.2 Use zoning requirements to promote land-use mix</td>
<td>Planning bureau, mayor's office</td>
<td>Strong incentive to turn the land zoned for public amenities for lucrative commercial and residential uses; therefore, need to enforce zoning requirement.</td>
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<td>2. Public transport and non-motorized transport</td>
<td>2.1 Multi-modal integration</td>
<td>Subway office, construction commission, transport commission, planning bureau</td>
<td>Need to coordinate a number of local governments and leverage the private sector, therefore it requires top-down intervention.</td>
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<td></td>
<td>2.2 Increase the number of bus-only lanes</td>
<td>Traffic police, transport commission</td>
<td>Enforcement of bus lane use must be tightened</td>
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<tr>
<td></td>
<td>2.3 Improve management and establish standards of service</td>
<td>Transport commission, bus operators</td>
<td>The input-oriented performance is not effective, need to adopt an output-oriented one (for example improve the quality of service)</td>
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<td>3. Travel demand management</td>
<td>3.1 Parking fees</td>
<td>Development and reform commission, transport commission</td>
<td>Involve the private sector to operate the parking spaces, ensure the revenue generated from parking could be reasonably divided between the public and private sector.</td>
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<tr>
<td></td>
<td>3.2 Parking supply</td>
<td>Planning bureau</td>
<td>Getting the price is the prerequisite.</td>
</tr>
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<td></td>
<td>3.3 Enforcement</td>
<td>Traffic police, district governments, construction commission</td>
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<td></td>
<td>3.4 Restricting car ownership (tentative)</td>
<td>Mayor's office, traffic police, transport commission</td>
<td>Public objection must be overcome with public outreach and communication strategies. Need to assess potential adverse effects on local auto manufacturers.</td>
</tr>
<tr>
<td>4. Public communications</td>
<td>4.1 Public outreach and communications to influence public perception of car ownership</td>
<td>Mayor's office, traffic police, transport commission</td>
<td>Lack of understanding of public perception and understanding</td>
</tr>
</tbody>
</table>

Note: Milestones as well as required funding should also be guaranteed.
EXAMPLES OF KEY PERFORMANCE INDICATORS

- Land-use mix and density
- Pedestrian access to public transportation network
- Public transport and non-motorized transport modal share
- Distance traveled
- Emissions
- Rent and sales

- Land-use mix (office, residential, retailing, and public amenities)
- Public transport and non-motorized transport mode share
- Commercial speed of buses
- Travel time
- Affordability
- Comfort
- Safety
- Emissions

- Utilization of parking spaces
- Compliance
- Public feedback

- Travel speed and traffic congestion
- Emissions and safety
- Public feedback

- Public transport and non-motorized transport mode share

WITH SUPPORT FROM:

CATERPILLAR

AUTHOR

Zhang Haitao  Senior Associate, EMBARQ China Director.
Email: htzhang@wri.org, Tel: +86 10 6416 5697 ext. 67

Xue Lulu  Research Analyst, EMBARQ China.
Email: lxue@wri.org, Tel: +86 10 6416 5697 ext. 39

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OUR IMPACT
Since 2002, the EMBARQ Network has worked globally with city and national governments, strategic partners, and the private sector to achieve on-the-ground change and influence policy at the local, national and international levels.

OUR MISSION
We catalyze and help implement environmentally, socially and financially sustainable urban transport and urban development solutions to improve quality of life in cities.