Viability of New Toll Road Infrastructure under Operational Uncertainties

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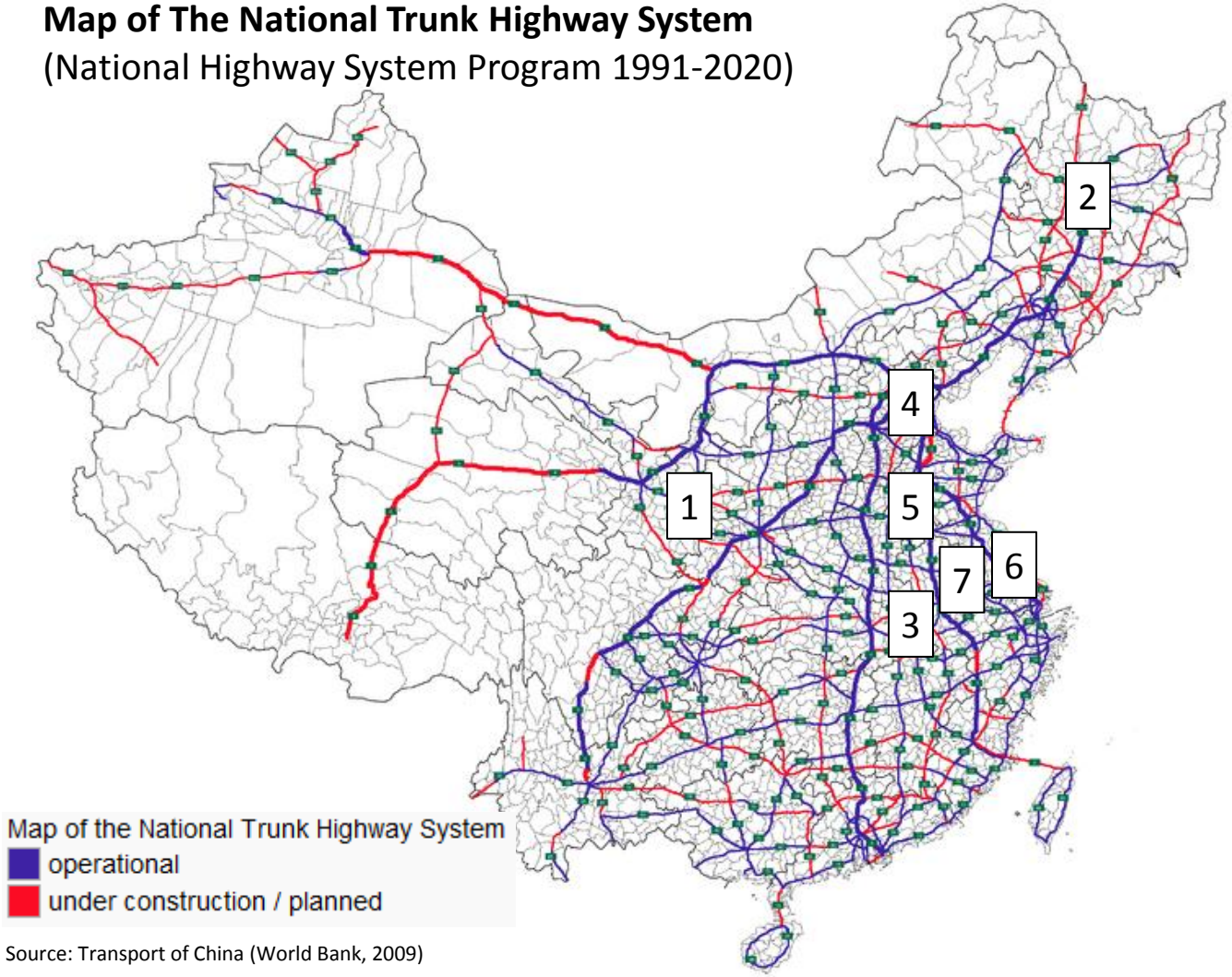
The Development of Expressway Network in China

Map of The National Trunk Highway System
(National Highway System Program 1991-2020)



Source: Transport of China (World Bank, 2009)

Seven Toll Road Projects
1. Chengdu-Nanchong Expressway
2. Changyu-Harbin Expressway
3. Hunan Expressway
4. Hebei Expressway
5. Xiaogan-Xiangfan Expressway
6. Taihe-Ganzhou Expressway
7. Zhengdian-Changsha Expressway

Problem Statement

Canceled infrastructure projects with private participation in developing countries

Sector	Projects reaching financial closure: Number	Projects reaching financial closure: Investment commitments (US$ billions)	Projects canceled: Number	Projects canceled: Investment commitments (US$ billions)	Canceled projects as % of sector total: By number	Canceled projects as % of sector total: By investment commitments
Energy	1,498	322.8	49	11.5	3.3**	3.6**
Electricity generation	836	190.2	23	9.7	2.8**	5.1
Electricity distribution or integrated utilities	328	76.8	20	1.2	6.1	1.6**
Natural gas	334	55.8	6	0.6	1.8**	1.1**
Telecommunications	797	537.3	35	11.2	4.4	2.1**
Transport	994	180.2	47	15.3	4.7	8.5**
Airports	118	25.6	4	0.9	3.4	3.6
Ports	298	33.1	4	0.5	1.3**	1.5**
Railways	101	36.8	7	4.6	6.9	12.6*
Roads	477	84.7	32	9.3	6.7	10.9**
Water and sewerage	546	53.9	48	15.3	8.8**	28.4**
Treatment plants	257	11.0	23	1.1	8.9*	9.8**
Utilities	289	42.9	25	14.2	8.7*	33.1**
Total	3,835	1,094.2	179	53.4	4.7	4.9

Source: World Bank and PPIAF, PPI Project Database.
Note: Data refer to projects reaching financial closure in 1990–2006.
* Difference significant at the 5 percent level.
** Difference significant at the 1 percent level.

Source: Harris and Pratap (2009), *What drives private sector exit from infrastructure?,* World Bank Public-Private Infrastructure Advisory Facilities Report.

Risks of Chinese construction industry

1. Project funding problem
2. Contractors' poor management ability
3. Difficulty in reimbursement
4. Unwillingness to buy insurance
5. Lack of awareness of construction safety and pollution

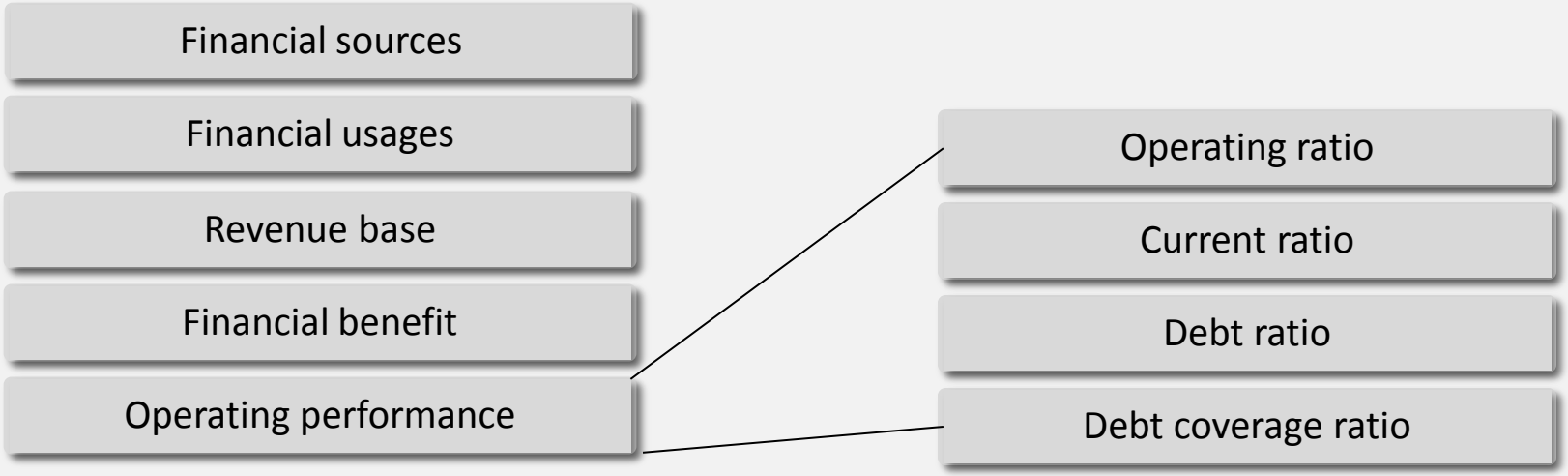
Zou, P et al. (2007)

Research Objective:

Develop the model of success factors for toll road projects to achieve financial viability

Data Source and Analysis Process

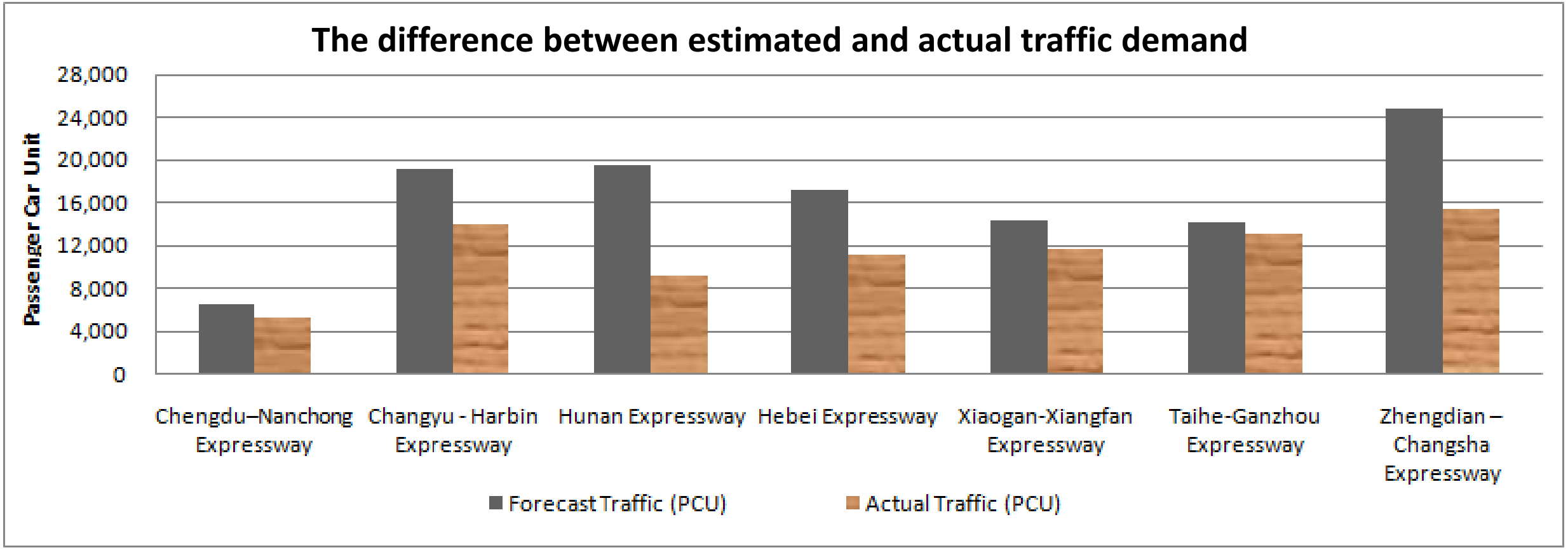
Data Sources		Project Outputs
World Bank	Asian Development Bank	
Project Appraisal Documents	Reports and Recommendations of the President	Estimated outcomes
Implementation Completion Reports	Project Completion Reports	Outcomes after 1-2 years operating
Project Performance Assessment Reports	Project Performance Evaluations	Outcomes after 3-5 years operating



Analysis and Results

- **Timely investment**
- Coordinated development
- Sufficient financing
- Toll rate structure
- Truck overloading

Traffic Demand



Note: The actual traffic demand means the traffic demand after 1-2 years project operating.

Time to Reach Forecasted Traffic Volume

Project	Actual traffic demand	Time to reach forecast traffic (25.000 PCU)	Debt coverage ratio (= Net operating income/Total Debt service)	Operating Ratio (=Total Expense/Total Revenue*100) (%)
1. Chengdu–Nanchong Expressway	5,214 PCU	19 years	0.62	89% (High)
2. Changyu – Harbin Expressway	13,922 PCU	7 years	1.34	27% (Low)
3. Hunan Expressway	9,212 PCU	9 years	1.00	33% (Medium)
4. Hebei Expressway	11,078 PCU	4 years	0.72	39% (Medium)
5. Xiaogan-Xiangfan Expressway	11,588 PCU	8 years	1.15	60% (High)
6. Taihe-Ganzhou Expressway	13,114 PCU	11 years	3.51	34% (Medium)
7. Zhengdian – Changsha Expressway	15,364 PCU	5 years	3.72	42% (Medium)

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Coordinated Development of Toll Roads with Feeder Roads and Industrial Areas

Project	Actual traffic growth	Feeder road development	Industrial zones development
1. Chengdu–Nanchong Expressway	11% (Low)	✓	X
2. Changyu – Harbin Expressway	25% (High)	✓	✓
3. Hunan Expressway	25% (High)	X	✓
4. Hebei Expressway	39% (Very High)	✓	✓
5. Xiaogan-Xiangfan Expressway	20% (Medium)	✓	X
6. Taihe-Ganzhou Expressway	23% (High)	✓	✓
7. Zhengdian – Changsha Expressway	19% (Medium)	✓	X

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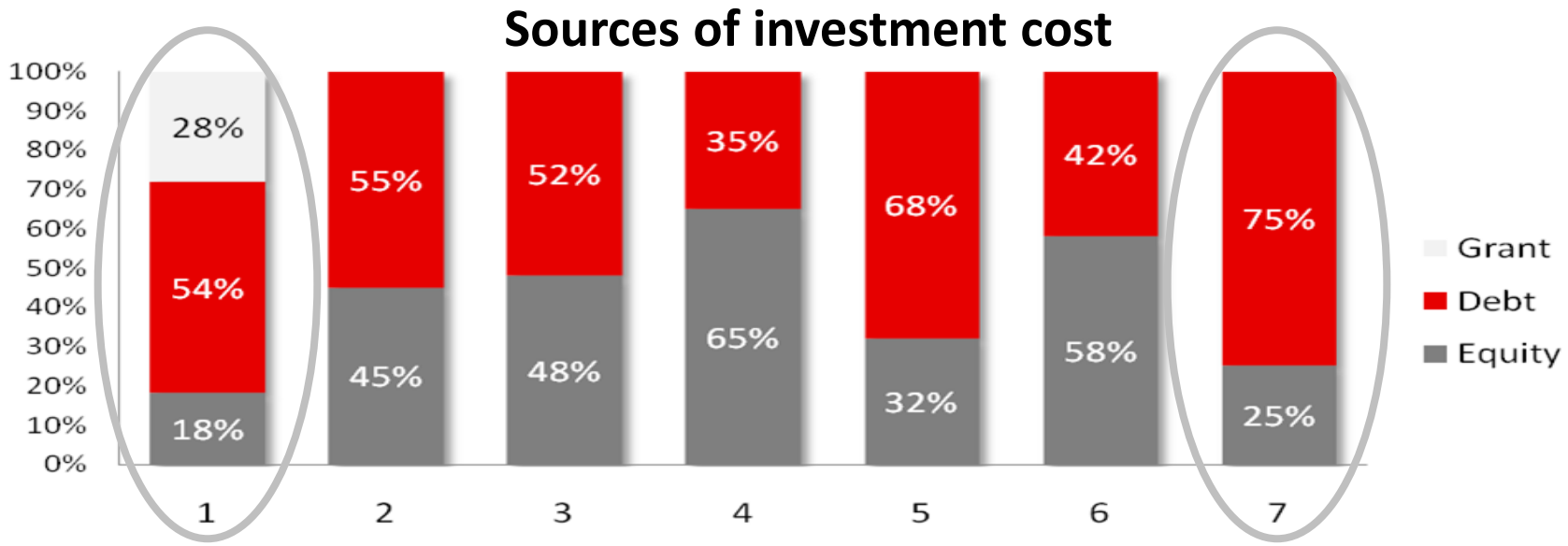
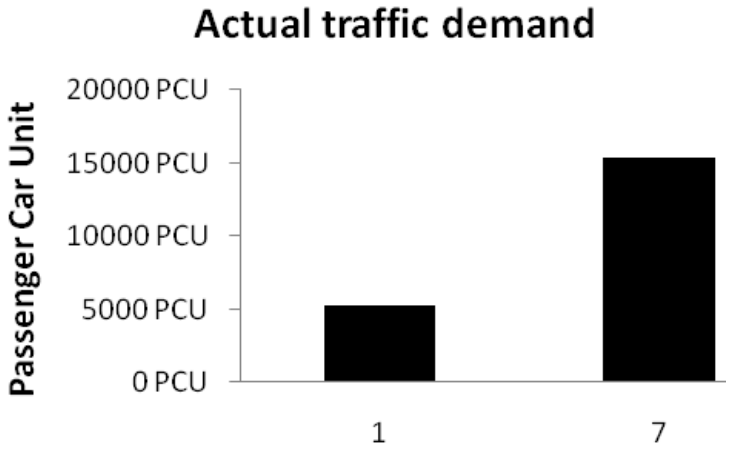
Appropriate Combination of Source of Funds



Low economic development region

High economic development region



Note: Actual traffic demand means the traffic demand after 1-2 years project operating.

Projects	D/E ratio	Debt coverage ratio	Risk Assessment
Project 1	54/46	0.62	Very high
Project 7	75/25	3.72	Low

(Debt Coverage Ratio =Net Operating Income/Total Debt Service)

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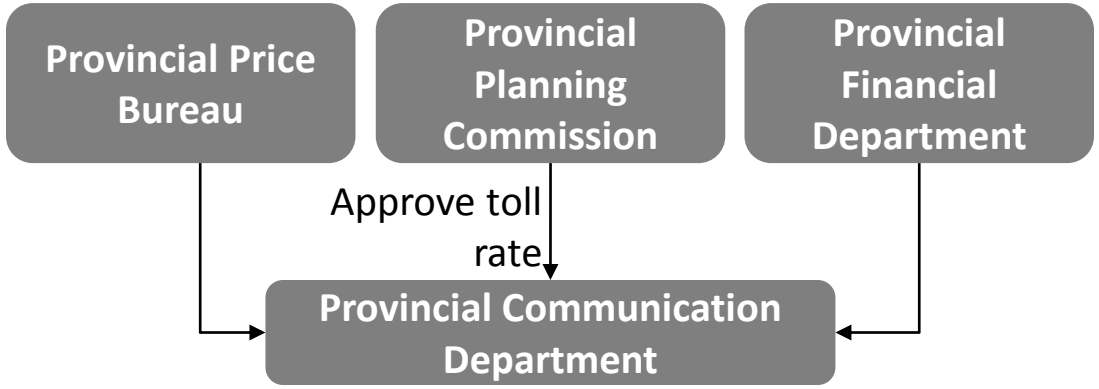
Complicated Toll Rate Structure and Approval Process

Complicated toll rate approval process



Toll rate (per km)	Changyu Component (Jilin Province)	Hashuang Component (Heilongjiang Province)
Passenger car	CNY0.40	CNY0.45
Small truck	CNY0.60	CNY0.45
Bus or medium truck	CNY0.80	CNY0.85
Large truck	CNY1.20	CNY1.10
Trailer	CNY2.00	CNY1.20

Note: This toll rate is applied for private car and small truck

Project name	Toll rate (CNY/km)	Socio-Economic Situation of the Area	Current Operating Ratio (%)
Chengdu–Nanchong Expressway	0.32	Eastern of China, low income area	88.9% (High)
Changyu - Harbin Expressway	0.4	Developed area, on the trade route	27.2% (Low)
Hunan Expressway	0.35	Under-developed area	33.1% (Medium)
Hebei Expressway	0.4	rural and under-developed area	39.0% (Medium)
Xiaogan-Xiangfan Expressway	0.4	High developed area, major automobile manufacturing plants	59.9% (High)
Taihe-Ganzhou Expressway	0.4	agriculture and low-income area	34.4% (Medium)
Zhengdian – Changsha Expressway	0.4	key corridor of developed area in coastal provinces.	42.2% (Medium)

Analysis and Results

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- **Truck overloading**

Examples of Truck Overloading

In the picture:
Police officers in Hunnan, China, fined a man after he turned his small truck into a pickup lorry by adding five huge bags to it. the lorry was actually a small pickup truck and the driver had tied five huge bags of merchandise onto the top and back to make it twice the size. (Source: http://www.telegraph.co.uk)

In the picture:
A driver stops to examine his overloaded truck on 204 National Highway in Hai'an.
Source: China Foto Press/Barcroft Media

Overview of Truck Overloading Situation

Project name	Truck Overloading Happened	Solution to solve problem
1. Chengdu–Nanchong Expressway	Yes	Yes, by a mobile weighing machine
2. Changyu – Harbin Expressway	Yes, the excess of weight from 18 to 27 tons per truck	No
3. Hunan Expressway	Yes	Yes, vehicle weigh-in-motion detectors were installed
4. Hebei Expressway	Yes. more than 30 percent of the trucks are routinely overloaded	No
5. Xiaogan-Xiangfan Expressway	Yes	Yes, by enhancing enforcement overloading of trucks
6. Taihe-Ganzhou Expressway	Yes	No
7. Zhengdian – Changsha Expressway	Yes	Not yet, but Hunan Government decided to implement toll surcharge policy

Recommendations

- **Recommendation to the Government**
  - Toll roads should be developed in combination with the development of feeder roads and industrial zones;
  - Provide a proper toll rate structure and fix frequency of tolling adjustment;
  - Establish strict penalties for truck overloading;
- **Recommendation to project developers**
  - Need to select the point of time of investment carefully;
  - Use appropriate combination of sources of fund.

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Thank you for your attention