# China Green Freight Policy and Institutional Analysis Report

***Final Report***


**Updated June 2013**

Clean Air Asia and World Bank, 2013. "China Green Freight Policy and Institutional Analysis Report"



**Disclaimer**

The views expressed in this publication are those of Clean Air Asia staff, consultants and management, and do not necessarily reflect the views of the Board of Trustees of the Clean Air Asia Center or the World Bank. The Clean Air Asia Center and the World Bank do not guarantee the accuracy of the data included in this publication and does not accept responsibility for consequence of their use.

**Acknowledgements**

This report was written by Fu Lu (China Director), Sophie Punte (Executive Director) and Sudhir Gota (Technical Manager Transport) of Clean Air Asia. The following experts contributed to the report:

- Laetitia Dablanc, Director of Research, French Institute of Science and Technology for Transport, Development and Networks, Université Paris-Est
- Anne Goodchild, Associate Professor, University of Washington
- Alan McKinnon, Professor, Head of Logistics and Dean of Programs, Kühne Logistics University

**Contact**

**Clean Air Asia Center**
Unit 3505 Robinsons Equitable Tower
ADB Avenue, Pasig City, 1605
Philippines
Tel +632 631 1042
Fax +63 2 6311390
center@cleanairasia.org

**Clean Air Asia China Office**
901A, Reignwood Building,
No.8 YongAnDongLi,
Jianguomenwai Avenue
Beijing 100022 China
Tel/Fax: +86 10 8528 8381
china@cleanairasia.org

**Clean Air Asia India Office**
1st Floor, Building No.4
Thyagraj Nagar Market
Lodhi Colony, 110003, India
Tel/Fax +91 11 40601234
india@cleanairasia.org

**Country Networks in**
China, India, Indonesia, Nepal, Pakistan, Philippines, Sri Lanka, Vietnam

**About Clean Air Asia** www.cleanairasia.org

Clean Air Asia promotes better air quality and livable cities by translating knowledge to policies and actions that reduce air pollution and greenhouse emissions from transport, energy, and other sectors.

Clean Air Asia was established as the leading air quality management network for Asia by the Asian Development Bank, World Bank and USAID in 2001, and operates since 2007 as an independent non-profit organization. Clean Air Asia has offices in Manila, Beijing and Delhi, networks in eight Asian countries (China, India, Indonesia, Nepal, Pakistan, Philippines, Sri Lanka, and Vietnam) and is a UN recognized partnership of 250 organizations in Asia and worldwide.

Clean Air Asia uses knowledge and partnerships to enable Asia's 1,000+ cities and national governments understand the problems and identify effective policies and measures. Our four programs are: Air Quality and Climate Change, Low Emissions Urban Development, Clean Fuels and Vehicles, and Green Freight and Logistics.

The biennial Better Air Quality (BAQ) conference is Asia's largest conference on air quality and climate change organized by Clean Air Asia and bringing experts, policy and decision makers together to network, learn and share experiences. www.citiesACT.org is Asia online database on Air quality, Climate and energy, and Transport.

# EXECUTIVE SUMMARY

## Introduction

Increasing globalization of markets and supply chains means that the global freight industry is essential to economic growth across the world and that freight movements increasingly cross borders and continents. Moreover, the freight sector has disproportionate environmental and social impacts: fuel use, $CO_2$ emissions, air pollution, safety, and working conditions. Inefficiencies in the freight sector, including in China, risk becoming a bottleneck for sustained economic growth.

An approach to address these challenges is "**Green Freight**", a range of strategies targeted at the movement of goods via road, rail, water and air, with the aim to improve fuel efficiency, reduce fossil fuel dependency, improve air quality and minimize carbon dioxide ($CO_2$) emissions that contribute to climate change, whilst maintaining competitiveness and economic growth.

The World Bank engaged Clean Air Asia to conduct a study as part of a broader "National Green Freight Program for China" project funded by Norway. The **objective** of this study was to analyze the institutions and policies relevant to green freight transport, identify gaps between the current China policy framework and international experience and best practice, and provide recommendations for the further development of green freight in China.

The **research approach** involved a desktop study, interviews with experts, consultations with major stakeholders, consideration of recent green freight developments in China, and review of the report by international freight and logistics experts. A greater emphasis was given to road freight because of its relative inefficiencies and contribution to fuel use and emissions compared to rail, inland waterways, maritime and air freight modes.

The **report** provides

- An overview of the institutional framework and overarching policies and plans in relation to the four main freight transport modes in China;
- An analysis of policies for trucks, freight logistics and intermodal transport; policy and institutional challenges and gaps in comparison with international experience; and
- Conclusions and short- and long-term recommendations to advance green freight in China.

The study will be used to inform the Steering Committee of the China Green Freight Initiative and to inform World Bank on what can further support China's green freight development.

## Main Findings/Conclusions

**Conclusion 1. There is an urgent need to improve the efficiency and reduce adverse social and environmental impact from freight movement in China, especially for road freight.** China's road freight volume and freight ton kilometers (FTK) has grown at 11.1% and 9.4% respectively from 2008 t0 2012, faster

than GDP at 9.3%. While waterborne freight accounts for a higher proportion of FTK (46.6%) compared to road freight transport (34.7%), the inefficiencies and impacts of road freight are most evident. China's 11 million commercial trucks in 2011 were owned by 700,000 carriers and over 6.5 million owner-operators, meaning that on average, operators owned only 1.6 trucks. Only 2.9% of carriers owned more than 50 trucks. Meanwhile, over 3000 types of trucks run on China's roads, increasing the difficulty of standardization and regulation of this industry. In 2011, trucks accounted for 36.8% of total carbon monoxide (CO) emissions from the transport sector; 41.2% of hydrocarbon (HC) emissions; 59.8% of nitrogen oxides ($NO_x$); and, 76.3% of particulate matter (PM).Reportedly, more than 40% of trucks run empty for inter-city trips and it takes on average 72 hours to unload and load a truck.

**Conclusion 2. A balanced mix of proven strategies exist and can be piloted and applied in China, aimed at trucks and vessels (improve), improving freight logistics (avoid) and transfer of road freight to intermodal and rail, inland waterways and other modes (shift).**

- Avoid strategies reduce the need for transport or the travel distance for road freight vehicles and mostly relate to improved logistics. Logistics solutions for road freight, including the use of articulated trucks ("drop-and-hook"), loading on return trips, matching vehicles capacities to loads, logistics information platform, consortia between freight companies, and freight consolidation centers. Similar strategies can be applied to other freight modes. Broader urban and transport planning can also be effective avoid strategies;
- Shift strategies aim to transfer freight movement to more energy-efficient and/or environmentally-friendly modes. This especially relates to shifting road freight to intermodal transport, rail, inland waterways and maritime freight transport; and,
- Improve strategies improve the energy efficiency of vehicles and vessels through technologies and management. Technologies for trucks, including tires and wheels, aerodynamics equipment, idling reduction technologies, emissions control technologies, fuel and oil, and engines and vehicles. For marine and inland vessels, some of the most important strategies relate to low sulfur fuel, emission control devices, and on-shore power supply while ships are at berth. For air freight, the use of alternative fuels to kerosene is a major area of improvement.

**Conclusions 3. Existing plans and policies provide a solid mandate and basis for government agencies and other stakeholders to focus on green freight.**

**Chinese Policies and Schemes In Support of Road Green Freight Development and Emissions Reductions**

| Trucks (Improve) | Freight Logistics (Avoid) | Intermodal Transport and Modal Shift (Shift) |
|---|---|---|
| • Vehicle fuel consumption, emissions and fuel standards<br>• Alternative fuels (CNG, LPG, LNG)<br>• Fuel efficiency and emission reduction technologies<br>• Eco-driving<br>• Vehicle phase-out schemes (compulsory scrappage and yellow label vehicles) | • Drop-and-hook (use of articulated vehicles)<br>• Logistics information platforms<br>• Improvement of urban distribution | • Promoting intermodal transport<br>• Promoting rail-sea development<br>• Promoting waterborne transport |

The most relevant national overarching policies and plans are the 12th Five-Year Plan (FYP) of Transport Development by the Ministry of Transport (MOT), the 12th FYP of Comprehensive Transport System by the National Reform Development Commission (NRDC) supplemented by mode-specific development plans and environmental/energy/emissions plans for road, rail and waterborne transport. For urban freight, MOT and six other ministries issued the document, "Opinions on Strengthening and Improving Urban Distribution Management" to local governments. Most importantly, China has set energy-intensity and $CO_2$ emissions-intensity targets for the four main transport modes – road, waterborne, air and railway transport, and for road transport separate targets are specified for passenger and freight transport. A set of policies and schemes to further help achieve these targets for the areas listed in the table, and some are supported by pilot projects.

**Conclusion 4. China has initiated national and local programs on which green freight efforts can build.**
China has initiated green freight programs at both local and national level. A small green truck pilot project was started in 2008 in Guangzhou, followed by a Guangdong Green Freight Demonstration Project (2011–2015) focused on truck technology, drop-and-hook, and logistics information platform demonstration. At the national level, the China Green Freight Initiative (CGFI) was launched in April 2012 as a national program to improve fuel efficiency and reduce $CO_2$ and air pollutant emissions from road freight. The CGFI is managed and implemented by the China Road Transport Association (CRTA), the Research Institute of Highway (RIOH) of the Ministry of Transport, and Clean Air Asia, and guidance is provided by a Steering Group of five key ministries and an Expert Group. The three main components cover the avoid-shift-improve strategies mentioned earlier: green management (avoid/shift), green technologies (improve) and green driving (improve), which will be promoted first among road freight enterprises through standards development, piloting, demonstration and training.

**Conclusion 5. Policy and institutional barriers must be addressed to achieve national targets relevant to green freight.** In general the national institutional framework comprises ministries that are responsible for the formulation of strategies, plans and policies. Ministries are supported by affiliated scientific and research institutes to provide research support for policy making and associations to act as a bridge between government and enterprises. The national institutional set up is also reflected in the institutional arrangements at the provincial and local levels. Since 2005, an Inter-Ministerial Joint Meeting for logistics has been in place comprising 13 ministries and two associations, and that meets twice per year.

Due to various institutional and policy challenges, the development and adoption of advanced truck technologies and management options, logistics strategies, and intermodal and other transport modes are likely to be adversely affected. In turn this affects China's ability to achieve its energy savings and emissions intensity targets.

Some of the key institutional and policies challenges are:

- Responsibilities relevant to green freight are spread across different ministries, their mandates are conflicting, and coordination between them and between their affiliated institutions is minimal;
- Before the regulatory responsibilities of the former Ministry of Railways (MOR) wereintegrated into the MOT early 2013, different transport modes were managed by different ministries, making coordination more complex;

- Freight has received less attention than passenger transport by government authorities;
- In some cases, especially where infrastructure is required, funds are lacking to implement policies effectively; and,
- Policies in support of intermodal transport are macro-level policies that are not legally binding and do not have detailed measures and timetables for implementation.

This has contributed to:

- Delays and ambiguities in the development and introduction of fuel consumption standards and to the delayed implementation of tighter vehicle emission standards;
- Limited infrastructure for the supply of natural gas resulting in delayed adoption by carriers;
- Limited use of full-trailer trucks, dual-trailer trucks and vehicle trains despite their promotion because they are prohibited from entering highways;
- Delays in the standardization of tractor and trailer types for articulated vehicles that is required for the adoption of drop-and-hook practices;
- Urban freight remaining a major challenge for cities especially in the face of growing urbanization; and,
- Gaps in the planning of intermodal transport linkage facilities and a lack of concrete measures to increase intermodal transport and a shift from road freight to other modes, and of timetables for their implementation.

A similar challenge exists for the research institutes that are affiliated to various Ministries, resulting in:

- Lack of basic data of transport modes, and data released by different research institutes are conflicting;
- Lack of solid research makes sound policy formulation impossible, for instance, MOT needs strong research results to illustrate that large trucks running on highway will not cause road safety issues, otherwise the Ministry of Public Security (MPS) is in no position to support large truck development in China; and,
- Research conducted by different research institutes are not mutually shared, either leaving research blank areas or causing repeated research.

**Conclusion 6. Ample international best practices exist on which China can draw to design its own policies and strategies and fill gaps.** The best practices described in the report that are of most relevance to China's gaps are:

- A supply and distribution network is needed for Adblue that is required for Euro 4, 5 and 6 vehicle emissions standards and exists in Europe, the US and several other developed countries;
- The technology verification system of the US EPA in support of the SmartWay Program, covering a wider range of truck technologies, detailed and specific test protocols, financing mechanisms to promote certified technology adoption, and a recognizable certification logo for public recognition of companies that apply certified technologies;
- Eco-driving schemes in the UK that involve training, electronic driver monitoring systems and incentive schemes;
- Consideration of alternative schemes to compulsory vehicle scrappage because of the high costs involved. Where scrappage schemes exist, for example in the Port of Seattle, the decision to retire vehicles is based on emissions tests rather than age limits;

- Combining drop-and-hook by using articulated vehicles with other measures to reduce empty runs, especially load-matching services ('online freight information exchange');
- Freight consolidation centers by retailers and for urban freight especially from Europe;
- Small freight company consortia to pool resources and strengths in order to win and manage larger and more lucrative logistics contracts;
- Fleet fuel management, especially through route planning; and,
- Measures to stimulate a shift from road freight to other modes, especially in Europe, through truck road charges, capital investments in railway infrastructure and connected networks, and the use of cargo bikes for urban freight.

## Main Recommendations

The following **policy recommendations** are meant to deal with the challenges of existing policies and actions:

- Fuel consumption standards: enhance coordination between MOT and Ministry of Industry and Information Technology (MIIT)on fuel consumption standards to improve consistency;
- Vehicle emissions standards: enhance coordination between MEP and NDRC for China IV and China V emission standard implementation and fuel supply; and more emphasis and resources for Ministry of Environmental Protection (MEP) and MOT for monitoring in-use vehicles' standard compliance;
- Technologies for trucks: a catalogue could include a wider range of products and technologies that save energy and reduce emissions under the China Green Freight Initiative, supplemented with strict testing protocols, and using US SmartWay's technology verification system and the technology demonstration results from Guangdong Green Freight Demonstration Project as starting points;
- Vehicle scrappage schemes: initiate a study on the disposal of scrapped trucks to prevent illegal disposal, and understand the cost-effectiveness ofvehicle scrappage schemes by comparing the costs per ton of emissions saved with other green freight initiatives. Secondly, revisit age limit as a criterion for truck retirement and consider emission tests results as an alternative criterion;
- Support to small freight companies: set up small freight company consortia to allow small companies to compete with large companies for contracts and to take part in drop-and-hook practices using articulated trucks;
- Route planning: pilot the application of computerized route planning software to reduce fuel consumption for carriers running multiple collection and delivery roundsand promote through incentive schemes;
- Urban goods distribution: a) enhance coordination between agencies involved in urban logistics management for example through working groups; b) lift city access restrictions for green trucks certified under CGFI; c) assess the viability of freight consolidation centers run by retailers and privately run urban freight consolidation centers to replace government run centers; and, d) conduct studies on urban freight logistics, including pick-up point networks, in Europe and Japan to assess suitability for China;
- Intermodal transport development: expand the networks for railways and inland waterways with coordinated planning, land approval, and infrastructure construction; and,
- The UK and US experience shows that liberalization of railway market successfully leads to increase of railway freight market share. The newly created China Railway Corporation could explore how to improve rail freight services and open the railway market up to private sector players with the aim to increase the share of freight moved via railways.

**Systemic recommendations** are aimed for sustainable green freight development in the long run and aimed at addressing systemic institutional and policy challenges. These recommendations are formulated around four cornerstones for green freight development in China

- Agency coordination: improve agency coordination through the existing Steering Committee under China Green Freight Initiative (led by MOT, and comprised of MIIT, MEP, NDRC and MPS) with a priority focus on addressing the specific policy challenges mentioned previously and decide on the direction of long-term green freight development in China;
- Research: establish a Research Institutes Coordination Network on green freight and involving the relevant ministry-affiliated institutes (China Academy of Transportation Sciences, RIOH, Transport Planning and Research Institute (PRTI), China Waterborne Transport Research Institute(WTI), the China Automotive Technology And Research Center (CATARC), Vehicle Emission Control Center (VECC) of the MEP, and Institute of Comprehensive Transportation (ICT) with rotating chairs. The focus of this network would be on a) compiling existing studies; b) collecting baseline data and statistics of the four main transport modes; c) analyzing experiences and lessons learned from existing pilots and demonstration projects; d) identify priority areas for in-depth research and coordinate the research among institutes; e) establish a database for existing and new studies, data, and pilot projects;
- Private sector involvement in green freight: allow associations to play a bigger role and channel private sector needs back to government. Relevant associations are the China Road Transport Association, China Communications and Transportation Association, and the Green Freight Asia of shippers, carriers and logistics service providers in Asia, with a majority operating in China also; and,
- International experience learning for better policy development and implementation: use the following channels for international experience learning: a) Expert Group under China Green Freight Initiative, which consists of international experts from leading agencies in green freight development; b) Green Freight Asia, for private sector best practices; and, c) a focused seminar on international experience learning and sharing can be held once a year as a back-to-back activity to the annual seminar of the China Green Freight Initiative.

# LIST OF ABBREVIATIONS

| | |
|---|---|
| ADB | Asian Development Bank |
| AQSIQ | General Administration of Quality Supervision, Inspection and Quarantine |
| CAAC | Civil Aviation Administration of China |
| CATARC | China Automotive Technology and Research Center |
| CATS | China Academy of Transportation Sciences |
| CCPCC | China Communications Product Certification Center |
| CCS | China Category Society |
| CCTA | China Communications and Transportation Association |
| CECP | China Certification Center for Energy Conservation Products |
| CFLP | China Federation of Logistics & Purchasing |
| CGFI | China Green Freight Initiative |
| CNG | Compressed Natural Gas |
| CNPC | China National Petroleum Corporation |
| CO | Carbon monoxide |
| $CO_2$ | Carbon dioxide |
| CRCTC | China Railway Container Transport Company |
| CRTA | China Road Transport Association |
| CVRS | Computerized vehicle routing and scheduling |
| DMV | Department of Motor Vehicles |
| DOC | Diesel oxidation catalyst |
| DPF | Diesel particulate filters |
| ECF | European Cyclists' Federation |
| EGR | Exhaust gas recirculation |
| EPA | Environmental Protection Agency |
| EPC | Energy performance contracting |
| ESCOs | Energy Service Companies |
| FTK | Freight Ton Kilometer |
| FYP | Five-year plan |
| GAC | General Administration of Customs |
| GDP | Gross domestic product |
| GEF | Global Environment Fund |
| GEPB | Guangzhou Environment Protection Bureau |
| GFAN | Green Freight Asia Network |
| GHG | Greenhouse Gas |
| GPS | Global positioning systems |
| GQTS | Administration of Quality and Technical Supervision of Guangzhou Municipality |
| GTC | Guangzhou Transport Committee |
| GTMB | Guangzhou Traffic Management Bureau |
| GVW | Gross vehicle weight |
| HC | Hydrocarbon |
| HDVs | heavy-duty vehicles |

| | |
|---|---|
| HEVs | hybrid electric vehicles |
| I&M | Inspection and maintenance |
| ICT | Institute of Comprehensive Transportation |
| LCCC | London Construction Consolidation Centre |
| LNG | Liquefied Natural Gas |
| LPG | Liquefied Petroleum Gas |
| LRR | Low rolling resistance |
| MEP | Ministry of Environment Protection |
| MIIT | Ministry of Industry and Information Technology |
| MOC | Ministry of Commerce |
| MOF | Ministry of Finance |
| MOHURD | Ministry of Housing and Urban-rural Development |
| MOR | Ministry of Railways |
| MOT | Ministry of Transport |
| MPG | Miles Per Gallon |
| MPS | Ministry of Public Security |
| NDRC | National Development and Reform Commission |
| NOx | Nitric oxide |
| PM | Particulate matter |
| RFID | Radio frequency identification tags |
| RIOH | Research Institute of Highway |
| RTG | Rubber Tired Gantry |
| SAC | Standardization Administration of China |
| SAIC | State Administration for Industry and Commerce |
| SAT | State Administration of Taxation |
| SCR | Selective catalytic reduction |
| SINOPEC | China Petrochemical Corporation |
| TPRI | Transport Planning and Research Institute |
| US EPA | United States Environmental Protection Agency |
| VECC | Vehicle Emissions Control Center |
| VKT | Vehicle Kilometers Travelled |
| WTI | China Waterborne Transport Research Institute |

# CONTENTS

# 1. INTRODUCTION

## 1.1 Green Freight

### 1.1.1 Green freight developments worldwide

Increasing globalization of markets and supply chains means that the global freight industry is essential to economic growth across the world and that freight movements increasingly cross borders and continents. Moreover, the freight sector has disproportionate environmental and social impacts: fuel use, $CO_2$ emissions, air pollution, safety, and working conditions. Asia's economy has grown by about 8 percent per year on average since 2002.[1] Logistics costs as percentage of GDP varies from 10-15 percent in the West to as high as 24 percent in Indonesia (and possibly even higher in other developing countries) and risk becoming a bottleneck to economic growth.[2] This points to a severe inefficiency in freight and logistics in developing Asian countries. For these reasons, freight transport is viewed as important in the **Rio+20 outcome document – "The Future We Want."** Government and the private sector must address these concerns of markets and society and support more efficient and greener freight movement.

Green Freight can be defined as strategies targeted at the movement of goods via road, rail, water and air, with the aim to improve fuel efficiency, reduce fossil fuel dependency, improve air quality and minimize Carbon Dioxide ($CO_2$) emissions that contribute to climate change, whilst maintaining competitiveness and economic growth. In some instances, a broader definition is applied within the context of the "green growth" concept to also include socio-economic impacts from freight, such as HIV-Aids among drivers, road safety, noise, vibration and working conditions.

Green freight programs have been established in several countries or regions that promote improve fuel efficiency and reduce environmental impact of freight transport. One of the earliest was the UK Freight Best Practice Programme which came to an end in 2001, although continues to be operated on a small scale by administrations in Scotland and Wales.[3]The furthest developed program is the US SmartWay Transport Partnership, a public-private partnership since 2004 managed by the Environmental Protection Agency (EPA), which in 2012 merged with Canada's Fleet Smart program.[4]Different from SmartWay, in that it involves only private companies and is not funded by a public agency, Green Freight Europe was launched in 2012 as an independent voluntary program for improving environmental performance of road freight transport in Europe involving more than 100 multinational carriers, shippers and logistics service providers.[5]Green Freight Asia,a consortium of private sector companies builds on these developments and was launched in December 2012 and will be incorporated in August 2013. Other programs exist in various countries but are less developed, such as Objective $CO_2$ in France, the China Green Freight Initiative, Korea Green and Smart Transport, and Transporte Limpio in Mexico. Other types of initiatives include the Cargo Working Group,

[1] Clean Air Asia (2012). Accessing Asia. http://cleanairinitiative.org/portal/AccessingAsia
[2] Green Freight Asia Network (2013). Green Freight in Asia Study – Towards a Green Economy: Macroeconomic indicators and their relevance for sustainable Road Freight in Asia and a comparison with markets in Europe and the Americas. www.greenfreightasia.org
[3]Green Logistics: Improving Environmental Sustainability of Logistics, 2nd edition, 2012.
[4]http://www.epa.gov/smartway/
[5]http://www.greenfreighteurope.eu/

focusing on maritime freight, The Aviation Cargo Working Group (TACWG) focusing on aviation carbon, and initiatives on broader transport and climate issues also covering freight movement, such as the Carbon Disclosure Project, GHG Protocol, and Carbon War Room.

At the Better Air Quality conference in Hong Kong in December 2012, the United Nations Centre for Regional Development announced the development of a Regional Agreement on Green Freight in Asia between the transport and environment ministries of 22 Asian countries.[6] This agreement will be developed under the framework of the Regional EST Forum in Asia in support of the Bangkok Declaration and governmental regional declarations in Asia and the Pacific facilitated by United Nations Economic and Social Development Commission.[7,8,9]

At the global level, a Green Freight Charter will be developed with the Climate and Clean Air Coalition in collaboration with the Smart Freight Centre, Clean Air Asia, ICCT, World Bank and US and Canada governments.

### 1.1.2 Green freight strategies: Avoid, Shift and Improve

There are ample opportunities for freight improvement, especially in relation to improving fuel efficiency and reducing air pollution and GHG emissions. An integrated approach is needed to achieve this, consisting of:[10,11]

- Avoid strategies reduce the need for transport or the travel distance for road freight vehicles and mostly relate to improved logistics;
- Shift strategies aim to transfer freight movement to more energy-efficient and/or environmentally-friendly modes; and
- Improve strategies improve the energy efficiency of vehicles and vessels through technologies and management. Technologies for trucks, including tires and wheels, aerodynamics equipment, idling reduction technologies, emissions control technologies, fuel and oil, and engines and vehicles. For marine and inland vessels, some of the most important strategies relate to low sulfur fuel, emission control devices, and on-shore power supply while ships are at berth. For air freight, the use of alternative fuels to kerosene is a major area of improvement.

[6] UNCRD (2012). News release: Asia needs Regional Agreement on Green Freight, international organizations decide. http://www.baq2012.org/assets/Uploads/Freight-Press-Release-final3.pdf

[7] Since 2005, the United Nations Centre for Regional Development (UNCRD) in collaboration with the Ministry of the Environment, Government of Japan, has organized the annual 'Regional Environmentally Sustainable Transport (EST) Forum in Asia' (EST Forum) attended by senior government officials from environment and transport ministries from 22 Asian countries.

[8] The "Bangkok Declaration for 2020 – Sustainable Transport Goals for 2010-2020" as agreed at the 5th EST Forum included 20 sustainable transport goals, including on freight transport: Achieve improved freight transport efficiency, including road, rail, air and water, through policies, programmes, and projects that modernise the freight vehicle technology, implement fleet control and management systems, and support better logistics and supply chain management.

[9] Regional governmental declarations include: Ministerial Declaration on Transport Development in Asia and the Pacific (2006); Busan Declaration on Transport Development in Asia and the Pacific (2006); Ministerial Declaration on Transport Development in Asia and the Pacific (2012) adopted the Regional Action Programme for Transport Development in Asia and the Pacific, phase II (2012-2016); Bangkok Declaration on Transport Development in Asia (2009).

[10] Adopted from Dalkmann and Brannigan (2007)

11Clean Air Asia and UNCRD (2010) Challenges and Opportunities for an Environmentally Sustainable Road Freight Sector in Asia. Clean Air Asia and UNCRD (2011). Best Practices in Green Freight – for an Environmentally Sustainable Road Freight Sector in Asia. http://cleanairinitiative.org/portal/projects/ESTForums

A balanced mix between these strategies is essential. Shift from road freight to rail, waterways and sea is a priority because of long-term and substantial reductions in energy and emissions, but it will take time to realize this shift. In the meantime, improving fuel efficiency and reducing emissions from trucks and ships can be achieved in a shorter timeframe and still result in significant improvements, and thus is also a priority.

Strategies for road freight are detailed further below.

### Improve strategies for road freight

Technologies and management strategies for trucks are listed below.[12]Annex A presents a list of main recent studies conducted in Europe and US on truck technologies.

- Tires and wheels technologies that reduce the weight and rolling resistance, including aluminum rims, low rolling resistance (LRR) tires, single wide-based tires, tire pressure monitoring or automatic tire inflation systems, and nitrogen-filled tire instead of air-filled tires;
- Aerodynamics equipment that reduce "drag" or air resistance of the tractor and the trailer, including roof fairings, cab extenders, side fairings, front bumper air dam, nose cones, specifying wheelbase and fifth-wheel settings, side skirts, trailer tails, sloping at the rear of the trailer, and streamlining the underside of the trailer with the possible use of an 'under-tray';
- Idling reduction technologies aimed at reducing idling of trucks and thus reduce fuel consumption, for example, through electric power sources at truck stops and auxiliary power units installed in the truck;
- Emissions control technologies, of which common technologies are EGR (exhaust gas recirculation), SCR (selective catalytic reduction), DOC (diesel oxidation catalyst) systems, diesel flow through filter, and diesel particulate filters (DPF);
- Fuel, engine and alternative vehicle technologies, such as low-sulfur diesel, low viscosity lubricants, and oil by-pass filtration systems, CNG, hybrid-electric trucks, fuel cell-powered trucks and light-weight components of trucks;
- Fleet replacement with more modern trucks;
- Inspection and maintenance;
- Speed management, eco-driving, driver training.

Often a combination of technologies is applied in which case the inter-dependences of technologies should be considered, which can reduce or enhance the effect on energy use and emissions. For example, combining advanced brake technologies and tires further increases the benefits of low rolling resistance.

### Avoid strategies for road freight

Avoid strategies for road freight are mainly logistics solutions primarily aimed at maximizing loads to the truck's capacity and at reducing "empty hauls" (empty trucks on return trips), and minimizing vehicle kilometers travelled (VKT).Strategies to reduce emissions from freight logistics include[13,14]:

[12] UNCRD and Clean Air Asia (CAI-Asia), 2011. "Best Practices in Green Freight – for an Environmentally Sustainable Road Freight Sector in Asia."

[13] Clean Air Asia (CAI-Asia), 2011. "Design of Green Freight China Program: Review of Freight Logistics Solutions." Pasig City, Philippines. http://cleanairinitiative.org/portal/projects/GreenFreightChinaProgram

[14] Logistics strategies sometimes increase distance travelled or utilization, but that is because they are trading off transportation costs for inventory costs.

- "Drop-and-hook" or the use of articulated vehicles to organize freight transport, where "Drop" refers to delivering a trailer and dropping at the customer site (or a distribution center), and "Hook" refers to immediately hooking up a loaded trailer and moving it to the destination. This effectively decouples the vehicle loading / unloading operations from the transport operation allowing each to be separately optimized. Most drivers prefer this because there is no waiting time for trailers to get unloaded or loaded;
- Maximizing the loads of trucks especially for the return trip, through securing return loads (backloading), consolidating loads, load stacking, the use of multiple-decked vehicles (subject to the road network offering sufficient height clearances), and matching the vehicle size with the load. Improving the management of loading trucks also helps to improve the efficiency of production and warehousing operations;
- Computerized vehicle routing and scheduling (CVRS) software to help optimize routes with multiple deliveries and collections;
- Logistics information platforms that enable companies that need goods to be transported to find freight carriers online;
- Freight company cooperation between trucking companies to pool their resources and strengths, which can range from contractually-based consortium to loose cooperation arrangement; and,
- Freight consolidation centers, where goods from different suppliers with the same origin and destination are combined into single shipments, thereby improving efficiency and reducing vehicles on the road. Other terms used are 'freight centers', 'transshipment centers', 'public logistics centers', 'city distribution center' and 'urban platforms'.

### Shift strategies for road freight

Strategies for modal shift in most instances refers to moving goods transported by trucks to intermodal transport and other modes.[12]A distinction is made between intermodal services (where road freight movement is required at one or both ends of rail or water line haul) and from direct line haul connecting factories and other premises with rail or water access. Options for shift strategies include:

- Rail for bulk goods over long distances and between key centers, such as a mine and a factory, or ports and distribution centers;
- Inland waterways for heavy bulk goods;
- Rail/road schemes using land containers or swap bodies;
- Container ships/vessels for transport of bulk goods between major ports along the same coastline (e.g. Shanghai and Shenzhen); and,
- Cargo bikes, motorbikes, tricycles, hand carriages, animal pushed carriages, and others for urban and rural freight movement. In developing countries, the strategy is to maintain some of the non-motorized modes of freight transportation that still exist.

## 1.2 China Freight Sector Status

China's freight ton kilometers (FTK) keeps growing along with economic growth. From 2008 to 2012, the average annual growth rates of freight volume and FTK were respectively 11.1% and 9.4% compared to a gross domestic product (GDP) growth of 9.3%.[15,16]In 2012, freight volume was 41.2 billion tons, and FTK was

[15] Statistical Communiqué of the People's Republic of China on the 2012 National Economic and Social Development, National

17,314.51 billion t-km.[17]Of the 41.2 billon tons of freight volume, road transport accounted for 78.2%, waterborne and rail transport shared respectively 11.1% and 9.5%, and air and pipeline transport made up the rest of 0.013% and 1.3%.[18]With respect to FTK, the highest share (46.6%) represents waterborne transport including maritime and inland waterways, followed by road transport with 34.7%.[19] Statistics show that freight trucks accounted for 36.8% of CO, 41.2% of HC, 59.8% of $NO_x$, and 76.3% of PM of total road transport emissions in 2011 in China.[20]A recent article in Chinese media reported on the inefficiencies of road freight transport: more than 40% of trucks run empty for inter-city road freight in China and that the average loading and unloading time of trucks is 72 hours.[21]

Given the above statistics, road freight is the key factor in China's economic development as well as a priority for reducing negative environmental and social impacts. Therefore, road freight should be addressed first and foremost as part of green freight development in China.

With regards to the road freight industry in China, there are about 700,000 carriers, 6,520,000 owner-operators and 11 million commercial trucks nationwide by the end of 2011. For the carriers, only 2.9% have their own fleets with over 50 trucks, and 2.9%of companies conduct special transport operations including container, large cargo and hazardous goods transport. There are approximately 3,000 truck types approved for use on Chinese roads by the Ministry of Industry and Information Technology, and the average tonnage of ordinary trucks and special trucks[22]is respectively 5.6 ton and 15.7ton.[23]

There are four factors that may be influencing road freight FTK in China, which has risen428% between 2007 and 2012[24]:

1. A shift of manufacturing industries from the eastern region to central and western regions of China as guided by national policies to balance regional development and address the issue of increasing production costs along the east coastline in Yangtze River Delta, Pearl River Delta and Bohai Sea. This has resulted in a steady increase of GDP contribution by the central and western region from 37.1% in 2008 to 39.2% in 2011[25]. Products produced in central and western regions and transported to other regions in China and the world will affect FTK;
2. A radical decline in annual growth rate of total volume of import and export since 2012, which dropped from 22.5% in 2011 to 6.2% in 2012. Lower freight growth rates and FTK will be a natural result of less foreign trade;
3. The recent rise of urban freight transport in response to the demands of the new urban economy: Direct-to-consumer business delivery has risen exponentially, decreased size of inventories (zero

---

Bureau of Statistics of China. The annual growth rate of freight volume from 2008 to 2012 is respectively 9.4%, 7.5%, 13.4%, 13.7%, and 11.5%, and that of FTK from 2008 to 2012 is respectively 3.8%, 9.8%, 12.4%, 12.1% and 8.7%.

[16] Statistical Communiqué of the People's Republic of China on the 2012 National Economic and Social Development (2012), National Bureau of Statistics of China. The annual growth rate of GDP from 2008 to 2012 is respectively 9.6%, 9.2%, 10.4%, 9.3% and 7.8%.

[17] Statistical Communiqué of the People's Republic of China on the 2012 National Economic and Social Development (2012), National Bureau of Statistics of China.

[18]Road has transported the majority of freight volume in China since 1990: 78.2% in 2012, 76.5 in 2000 and 74.6% in 1990.

[19] National Statistics Yearbook (2012), National Bureau of Statistics of China.

[20] Yin Hang, VECC, PPT at US-China Clean Truck and Bus Summit, Beijing, October 30-31, 2012.

[21]http://energy.people.com.cn/n/2013/0304/c71890-20670527.html

[22]Per the Administration Rules on Road Goods Transport and Stations, road goods transport includes ordinary transport, specialized transport (goods transport using container, refrigeration equipment and tank), large cargo transport and hazardous goods transport. Special trucks are used for specialized transport, large cargo transport and hazardous goods transport.

[23]Statistics is quoted from experts who are interviewed for this study.

[24]Road freight FTK is 1135.5 billion in 2007 and 5999.2 billion in 2012, National Statistics Yearbook of 2012 and Statistical Communiqué of the People's Republic of China on the 2012, National Bureau of Statistics of China.

[25]National Statistics Yearbook, National Bureau of Statistics of China.

stock), growing demand for express and urgent deliveries, fragmentation of shipments (a few parcels received each day instead of a consolidated load once a week), and a fast increase of home deliveries following the rapid growth of on-line shopping; and,

4. Emerging needs of rural logistics, providing rural people with what they need for production and daily life. The growth in road TKM is therefore not simply the result of economic growth but also due to the restructuring of production and distribution systems.

## 1.3 China Green Freight Policy and Institutional Analysis

The World Bank engaged Clean Air Asia (formerly Clean Air Initiative for Asian Cities) to conduct a policy and institutional analysis of green freight in China as part of a broader "National Green Freight Program for China" project funded by Norway. The "National Green Freight Program for China" is designed to pilot practices that reduce the negative environmental impact of road freight in China with the aim that such practices will lead to policy change.

The **objective** of this study is to analyze the institutions and policies relevant to green freight transport, identify gaps between the current China policy framework and international experience and best practice, and provide recommendations for the further development of green freight in China. In China, the management of energy saving and emission reduction in the freight sector had long been neglected, and initiatives to promote green freight were started off rather late in 2008 through the World Bank-funded "Guangzhou Green Trucks Pilot Project" designed and implemented by Clean Air Asia. Comprehensive studies on the energy saving and emission reduction achievements and potential of the transport sector have been conducted, as well as studies on certain specific topics in the freight sector such as drop-and-hook and vehicle emission control. However, no studies have been done to provide a comprehensive high-level review of the policies and institutions focused on green freight in China. Therefore, this study will be the first one in this subject area.

Considering that the practice of green freight operations is still at an early stage of development in China, traditional analyses of existing major policies are of limited significance. Instead, the project team decided to review existing policies and institutions from the point of view of how green freight can be achieved better and faster and to identify the gaps between existing policies and the policies needed to achieve green freight. With this objective-oriented analysis approach, the study is grouped into three policy areas, respectively, technologies and management strategies for trucks (improve), strategies to reduce emissions from freight logistics (avoid), and intermodal transport (shift). These three policy areas are the primary means to achieve green freight identified by Clean Air Asia, based on the accumulated knowledge and understanding of international successful experiences of green freight. Financial measures are not included under this study, because World Bank is conducting a parallel study focused on green freight financing.

The report was based on the following **research approach**:

- A review of available information, which includes existing studies, policy documents, plans, presentations delivered by government officials, etc;
- Interviews with experts from relevant institutions specializing in the various key topics of this study and consultation with major stakeholders, including government agencies, research institutes, industry

associations, and the private sector. See Annex B for the list of experts and stakeholders whom have been consulted and interviewed for the report;
- Consideration of several complementary events that have taken place in the past year, such as the China Green Freight Initiative (CGFI) Seminar 2012, and the launch of a Guangdong Global Environment Fund (GEF) Green Freight Demonstration Project and the Green Freight Fair in Shenzhen; and,
- Review of the draft and final report by international green freight experts.

The **study scope** was as follows:
- While the overview starts the analysis of the institutions and overarching polices relevant to four transport modes, the remaining chapters place a greater focus on road freight. This follows from the fact that road freight accounts for the largest share of the national freight mix for land transport, and is of greater significance in energy consumption and environmental impact in China compared to other freight modes; and
- In this report, the definition of "policy" includes plans, laws, regulations, standards, schemes, etc.

The structure of the remainder of the report is as follows:
- Chapter 2 gives an overview of the institutional framework and overarching policies and plans in relation to the four main freight transport modes in China;
- Chapter 3 to 5 subsequently discuss the policies for trucks (chapter 3), strategies to reduce emissions from freight logistics (chapter 4), and intermodal transport (chapter 5), and identify the challenges and gaps in comparison with international experience; and
- Chapter 6 puts forward the recommendations on the priority areas in which green road freight can be promoted in China and the implementing agencies for the recommended actions.

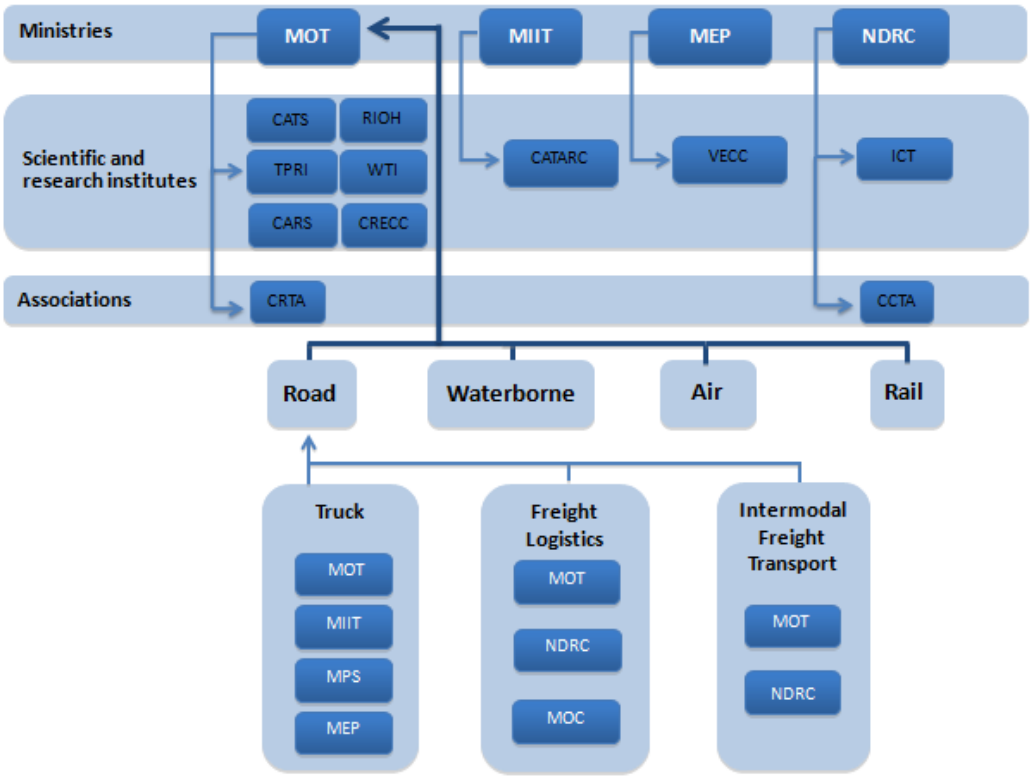
The study will be used to inform the Steering Committee of the China Green Freight Initiative and to inform World Bank on it can further support China's green freight development.

# 2. OVERALL INSTITUTIONAL AND POLICY FRAMEWORK FOR FREIGHT TRANSPORT

## 2.1 Institutional Framework

This section gives an overview of the institutional framework at the national level relevant to the four main modes of freight transport – road, waterborne, air and rail – with a specific focus on energy or fuel consumption and emissions because of the relevance to green freight. In general the national institutional framework comprises

- Ministries that are responsible for the formulation of strategies, plans and policies;
- Scientific and research institutes that are affiliated with individual ministries to provide research support for policy making; and
- Associations that are set up by government to act as a bridge between government and enterprises, reflecting enterprises' appeal and regulating industry behavior.




### 2.1.1 Ministry of Transport

The Ministry of Transport (MOT) is the national government agency responsible for the management of road, waterborne, air and rail freight transport, the authority of which has been granted through several rounds of government institutional reform. Before 2008, MOT was only responsible for the road and waterborne freight transport. Through the 2008 institutional reform, the former Civil Aviation Administration of China

(CAAC) was merged into MOT, and air transport management became the authority under MOT. At the latest institutional reform in 2013, the Ministry of Railways (MOR) was abolished, and its previous all-encompassing functions are transferred to different agencies. The planning and policy formulation function for the railway sector is merged into MOT; the other administration functions of the previous MOR will belong to a newly established Department of Railway under MOT; and the China Railway Corporation, a state-owned enterprise has been created to perform the enterprise function of the previous MOR with the previous MOR minister as its General Manager.

MOT is responsible for the overall management of commercial trucks running on the road, including issuance of permits to commercial trucks, without which trucks cannot legally operate on the road, and performing annual inspection of truck safety and fuel consumption. MOT also develops fuel consumption standards for commercial trucks – albeit in a separate process to the standard developed by the Ministry of Industry and Information Technology for new trucks.

Affiliated research institutions of MOT include the China Academy of Transportation Sciences (CATS), Transport Planning and Research Institute (TPRI), Research Institute of Highway (RIOH) that has an Automotive Transportation Technology Center, and the China Waterborne Transport Research Institute (WTI).The China Road Transport Association (CRTA) was established specifically for road transport under MOT.

The Departments of Transport and Transport Bureaus/Committees assume similar sectoral development and management responsibilities at the provincial and local levels respectively, and report directly to the provincial or city government. They are responsible for the implementation of national policies and programs issued by the central government and MOT.

### 2.1.2 Ministry of Industry and Information Technology

The Ministry of Industry and Information Technology (MIIT) is in charge of the administration of certain traditional industries, as well as communication and information industries by formulating development strategies, plans, policies, laws, regulations, standards and guidelines, and organizing their implementation. MIIT was transformed from the Ministry of Information Industry as part of the 2008 institutional reform, and integrated various functions from other national agencies including the National Development and Reform Commission (NDRC)'s functions on industry and trade management; the functions of the Commission of Science, Technology and Industry for National Defense except those on nuclear power management; and the functions of the Ministry of Information Industry and the State Council Information Office.[26]

MIIT is highly relevant to the freight sector because it is the authority issuing permits to commercial vehicle manufacturers entering the Chinese market, and approving the production and sale of commercial vehicles including all types of trucks. To manage the approval of production and sale of vehicles, MIIT developed a fuel consumption standard for heavy-duty vehicles (HDVs).The most relevant affiliated institute in this regard is the China Automotive Technology and Research Center (CATARC), which supports MIIT with research and drafting of standards.

[26] http://www.china.org.cn/government/news/2008-06/30/content_15906787.htm

### 2.1.3 Ministry of Environmental Protection

The Ministry of Environment Protection (MEP), as the national authority for environmental protection, sets and enforces emissions standards for all vehicle types, including HDVs. MEP is supported by the Vehicle Emissions Control Center (VECC-MEP) in policy research, technical support and management of Chinese national vehicle emission control strategies, policies, laws, regulations and standards. VECC-MEP's responsibilities are to a) conduct technical reviews of new vehicles' emissions tests and grant Type Approval for production; b)provide technical support to low emission vehicle type management and in-use vehicle emission monitoring; c) develop and amend environmental protection indicators of vehicle fuels, additives and lubricants; d)provide technical support to vehicle emission inspection institutions; to conduct training courses concerning vehicle emissions control technologies; and, e) manage the vehicle emission control website (http://www.vecc-mep.org.cn/eng/).[27]

### 2.1.4 National Development and Reform Commissions

The National Development and Reform Commission (NDRC) is responsible for the formulation of strategies, policies and reform plans for the transport sector. In particular, it is within NDRC's authority to formulate the plans for comprehensive transport system development, and balance the development of various transport modes. The Institute of Comprehensive Transportation (ICT) is affiliated with NDRC conducting comprehensive transportation research in China's macroeconomic management field. The China Communications and Transportation Association (CCTA) is under NDRC's management covering rail, air, road, waterborne and pipeline transport.

### 2.1.5 Other National Ministries and Institutions

There are several other ministries and institutions that are relevant to green freight. The most relevant are the:

- Ministry of Public Security (MPS)manages vehicle registration and safety inspections of trucks on the road;
- Ministry of Finance sets tax rates, including fuel tax, and manages all subsidy policy;
- The Standardization Administration of China (SAC) is China's standards organization, authorized by the State Council to coordinate and manage standardization work;
- The General Administration of Customs (GAC) sets and enforces import and export regulations, including for vehicles and technologies; and,
- China Federation of Logistics & Purchasing (CFLP) is the logistics and purchasing industry association approved by the State Council and focuses on the development of the logistics industry and the procurement businesses of both government and enterprises, produces industry statistics and sets relevant industry standards.

[27] http://www.craes.cn/cn/jgsz/jgsz_7_4.html

### 2.1.6 Provincial and Local Government Agencies

The national institutional set up is also reflected in the institutional arrangements at the provincial and local levels. Guangdong province and its capital Guangzhou are selected to illustrate the local institutional set up, because of its position in pioneering green freight development in China.

Taking Guangdong Province as an example, the most relevant institutions for green freight at the provincial level and their roles are as follows:

- Guangdong Department of Transport manages road and waterborne transport in Guangdong province and is the leading department of the current green freight demonstration project in Guangdong;
- Guangdong Development and Reform Commission is responsible for the formulation of comprehensive plans of transport development and is in charge of project approval of green freight projects;
- Guangdong Economic and Information Commission promotes the logistics information platform in Guangdong province;
- Guangdong Environmental Protection Bureau develops systems for vehicle pollution control and responsible for their implementation;
- Guangdong Public Security Department guides and supervises the management of road transport safety, and manages driving licenses; and,
- Guangdong Finance Department arranges, supervises and manages provincial special funds (i.e. the special fund for drop-and-hook transport using articulated trucks).

Taking Guangzhou as an example at the city level, the most relevant institutions for green freight are as follows:[28]

- Guangzhou Transport Committee (GTC) has its most relevant roles in management of truck terminals, management of automotive inspection and maintenance centers, and training; setting of transport fees together with Guangzhou Municipal Price Bureau and fuel taxes together with the Municipal Bureau of Finance and Taxation; managing transport projects, including international cooperation projects; and liaising with truck companies and associations registered in Guangzhou;
- Guangzhou Environment Protection Bureau (GEPB) is responsible for developing local regulations relating to transport-related emission monitoring and reduction, and air quality measures;
- Guangzhou Traffic Management Bureau (GTMB), under the Public Security Bureau of Guangzhou Municipal Government, assumes overall responsibility on road safety. Trucks have to be registered at the Vehicle Management Division of GTMB;
- Administration of Quality and Technical Supervision of Guangzhou Municipality (GQTS) assumes responsibility of product quality and technical supervision; drafts the municipal rules and regulations on standardization, measurement, quality inspection and safety supervision; and directs and supervises the administrative enforcement within the system in various sectors including transport;
- Finance Bureau of Guangzhou Municipality and Price Bureau under Guangzhou Development and Reform Commission are involved in assessing financial mechanisms to create incentives and instruments for improved fuel consumption and emission reduction.

[28] Clean Air Asia (CAI-Asia Center) and World Bank 2010. Guangzhou Green Trucks Pilot Project – Analysis Report. http://cleanairinitiative.org/portal/projects/GreenTrucksPilot

## 2.2 Overarching Policies and Plans under the 12th Five-Year-Plan

For the 12th Five-year plan (FYP) period (2011-2015), overarching plans for the transport sector were issued by different responsible ministries. The most relevant are (see Table C – 1 in Annex C):

- Two overarching plans relating to transport development are the 12th FYP of Transport Development by MOT[29], and the 12th FYP of Comprehensive Transport System by NRDC. These are supplemented by mode specific development plans: 12th FYP of Road Transport Development by MOT, 12th FYP of Civil Aviation Development by CAAC, and 12th FYP of Railway Development by former MOR;
- The 12th FYP of Environmental Protection of Road and Waterborne by MOT covers pollution and resource efficiency but not energy consumption;
- Two complementary plans by MOT on energy savings and emissions cover different timeframes: Mid- and Long-term Plan of Energy Saving in Road and Waterborne Transport (2005-2020), and 12th FYP of Energy Saving and Emission Reduction of Road and Waterborne Transport (2011-2015); and
- A non-binding Guidance on the Construction of Low Carbon Transport System (2011) was issued to guide the reduction of greenhouse gas emissions in the transport sector against background of climate change.

In general, these plans consist of the following main sections: current status and development needs, development principles, objectives and targets, main tasks and supporting measures. The next sections present targets and main tasks relevant to green freight development included in these plans.

### 2.2.1 National Energy and Emission Targets

China's central government adopted energy efficiency and emission intensity reduction targets as binding commitments in the 11thFYP of National Economic and Social Development: energy intensity of the country's gross domestic product (GDP) should be reduced by 20% from 2005 to 2010. Subsequently, the amended "*Energy Conservation Law of PRC"* came into effect in 2008. Under the new targets in the 12th FYP, energy intensity (energy consumption per unit of GDP) will be reduced by 16% and $CO_2$ intensity (carbon emissions per unit of GDP) will be reduced by 17% below 2010 levels by the end of 2015. The 16% reduction in this FYP will bring the total reduction for the total ten year period (2006-2015) to 32% below 2005 levels.[30]

For the first time, in the 12th FYP, binding targets for $CO_2$ emissions reductions were assigned at the provincial level varying from 10% to 19.5%, and energy intensity reductions targets varies from 10% to 18% nationwide.[31, 32]The baselines for the above targets are described as a year, e.g. 2005 or 2010 levels, however, quantitative baselines are not included. It is understood that energy use and emissions data are based on data from China's National and Provincial Statistical Yearbooks issued by the National and Provincial Statistics Bureaus.

Separate targets were set for passenger and freight road freight, and targets for air and rail transport are much more modest than those for road. In this context, MOT's national energy saving and emission

[29] This plan covers road, water and aviation transport, but not rail and pipeline transport
[30]http://iepd.iipnetwork.org/policy/energy-and-carbon-intensity-targets-12th-five-year-plan.
[31]Zhang et al. 2012. Quantifying regional economical impacts of the CO2intensity reduction target allocation in China.
[32]http://politics.people.com.cn/GB/1026/15660407.html

reduction targets for the transport sector as listed below. Similarly, the baseline of the targets is described as a year.

### National energy intensity reduction targets

Energy intensity reduction targets, aim to reduce the energy consumption per unit of travel or goods moved.

- Road: compared to the level in 2005, the energy consumption per freight ton kilometer (FTK)of operating trucks will be reduced by 12% in 2015 and 16% in 2020;
- Waterborne: compared to the level in 2005, the energy consumption per FTK of operating ships will be reduced by 15% in 2015 and 20% in 2020. This translates to reductions for inland ships of 14% and 20% respectively, and for marine ships of 16% and 20% respectively. The energy consumption per unit of port handling capacity will be reduced by 8% and 10% respectively;
- Air: compared to the level in 2010, the energy consumption per ton kilometer of civil aviation will be reduced by more than 3% in 2015;
- Rail: compared to the level in 2005, the energy consumption per transport workload of rail transport will be reduced by 5% in 2015.

### National emissions intensity reduction targets

Emission intensity reduction targets, aim to reduce the $CO_2$ consumption per unit of travel or goods moved.

- Road: compared to the level in 2005, the $CO_2$ emission per FTK of operating trucks will be reduced by 13% in 2015 and 20% in 2020.
- Waterborne: compared to the level in 2005, the $CO_2$ emission per FTK of operating ships will be reduced by 16% in 2015 and 22% in 2020, among which inland ships will be reduced by 15% and 23% respectively, and marine ships will be reduced by 17% and 21% respectively. The $CO_2$ emission per port handling capacity will be reduced by 10% and 12% respectively.
- Air: compared to the level in 2010, the $CO_2$ emission per ton kilometer of civil aviation will be reduced by more than 3% in 2015. And ratios of garbage decontamination and wastewater treatment at newly constructed airports will achieve 85% by 2015.

The targets vary from province to province considering local conditions and thus reduction potentials. Taking the waterborne transport target as an example, Shanghai sets energy consumption per ton kilometer of operating ships to be reduced by 19% in 2015, a higher target than the national 15%, and Shaanxi Province sets it at the level of 14%, lower than the national target.

## 2.2.2 Main Tasks under Overarching Policies and Plans

Main tasks are devised in the plans aimed to achieve the development targets including those described earlier. Depending on the planning scope (i.e. all transport modes, individual transport mode, or one aspect of one transport mode), the level of detail of main tasks developed under the plan varies. The broader the planning scope, the more general the main tasks. The policy objective of the task is also described, independent of the level of detail of the task. The only exception is the *Mid- and Long-term Plan of Energy Saving in Road and Waterborne Transport*, which provides the expected percentage of energy consumption reduction of each main task in addition to its policy objective.

The following sections analyze where overarching policies have devised main tasks in support of green freight development directly or indirectly.

### Road Freight

The main tasks for the reduction of energy consumption and $CO_2$ emissions in road freight are developed in two special plans focused on energy saving and emissions reduction of road and waterborne transport in the 12$^{th}$FYP period and energy saving of road and waterborne transport by 2015 and 2020.

Table 1 presents the main tasks relevant to road freight, their objectives and energy saving potential as included in the plan of energy saving of road and waterborne transport by 2015 and 2020.

**Table 1. Main Tasks, Objectives and Energy Saving Potential for Road Freight by 2015 and 2020**

| Item | | 2015 | | 2020 | |
|---|---|---|---|---|---|
| **Type** | **Main Tasks** | **Objectives** | **Energy saving potential** | **Objectives** | **Energy saving potential** |
| Structure optimization | Road network optimization (excluding rural road) | Road above 2nd class≥20%<br>Road pavement ≥70% | 3.0% | Road above 2nd class≥21%<br>Road pavement≥75% | 4.5% |
| | Energy structure optimization (equivalent to standard coal) | Diesel used in trucks≥85% | 2.4% | Diesel used in trucks≥90% | 3.1% |
| | Freight transport structure optimization | Average truck weight≥4.4t,average heavy-duty truck weight≥12t, ratio of truck weight to total load ≥78% | 3.0% | Average truck weight≥4.5t, average heavy-duty truck weight≥14t, ratio of truck weight to total load ≥80% | 3.6% |
| Management | Transport organization optimization | Ratio of drop-and-hook carriage ≥12% | 1.2% | Ratio of drop-and-hook carriage≥15% | 1.8% |
| | Transport efficiency improvement | Ratio of freight mileage utilization ≥66% | 5.1% | Ratio of freight mileage utilization≥67% | 8.1% |
| | Eco-driving | Ratio of eco-driving≥65% | 1.6% | Ratio of eco-driving≥70% | 2.1% |
| Technology | Promote trucks using alternative fuels, and trucks with light tare weight and high loading capacity | NA | NA | NA | NA |
| | Trucks using fuel saving engines | NA | NA | NA | NA |
| | Trucks applying energy saving technologies/products | NA | NA | NA | NA |

Source: Modified from the Mid- and Long-term Plan of Energy Saving in Road and Waterborne Transport.

Based on the main tasks developed in the above plan, the 12th FYP on energy saving and emission reduction of road and waterborne transport further devises two special activities and eight key programs related to road freight as shown in Table 2.

**Table 2. Special Activities and Programs for Energy Saving and Emission Reduction Concerning Road Freight in the 12th FYP Period**

| **Special Activities** | **Objectives** |
|---|---|
| 1. Science and technology development | To strengthen and promote capacity building, strategy and policy studies, research and development, demonstration and promotion of energy saving and emissions reduction science and technology |
| 2. Energy saving and emissions reduction of key enterprises | To conduct demonstration projects on energy saving and emissions reduction of selected high energy consuming enterprises |
| **Key Programs** | **Objectives** |
| 1. Vehicle market entry and phase out based on fuel consumption standards | To implement fuel consumption standards and pilot the phase out of old vehicles |
| 2. Energy saving and new energy vehicles | To pilot natural gas trucks for urban and inter-city freight |
| 3. Drop-and-hook (using articulated trucks) | To pilot drop-and-hook transport in selected areas and selected enterprises |
| 4. Eco-driving and maintenance | To promote eco-driving, utilization of driver training simulators, and green maintenance |
| 5. Smart transport | To promote the development and application of modern logistics technology with the current focus on public logistics information platforms |
| 6. Road construction and operation | To reduce the energy consumed by road construction and operation through technologies |
| 7. Energy performance contracting (EPC) | To cultivate EPC service enterprises and demonstrate EPC in energy saving renovation of road tunnels and application of advanced and mature truck energy saving technologies or products |
| 8. Government management capacity building | To enhance capacity of government agencies in managing energy saving and emissions reduction of road freight |

Source: Modified from the 12th Five-Year Plan of Energy Saving and Emission Reduction of Road and Waterborne Transport

### Waterborne Freight

Waterborne transport development is planned under the same overarching policies as for road transport. However, passenger and freight waterborne transport do not have separate targets for energy saving and $CO_2$ emissions. For this reason, Table 3 below shows the main tasks devised for the achievement of the waterborne transport targets in general and not specific to waterborne freight.

**Table 3. Main Tasks, Objectives and Energy Saving Potential for Waterborne Transport by 2015 and 2020**

| Item | | 2015 | | 2020 | |
|---|---|---|---|---|---|
| **Type** | **Main Tasks** | **Objectives** | **Energy saving potential** | **Objectives** | **Energy saving potential** |
| Structural Optimization(increase ship sizes to carry more tonnage) | Ship tonnage | Inland ships≥500t Ocean ships≥10000t | Inland 3.5% Ocean 3.7% | Inland ships≥600t, Ocean ships≥12000t | Inland 5.2% Ocean 4.6% |
| | Inland waterway class | 3rd class above≥9% | | 3rd class above≥10% | |
| Technology application | Fuel additives | Application ratio≥60% | 1.6% | Application ratio≥80% | 2.2% |
| | Anti-foulant | Application ratio≥70% | 3.4% | Application ratio≥90% | 4.6% |
| | Energy saving ships | Application ratio≥70% | 1.4% | Application ratio≥80% | 2.0% |
| Management | Loading capacity utilization rate | Inland ships≥65% Ocean ships≥69% | Inland 3.6% Ocean 1.7% | Inland ships≥70%, Ocean ships≥72% | Inland 4.5% Ocean 2.2% |
| | Reduce navigation speed of ocean ships | Reduce average navigation speed of container ships at sea ≥6% | 5.3% | Reduce average navigation speed of container ships at sea≥8% | 7.6% |
| | Ship maintenance | Maintenance ratio≥75% | 1.2% | Maintenance ratio≥80% | 1.6% |

Source: Modified from the Mid- and Long-term Plan of Energy Saving in Road and Waterborne Transport

**Table 4. Special Activities and Programs for Energy Saving and Emission Reduction Concerning Waterborne Transport in the 12th FYP Period**

| **Special Activities** | **Objective** |
|---|---|
| 1. Science and technology development | To strengthen and promote capacity building, strategy and policy studies, research and development, demonstration and promotion of energy saving and emissions reduction science and technology |
| 2. Energy saving and emissions reduction of key enterprises | To conduct demonstration projects of energy saving and emissions reduction of selected high energy consuming enterprises |
| **Key Programs** | **Objective** |
| 1. Inland ship standardization | To increase the competitiveness of inland ships |
| 2. Eco-driving and maintenance | To promote eco-driving and utilization of driver training simulators |
| 3. Smart transport | To achieve harbor report without berth |
| 4. Green port | To demonstrate waterborne– rail intermodal transport, convert oil to electricity of rubber tired gantry (RTG) cranes, promote utilization of shore power by ships at berth and renewable energy |
| 5. Energy performance contracting (EPC) | To cultivate EPC service enterprises and demonstrate EPC in port lighting and RTG crane oil to electricity conversion, shore power utilization by ships at berth and application of advanced and mature ship energy saving technologies or products |
| 6. Ship energy efficiency management system and database | To develop standards and verification regulations of ship energy efficiency management system and build database of ship energy efficiency design index and operation index based on existing international practice and experience |
| 7. Government management capacity building | To enhance capacity of government agencies in managing energy saving and emissions reduction of waterborne freight |

Source: Modified from the 12th Five-Year Plan of Energy Saving and Emission Reduction of Road and Waterborne Transport.

### Air Freight

The main tasks of energy saving and emissions reduction of air transport during the 12th FYP period are listed in the 12th FYP for civil aviation development as follows without further details and without distinction between passenger and freight transport:

- Optimize ground operation
- Develop and promote alternative fuels for airplanes
- Install winglets
- Strengthen the project of replacing auxiliary power unit
- Renovate airport facilities to monitor noise and treat garbage and wastewater

### Rail Freight

The 12th FYP of railway development lists the main tasks to strengthen green railway development as follows without further details and without distinction between passenger and freight transport:

- Accelerate the electric technology reform of railway, and optimize the network technology structure;
- Apply new technologies, equipment and processes to reduce the traction energy consumption, and utilize more new energy, products and materials to reduce the energy consumption from other areas other than electric traction;
- Optimize transport organization and increase transport efficiency;
- Strengthen the dust protection from rail freight; and
- Improve the target responsibility system to supervise the energy saving and emissions reduction during the planning, construction and operation of railways.

## 2.3 Green Freight Programs

### 2.3.1 National program

The China Green Freight Initiative (CGFI) was launched in April 2012 as a national program to improve fuel efficiency and reduce $CO_2$ and air pollutant emissions from the road freight sector in China. The program also aims to enhance collaboration between government, the private sector, development agencies and other stakeholders to support green freight development in China.

**CGFI Logo**

Developing green freight is important for China, because road freight has grown steadily with economic development. Transport accounts for one-third of China's total energy consumption, with more than half used for road transport. The CGFI establishment was inspired by the Clean Air Asia and World Bank-led Guangzhou Green Trucks Pilot Project (Dec 2008 – Feb 2010) and GEF Guangdong Green Freight Demonstration Project (launched in September 2011), as well as the success of the SmartWay Transport program in the US and Canada and the Green Freight Europe program.

The CGFI is managed and implemented by the China Road Transport Association (CRTA), the Research Institute of Highway (RIOH) of the Ministry of Transport, and Clean Air Asia. The first year focused on setting up the institutional mechanism for CGFI. The CGFI Steering Committee provides guidance to the CGFI development and consists of the Ministry of Transport (MOT), Ministry of Environmental Protection (MEP), National Development and Reform Commission (NDRC), Ministry of Public Security (MPS) and Ministry of Industry and Information Technology (MIIT). A CGFI Expert Group provides advice and technical input.

In addition, an implementation plan was prepared for the first five years, covering three components:

- **Green Freight Management** to promote efficient management of fleets that reduce travel distances and empty miles through the development of green carrier standard. Priority strategies currently promoted under CGFI are drop-and-hook methods and the application of information technology for logistics improvement.
- **Green Technologies** to promote the adoption of green technologies for trucks and light weight trucks through the development of green truck standard and issuance of a catalogue of green technologies and energy-saving products.[33]
- **Green Driving** to promote eco-driving through the development of eco-driving standard.

In addition there are over-arching activities such as the annual CGFI Seminar and other activities to enhance collaboration between government, private sector, development agencies, and civil society; branding, marketing, and communication of the program, and program management.

By design, the program aims to encourage and award companies that adopt green management, green technologies and green driving practices. For this reason, the CRTA and RIOH are developing guidance Green Freight Enterprise Standards for carriers and Green Freight Vehicle Standards for trucks that will be piloted by selected CRTA members during 2013. This guidance will define five levels of performance corresponding with the 5 leaves in the CGFI logo. According to the first five year work plan of CGFI, 1000 trucks from leading road freight carriers will be selected for demonstration.

### 2.3.2 Local programs

To support Guangzhou's efforts to improve air quality in preparation for the 2010 Asian Games, the World Bank and Clean Air Asia implemented a pilot project - Guangzhou Green Trucks Pilot Project aimed at improving fuel consumption and reducing $CO_2$ emissions and air pollution from trucks in Guangzhou, and developing a "proof of concept" for a truck program in Guangdong Province, and possibly China. The project consisted of three components, namely, technology pilot, driver training course and truck sector survey. The promising results of the pilot proved that technologies applied in the US and other Western countries can work in China, but a larger pilot is needed to confirm savings potential, and a nation-wide program is needed to improve fuel efficiency and reduce emissions from diesel trucks. [34]

[33] Technologies and related strategies to improve energy efficiency and CO2 and air pollutant emission reductions under consideration include vehicles (e.g. tires, aerodynamics, weight, truck sizes/shapes); engines and exhausts (e.g. SCR, DPFs, engine thermal management); fuels (e.g. low S fuels, CNG, hybrid, electric, fuel additives and lubricants); vehicle performance management inspection and maintenance (includes use of GPS or BDS - Beidou navigation satellite system)

[34] http://cleanairinitiative.org/portal/projects/GreenTrucksPilot

Following the Guangzhou Green Trucks Pilot Project, Guangdong Province is implementing the Guangdong Green Freight Demonstration Project funded by the Global Environment Facility and implemented by World Bank. The project was officially approved in April 2011 and will be completed in March 2015. The components of the project include: 3 demonstrations, respectively on green truck technologies, drop-and-hook, and logistics information platform, and 4 areas of supporting work, namely, Guangdong green freight information website, green freight policy study, training, and publicity. Currently, the project is in the phase of green truck technology demonstration.[35]

A number of private sector companies in China are piloting and implementing measures to improve fuel efficiency and reduce emissions. However, there is no national overview of these initiatives, which would be necessary to use experiences from these projects to help scale up efforts in China.

[35] http://www.gdlshy.com/EnIndex.aspx

# 3. POLICIES: TRUCKS

In this section, policies relevant to trucks are presented, and especially in relation to truck technologies and management strategies that promote green freight in China. The main ministries relevant to policies for trucks are MOT, MEP and MIIT, along with their respective affiliated institutions. The policies discussed in this section are listed in Table C– 2 in Annex C.

## 3.1 Fuel Consumption, Emission and Fuel Standards

### 3.1.1 Fuel Consumption Standards

The fuel efficiency or fuel consumption of vehicles is determined by the distance traveled per unit of fuel used in miles per gallon (mpg) or kilometers per liter (km/L), or, inversely but equally, fuel consumption per distance travelled (e.g. L/100 km). The objective of fuel consumption standards is to reduce fuel consumption of vehicles to control the emission of greenhouse gases, which in Europe and the US (EPA standard) are now measured in $gCO_2$/km.

The Ministry of Industry and Information Technology (MIIT) has issued fuel consumption standards for new light-duty commercial vehicles and heavy-duty commercial vehicles since 2007. For light-duty commercial vehicles(GVM ≤3.5 metric tons, and design speed ≤ 50km/h ), the fuel consumption limit standard,"Limits of Fuel Consumption for Light-Duty Commercial Vehicles (GB 20997 - 2007)" is a national binding standard, under which fuel consumption limits are controlled by the vehicle gross vehicle weight (GVW) and engine displacement for both diesel and gasoline vehicles as shown in Table 5 below.

China is the third country, following Japan and the United States, to adopt fuel consumption standards for new heavy-duty vehicles (GVW >3.5 metric tons).[36]There are currently two standards in this regard. One is an industry standard,"Fuel Consumption Limits for Heavy Duty Commercial Vehicles (first stage) (QC/T 924 – 2011)" issued by MIIT by the end of 2011.This standard is applied to trucks and semi-trailer tractors with GVW over 3.5 mt, effective on 1 July, 2012 for new vehicle type approvals, and will take effect for pre-approved models on 1 July, 2014. The standard controls the fuel consumption limit for diesel vehicles based on the vehicle GVW as shown in Table 6 below, and stipulates that the limits for gasoline vehicles should be multiplied by 1.3.A more ambitious and binding National Standard is currently in the final stage of development. MIIT opened the draft of the national standard for public comment in September 2012. It is expected to be released formally in 2013 and begin taking effect in 2014.

[36] http://transportpolicy.net/index.php?title=China:_Heavy-duty:_Fuel_Consumption

**Table 5. Fuel Consumption Limits for Light-Duty Trucks**

| Gross vehicle weight (GVW) (M in kg) | Engine Displacement (V in l) | Fuel Consumption Limits (l/100km) |
|---|---|---|
| **Gasoline vehicles** | | |
| M≤2000 | All | 7.8 |
| 2000 ＜ M ≤2500 | V≤1.5 | 8.1 |
| | 1.5 ＜ V≤2.0 | 9.0 |
| | 2.0 ＜ V≤2.5 | 10.4 |
| | V ＞ 2.5 | 12.5 |
| 2050 ＜ M ≤3000 | V≤2.0 | 9 |
| | 2.0 ＜ V≤2.5 | 10.8 |
| | V ＞ 2.5 | 12.6 |
| M ＞3000 | V≤2.5 | 11.3 |
| | 2.5 ＜ V≤3.0 | 12.6 |
| | V ＞ 3.0 | 14 |
| **Diesel vehicles** | | |
| M≤2000 | All | 7.0 |
| 2000 ＜ M ≤2500 | V≤2.5 | 8.0 |
| | 2.5 ＜ V≤3.0 | 8.5 |
| | V ＞ 3.0 | 9.5 |
| 2050 ＜ M ≤3000 | V≤2.5 | 9.0 |
| | 2.5 ＜ V≤3.0 | 9.5 |
| | V ＞ 3.0 | 10.5 |
| M ＞3000 | V≤2.5 | 10.0 |
| | 2.5 ＜ V≤3.0 | 10.5 |
| | 3.0 ＜ V≤4.0 | 11.0 |
| | V ＞ 4.0 | 11.5 |

**Table 6. Fuel Consumption Limits for Diesel Heavy-Duty Trucks by QC/T924-2011**

| Trucks (excluding dump trucks) | | Semi-trailer Tractors | |
|---|---|---|---|
| **Gross vehicle weight (GVW) (kg)** | **Limits (L/100km)** | **Gross vehicle weight (GVW) (kg)** | **Limits (L/100km)** |
| 3500 ＜M≤ 4500 | 15.5 | M ≤18000 | 38 |
| 4500＜M≤ 5500 | 16.5 | 18000＜M≤ 27000 | 42 |
| 5500 ＜M≤ 7000 | 18.5 | 27000＜M≤35000 | 45 |
| 7000＜M≤ 8500 | 22 | 35000＜M≤40000 | 47 |
| 8500＜M≤ 10500 | 24 | 40000＜M≤43000 | 49 |
| 10500＜M≤ 12500 | 28 | 43000＜M≤46000 | 51.5 |
| 12500＜M≤ 16000 | 31 | 46000＜M≤49000 | 54 |
| 16000＜M≤ 20000 | 35 | M ＞49000 | 56 |
| 20000＜M≤ 25000 | 41 | | |
| 25000＜M≤ 31000 | 47.5 | | |
| M ＞31000 | 50 | | |

The other standard – Limits and Measurement Methods of Fuel Consumption for Commercial Trucks (JT 719—2008) was issued by MOT on 1 September, 2008. It is a binding standard that any operating trucks with GVW over 3.5 Mt must abide by in order to apply for the permit to run on the road. Table 7 lists the fuel consumption limits for diesel vehicles as required by this standard and the limits for gasoline vehicles should by multiplied by 1.15.

**Table 7. Fuel Consumption Limits for Diesel Heavy-Duty Trucksby JT719-2008**

| Gross vehicle weight (GVW) (kg) | Trucks | Dump Trucks | Semi-trailer Combination Vehicles | |
|---|---|---|---|---|
| | Limits (L/100km) | Limits (L/100km) | Gross vehicle weight (GVW) (kg) | Limits (L/100km) |
| 3500＜M≤5000 | 11.3 | 11.2 | M≤27000 | 35.1 |
| 5000＜M≤7000 | 14.7 | 13.9 | 29000＜M≤35000 | 35.9 |
| 7000＜M≤9000 | 16.9 | 16.5 | 35000＜M≤43000 | 38.0 |
| 9000＜M≤11000 | 19.4 | 18.6 | 43000＜M≤49000 | 39.0 |
| 11000＜M≤13000 | 21.4 | 20.4 | | |
| 13000＜M≤15000 | 23.1 | 21.8 | | |
| 15000＜M≤17000 | 24.7 | 22.9 | | |
| 17000＜M≤19000 | 26.0 | 23.5 | | |
| 19000＜M≤21000 | 27.2 | 23.9 | | |
| 21000＜M≤23000 | 28.3 | 24.2 | | |
| 23000＜M≤25000 | 29.3 | 24.5 | | |
| 25000＜M≤27000 | 30.2 | 25.1 | | |
| 27000＜M≤29000 | 31.1 | 26.1 | | |
| 29000＜M≤31000 | 32.0 | 28.0 | | |

### 3.1.2 Emission Standards

Statistics show that freight trucks accounted for 36.8% of CO, 41.2% of HC, 59.8% of NOx, and 76.3% of PM of total road transport emissions in 2011 in China (Table 8).Vehicle emission standards refer to the control of the amount of conventional air pollutants in exhaust, including nitrogen oxides ($NO_x$), hydrocarbons (HC), carbon monoxide (CO) and particulate matter (PM). In the case of trucks, separate though similar sets of emission standards have been devised by the EU, the United States and Japan, and are tightened at 4–6 year intervals. This has induced a dramatic decline in emissions from new trucks over the past 20 years. Countries in other parts of the world have tended to adopt the EU or US emission standards.[37]

[37] Green Logistics: Improving Environmental Sustainability of Logistics, 2nd edition, 2012.

**Table 8. Proportion of Pollutants Emission of Trucks to Vehicle Emissions in 2011[38]**

| Trucks (metric tons) | CO (%) | HC (%) | NOx (%) | PM (%) |
|---|---|---|---|---|
| **Trucks＞ 12** | 21.1 | 25.9 | 48.6 | 61 |
| **4.5 ≤Trucks＜12 (excluding low speed trucks*)** | 6.0 | 6.0 | 6.0 | 6.0 |
| **1.8 ＜Trucks＜ 4.5 (excluding low speed trucks)** | 9.0 | 8.6 | 4.5 | 8.6 |
| **Trucks ＜1.8 (excluding low speed trucks)** | 0.7 | 0.7 | 0.7 | 0.7 |
| **Total** | **36.8** | **41.2** | **59.8** | **76.3** |

*Low speed trucks are diesel trucks with design speed＜ 70 km/h, and gross vehicle weight ≤ 4.5 mt

Emission standards for new passenger and freight vehicles in China follow the European standards, and are known as China I, II, III, IV and V. China has historically implemented equivalent Euro vehicle emission standards approximately 7-8 years after Europe. Table 9 presents implementation dates for emission standards for heavy-duty diesel and gasoline vehicles in China.[39]

**Table 9. Implementation Dates for China Vehicle Emission Standards**

| Stage | Standard | Implementation Date (type approval) | Implementation Date (all sales and registrations) |
|---|---|---|---|
| **Diesel Engines** | | | |
| China I | GB 17691-2001 | 1 Sep 2000 | 1 Sep 2001 |
| China II | | 1 Sep 2003 | 1 Sep 2004 |
| China III | GB 17691-2005 | 1 Jan 2007 | 1 Jan 2008(1) |
| China IV | | 1 Jul 2010(2) | 1 Jul 2013(3) |
| China V | | TBD(4) | TBD(4) |
| **Gasoline Engines** | | | |
| China I | GB 14762-2002 | 1 Mar 2003 | 1 Jul 2003 |
| China II | | 1 Sep 2003 | 1 Sep 2004 |
| China III | GB 14762-2008 | 1 Jul 2009 | 1 Jul 2010 |
| China IV | | 1 Jul 2012 | 1 Jul 2013 |

(1) Existing stock permitted to be sold until 30 June 2008.
(2) In December 2011, MEP announced that China III type approvals would be permitted again until 30 June 2013
(3) This date represents a 30-month delay from the original intended implementation date of 1 January 2011. The date was first extended by one year in December 2010, then again by an additional 18 months in December 2011. It is expected that this standard may once again not come into effect by July 2013.
(4) The original standard has implementation dates of 1 January 2012 and 1 January 2013, but these were delayed indefinitely in December 2011.

[38] Yin Hang, VECC, PPT at US-China Clean Truck and Bus Summit, Beijing, October 30-31, 2012.
[39] http://transportpolicy.net/index.php?title=China:_Heavy-duty:_Emissions

The current standard applied nationwide in China is China III (similar to Euro III).Emission limits for China III-V are shown in Table 10 in comparison with equivalent European standard.[40] Chinese test cycles are based on the European test cycles. Beijing has historically led in the advanced implementation of vehicle emission standards, following by Shanghai, Guangzhou, and some other major cities. Table 11summarizes the advanced implementation of HDV emission standards in sub-national regions in China.

[40]http://www.dieselnet.com/standards/cn/hd.php, and http://www.dieselnet.com/standards/eu/hd.php

**Table 10. Emission Standards for Heavy-Duty Engines in China and Europe**

| | China | | | | | | Euro | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Standard** | **China III** | | **China IV** | | **China V** | | **Euro III** | | | | **Euro IV** | | **Euro V** | |
| **Test Cycle** | **ESC° + °ELR** | **ETC** | **ESC° + °ELR** | **ETC** | **ESC° + °ELR** | **ETC** | **ESC° + °ELR** | **ETC** | **ESC° + °ELR** | **ETC** | **ESC° + °ELR** | **ETC** | **ESC° + °ELR** | **ETC** |
| **CO(g/kWh)** | 2.1 | 5.45 | 1.5 | 4 | 1.5 | 4 | 1.5 | 3 | 2.1 | 5.45 | 1.5 | 4 | 1.5 | 4 |
| **HC(g/kWh)** | 0.66 | - | 0.46 | - | 0.46 | - | 0.25 | 0.65 | 0.66 | 1.6 | 0.46 | 1.1 | 0.46 | 1.1 |
| **NMHC(g/kWh)** | - | 0.78 | - | 0.55 | - | 0.55 | - | 0.4 | - | 0.78 | - | 0.55 | - | 0.55 |
| **NOx(g/kWh)** | 5 | 5 | 3.5 | 3.5 | 2 | 2 | 2 | 2 | 5 | 5 | 3.5 | 3.5 | 2 | 2 |
| **PM(g/kWh)** | 0.10/0.13† | 0.16/0.21† | 0.02 | 0.03 | 0.02 | 0.03 | 0.02 | 0.02 | 0.10a | 0.16c | 0.02 | 0.03 | 0.02 | 0.03 |
| **Smoke(1/m)** | 0.8 | - | 0.5 | - | 0.5 | - | 0.15 | - | 0.8 | - | 0.5 | - | 0.5 | - |

**Table 11. Vehicle Emission Standards for Chinese Cities[41]**

| Stage | Beijing | Shanghai | Guangzhou and others |
|---|---|---|---|
| China I | 1 Jan 1999 | 1 Jul 1999 | n/a |
| China II | 1 Jan 2003 | 1 Mar 2003 | 1 Jul 2005 |
| China III | 31 Dec 2005 | HDV: phased-in over 2007 | 1 Sep 2006 |
| China IV | 1 Jul 2008(1) | 1 Nov 2009(1) | 1 June 2010 (GZ + 9 cities in Guangdong Province) |
| China V | 1 Feb 2013 | n/a | n/a |
| China VI | 2016 (proposed) | n/a | n/a |
| (1) Public buses and municipal service vehicles only | | | |

### 3.1.3 Fuel Standards

The fuel quality standards for vehicles in China include the *"Vehicle Diesel"* (GB19147-2009) and *"Vehicle Gasoline"* (GB17930-2011). Vehicle diesel should contain less than 350ppm of Sulphur from 30 June 2011, which is equivalent to the requirement of China III diesel vehicle emission standard. With regard to vehicle gasoline, the current standard is equivalent to China III, which is up to 150 ppm of Sulphur, and since January 1, 2014, the standard for China IV, 50 ppm of Sulphur will be implemented.

In February 2013, the State Council released the timetable of fuel standard upgrade[42]. It is planned that the vehicle diesel standard for China IV (50 ppm) will be issued and take effect on 1 January, 2015. As to fuel standard for China V, diesel standard (10 ppm) shall be issued by June 2013, and gasoline standard (10 ppm) by the end of 2013, and the implementation of both will be officially started from 1 January, 2018.

## 3.2 Alternative Fuels

China government promotes the development and application of alternative fuels in order to reduce emissions in the transport sector. The alternative fuel vehicles supported by policies include natural gas vehicles for urban logistics distribution and inter-city freight movement, hybrid electric vehicles (HEVs), and biofuel vehicles at regions with abundant biofuel resources.

The main alternative fuel vehicle provided with financial support is natural gas vehicles. In 2011, MOT and MOF established a special fund through general budget and vehicle purchase taxes to support energy saving and emission reduction of road and waterborne transport during the 12$^{th}$FYP period. The special fund is distributed as rewards instead of allowances to projects that have achieved the energy saving and emission reduction targets.

In 2012, two project lists supported by the special fund have been released, with 292 projects being awarded 495 million RMB. Among the 292 projects, 36 projects are relevant to the application of natural gas in road transport and got 45.35 million RMB awards: 16 projects relevant to LNG with 45.44 million RMB; 1 project

[41]http://transportpolicy.net/index.php?title=China:_Heavy-duty:_Emissions
[42]http://www.chinadaily.com.cn/china/2013-02/07/content_16209597.htm

relevant to CNG with 3.08 million RMB; 2 projects relevant to gas with 11.97 million RMB; 1 project relevant to the development of 5 standards pertaining to new-energy vehicles and clean fuel vehicles with 1.8 million RMB. In total, these 36 projects account for 19% of the projects and 22% of the monetary rewards. It clearly demonstrates a substantial financial support the government provides to the development and application of natural gas, LNG and other alternative fuels in the transport sector.

## 3.3 Fuel Efficiency Technologies and Management Strategies

Although the development of alternative fuel vehicles is an essential solution for emissions, diesel trucks are and will remain in the majority for the foreseeable future. Therefore energy saving and emission reduction in conventional diesel vehicles is vital. Moreover, the Mid- and Long-term Plan of Energy Saving in Road and Waterborne Transport promotes the dieselization of commercial trucks: by 2015 and 2020, the diesel consumption ratio is expected to reach 85% and 90% respectively. This is a different development from that is taking place in Europe where diesel is being increasingly accused to be a major contributor to the emission of particulate matters, with links to very severe health issues and even cancer. Late 2012, the World Health Organization also confirmed that diesel emissions are carcinogenic.[43]

### 3.3.1 Verification System and Recommended List of Transport Energy Saving Products

China has established a systematic energy saving verification system and a recommended list of transport energy saving products (technologies). The verification system is established by MOT in 2007, and CCS (China Category Society) and CECP (China Certification Center for Energy Conservation Products) are responsible for receiving application, reviewing and issuing “Certificate of Transport Energy Saving Products Verification”. This verification is voluntary. Since the verification started in 2009, the verified products pertaining to vehicles only include vehicle additives.

The recommended list of transport energy saving products (technologies) was first issued by MOT during the 7$^{th}$FYP period. This list is for promotion of energy saving products, and enterprises can apply to it voluntarily. MOT releases the recommended list of reviewed energy saving products, and issues the “Certificate of Energy Saving Product (Technology) of Operating Vehicles and Ships”. This list is released 2 to 3 times in every FTP period. The recommended energy saving products has thus far concentrated on fuel additives, energy saving engine oils and fuel-efficient devices (devices which reduce fuel consumption through the control of fuel supply system of the engines)as shown in Table 12, and its energy saving effect is also limited (1.5% - 3%). [44]

[43] http://press.iarc.fr/pr213_E.pdf
[44] China Green Freight Initiative 2012 Project Report.

**Table 12. Energy Saving Products (Technologies) of the MOT Recommended List**

| Energy Saving Products (Technologies) | 11th FYP Period – 1st batch[45] | | 11th FYP Period – 2nd batch[46] | | 12th FYP Period – 1st batch[47] | |
|---|---|---|---|---|---|---|
| | Gasoline Vehicles | Diesel Vehicles | Gasoline Vehicles | Diesel Vehicles | Gasoline Vehicles | Diesel Vehicles |
| Fuel additives | 2 | 3 | 2 | 4 | 2 | 6 |
| Energy saving engine oils | 1 | | 4 | | 5 | 3 |
| Energy saving devices | 2 | 1 | 6 | 6 | 3 | 3 |
| **Total** | 5 | 4 | 12 | 10 | 10 | 12 |
| | **9** | | **22** | | **22** | |

Source: China Green Freight Initiative 2012 Project Report.

### 3.3.2 Policies Promoting Fuel Efficiency Technologies

Since the issuance of the *Mid- and Long-term Plan of Energy Saving in Road and Waterborne Transport*, the China national government has provided guidance and support to development of certain fuel efficiency technologies as follows:

- Radial tires: Policies supporting the promotion and application of radial tires are in place. The *Mid- and Long-term Plan of Energy Saving in Road and Waterborne Transport* shows that replacing diagonal tires with radial tires can achieve 5-10% energy conservation, so that the application of radial tires and relevant technology development is encouraged. The Tire Industry Policy issued by MITT aims to standardize all types of economic entities involved in tire production, circulation, consumption, create a fair and uniform market, and to establish a tire recall system to improve the standard of services.[48]Under this policy the application of radial tires is promoted by increasing the production capacity of tire factories, because they are considered as safe, energy saving and environmentally friendly. The policy requires that by 2015, the ratio of radial tires for light-duty vehicles and heavy-duty vehicles will reach 85% and 90% respectively. Presently, large enterprises have started using radial tires. However, the high purchase cost and high technical requirements for maintenance make the radial tires not attractive for small and medium size enterprises. In addition, the government does not provide any financial support to these enterprises for the application of radial tires. Given that small and medium enterprises form the large majority of trucking companies in China, mandatory requirements for radial tires and/or incentive schemes to make the adoption of radial tires financially feasible are likely needed if these targets are to be achieved.
- Deflectors: The *Mid- and Long-term Plan of Energy Saving in Road and Waterborne Transport* encourages the installation of deflectors on truck cabins to improve aerodynamic flow, resulting in fuel Savings. While the plan mentions general promotions measure such as policies, demonstration projects and financing, it does not specify how the adoption of deflectors will be encouraged specifically. However, their widespread adoption is likely because the cost of deflectors is low and the payback through fuel

[45]http://jtjnw.mot.gov.cn/wenjiangg/200706/P020070621528689685120.doc
[46]http://www.mot.gov.cn/zfxxgk/JG010000/JG010300/JG010302/200907/t20090720_601672.html
[47]http://jtjnw.mot.gov.cn/wenjiangg/201106/P020110630306073890201.doc
[48]http://www.eustandards.cn/2010/10/27/miit-release-tire-industry-policy/ and
http://www.miit.gov.cn/n11293472/n11293832/n11293907/n11368223/13427688.html

savings is fast. New trucks are generally equipped with deflectors and truck companies or owners of in-use trucks are also willing to install deflectors at their own expense.

### 3.3.3 Policies Supporting Eco-driving

The *Mid- and Long-term Plan of Energy Saving in Road and Waterborne Transport* shows that by improving the driving skills, energy can be saved at a rate of 7-25%. The following policies aimed at promoting eco-driving are listed under the overarching plans of transport sector development in the 12th FYP period:

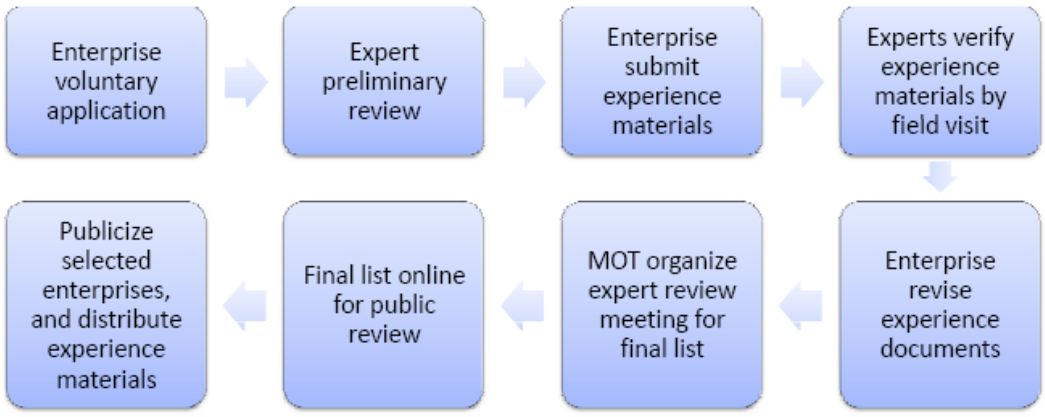
- Formulate standards and regulations on eco-driving skills, such as acceleration, breaking, and idling;
- Compile training materials and operation guidelines;
- Promote simulator driving, strengthen the training on eco-driving of road transport enterprises, and improve drivers' awareness of energy saving;
- Incorporate energy saving and emission reduction awareness and skills as the main content and criteria into the professional qualification examination and assessment for vehicle driving trainers, drivers and ship crews; and,
- Increase the penetration of eco-driving training to 65% in 2015 and 70% in 2020 compared with the 2005 level, and the expected unit consumption will decrease by 1.6% and 2.1% respectively.

Using the special fund of energy saving and emission reduction, MOT provided RMB 2.15 million to support four pilot projects of applying vehicle driving simulators for vehicle training in 2012.In addition to this top-down funding support, MOT has also disseminated information on good practices of transport sector enterprises that have achieved significant energy saving and emission reduction results since 2007. In 2010, MOT issued a guidance document to improve and formalize the procedures of such good practice selection as shown the box below. So far, five batches of such project results (each including 20 projects) have been distributed on the MOT website and in printed copies. As part of these, two projects were specifically on eco-driving.

**Selection of Energy Saving and Emission Reduction Demonstration Projects in the Transport Sector**

**Project coverage:** road and waterborne transport, port loading and unloading, urban public transport and taxies, and transport infrastructure construction, maintenance and management.

**Selection process:**



## 3.4 Vehicle Phase-out Schemes

China has been issuing mandatory rules for vehicle scrappage since 1997 that set limits to operating years or distance travelled for both passenger and freight vehicles. The most recent rule is the Rule of Compulsory Vehicle Scrappage issued at the end of 2012 by the Ministry of Commerce, NDRC, MEP and MPS, and came into effective on 1 May 2013. All previously issued rules in this regard are abolished.

Under the 2012 rule, compulsory scrappage and recommended scrappage are distinguished for the first time. Trucks shall be scrapped if they meet one or more of the following four conditions: a) Limits of service years have been reached (Table 13, from the date the vehicle is registered); b) Failure to meet the national standard of vehicle safety technical requirements for in-use vehicles; c) Failure to meet national standards of air pollution emissions or noise prevention for in-use vehicles; and,d) Fail three times consecutively at vehicle inspection. Recommended scrappage is referred to when truck kilometers travelled have reached a certain level as designated under the rule( Table13).

**Table 13. Limits of Vehicle Compulsory and Recommended Scrappage**

| Types of vehicles | Compulsory Scrappage | | Recommended Scrappage |
|---|---|---|---|
| | service life (year) | travel distance reference number (10,000 Km) | travel distance reference number (10,000 Km) |
| Mini trucks | 12 | 50 | 50 |
| Light duty trucks | 15 | 60 | 60 |
| Heavy duty trucks | 15 | 70 | 70 |
| Trucks for Transportation of Dangerous Goods | 10 | 40 | 40 |
| Three-wheeled low-speed trucks loaded with single cylinder engine | 9 | NA | NA |
| Low-speed trucks loaded with multi-cylinder engine | 12 | 30 | 30 |
| Trucks for special uses | 15 | 50 | 50 |

In addition to compulsory scrappage, China has also introduced a labeling scheme with green and yellow labels in relation to vehicle emissions control. Green labels are applied to diesel vehicles which correspond to China III emission standards or above, whereas yellow labels are given to diesel vehicles which do not meet China III standards. To provide disincentives for high-polluting vehicles running in cities and thus phase-out them before compulsory scrappage conditions are met, yellow label vehicles are restricted from running in the cities for specific hours of the day as regulated by each city. For instance, Beijing bans yellow label vehicles running within the 6$^{th}$ ring road (including 6$^{th}$ ring road) at any time since 2009, which means that yellow label vehicles cannot function in Beijing. In Nanjing, Jiangsu Province, starting from 1 November, 2012, yellow label vehicles are not allowed to run on designated routes within Nanjing from 7:00 – 22:00. The *12$^{th}$ FYP for Air Pollution Prevention and Control of Key Regions,* issued in October 2012, calls for three key regions and 10 city clusters designated under the plan to gradually ban yellow label vehicles in the main urban areas, and at the latest by 2015.[49]Moreover, by 2015, yellow label vehicles registered before 2005 should be phased

[49]The cities included in the 3 regions and 10 city clusters are 125 in total, accounting for 19% of all Chinese cities.

out, and all other yellow label vehicles should be phased out in the 3 regions (Beijing-Tianjin-Hehei, Yangtze River Delta and Pearl River Delta).

Local governments provide subsidies to yellow label vehicles that are phased-out earlier than legally required. For instance, Beijing spent about RMB 500 million(~ USD 82 million) from 2009 – 2010 to provide subsidies for yellow label vehicle phase-out with up to RMB 25,000 RMB (~USD 4,100) per vehicle. But such subsidy policy was stopped in 2011. It is estimated that the phase-out program of yellow label vehicles under the *12th FYP for Air Pollution Prevention and Control of Key Regions* will cost RMB 94 billion (~USD 15.5 billion).

## 3.5 Challenges and Gaps

Challenges and gaps are presented for institutions, policies and gaps in comparison with international practices.

### 3.5.1 Institutional challenges

Responsibilities for truck management are spread across different ministries, their mandates are conflicting, and coordination between ministries and between their affiliated institutions is minimal. This has contributed to delays and ambiguities in the development and introduction of fuel consumption standards and to the delayed implementation of tighter vehicle emission standards. As a result, the development and adoption of advanced truck technologies that can help meet the standards is likely to be adversely affected. This is further explained below.

#### Fuel consumption standards

MIIT approves the manufacturing and sale of new truck types, within its mandate of supporting vehicle industry development, and appears to have the primary authority for developing fuel consumption standards. MOT manages the operation of commercial trucks in China, and even though fuel consumption is not within its authority, it still is in MOT's interest that trucks' fuel consumption and emissions are reduced. Therefore the preferred scenario would have been for MIIT and MOT to jointly develop fuel consumption standard and apply the same standard in the approval process of new truck types. This makes sense from an institutional perspective but also sends a clearer message to truck and engine manufacturers, technology suppliers, and companies that purchase trucks.

However, in reality, this is not the case. MOT issued fuel consumption standard (JT 719—2008) for trucks in 2009 and lists it as one of the review criteria for the application of a Road Transport Permit that trucks are required to possess to drive on roads. Subsequently, MIIT developed its own industrial standard (QCT924-2011) for fuel consumption for trucks and is implementing only the industrial standards.

The parallel existence of two standards creates uncertainty in the market, especially as the two standards are different in several ways[50]:

- For trucks and semi-trailer tractors, the standards provide fuel consumption limits based on different categories of vehicle GVW;

[50] http://transportpolicy.net/index.php?title=China:_Heavy-duty:_Fuel_Consumption

- For the same weight vehicle, limits are different between the two standards;
- The stringency of the two standards cannot be directly compared because different test methods are applied; and,
- The MIIT standard does not set limits for dump trucks, while the MOT standard does.

### Vehicle emissions standards

Vehicle emissions and fuel quality are interrelated and it is therefore important that standards for both are set in coordination. MEP issues vehicle emission standards for heavy duty vehicles including trucks, but not fuel standards. The two current fuel standards for gasoline and diesel vehicles are put forward by the National Standardization Technical Committee for Petroleum Products and Lubricants under Standardization Administration of China and drafted by the Research Institute of Petroleum Processing of SINOPEC (China Petrochemical Corporation) and the Research Institute of Petrochemicals of CNPC (China National Petroleum Corporation). Close coordination is needed between MEP and the National Standardization Technical Committee for Petroleum Products and Lubricants to ensure that the fuel on the market is of such quality that vehicle emission standards can be met.

Suppling fuel that can meet emission standards is another factor in the implementation of vehicle emission standards. MEP in its official notice cited lack of fuel that can be used in vehicles meet the China IV emission standard as the reason to postpone the implementation of China IV standard. Fuel supply is not under the control of MEP but is controlled by NDRC, which oversees and regulates the market behavior of the two major state-owned oil companies, SINOPEC and CNPC, and thus the fuel supply to filling stations in the Chinese market. It is within NDRC's authority to ensure that fuels equivalent to certain emission standards are available on the market, and that fuelling stations do not provide fuels that do not meet the standards.

Another challenge is the availability of general diesel alongside vehicle diesel at filling stations. The Sulphur content in general diesel is much higher: maximum 2000 ppm Sulphur until 30 June 2013, and 350 ppm Sulphur after 1 July 2013 as required by the General Diesel Standard (GB252-2011). This poses the risk of general diesel use in vehicles, including trucks, which would result in a breach of vehicle emission standards (and degradation of emission control systems installed on trucks).The management of filling stations is within the authority of NDRC, and MEP cannot check the fuel provision at gas stations even if MEP is responsible for vehicle emissions control.

## 3.5.2 Policy challenges

### Alternative fuels

Although natural gas trucks are strongly promoted by government policies with actual financial support, the wide adoption of natural gas trucks still face challenges. At the US-China Clean Truck and Bus Summit (Beijing, November, 2012), representatives of truck and engine manufacturers indicated that they have started manufacturing natural gas engines and trucks. However, logistics enterprises pointed out during interviews that they would not choose natural gas trucks for freight transport, citing the lack of supply infrastructure. First, current natural gas filling stations in cities are mainly catered for buses and taxis, and not for trucks. Second, there are no natural gas filling stations along highways, posing a challenge for long-haul trucks because one tank of natural gas will last for maximum 500 km. Investments and government policies to

expand the infrastructure for natural gas filling stations for trucks in cities and along highways is needed for natural gas to be adopted more widely.

The other key concern as expressed by experts interviewed is that the life-cycle assessment of producing, using and scrapping natural gas trucks needs to be taken into account before natural gas trucks are promoted more widely, even though using such alternative fuel trucks reduce missions greatly during the freight transport process.

### 3.5.3 Gaps between Chinese and international practices

#### Fuel consumption and emission standards

There has been a fuel efficiency penalty associated with the pursuit of higher emission standards. To reach Euro 4, 5 and 6 standard many truck manufacturers have opted for the selective catalytic reduction or SCR technology that requires the addition of the AdBlue compound, containing urea. This requires a distribution network and adds weight to the vehicle because an extra tank must be installed and leads to higher costs. China will encounter this problem as it upgrades the equivalent of Euro 4 and 5 emission standards, and thus MOT and MIIT need to work together with MEP and consider this factor when developing the next phase of fuel and vehicle emissions standards for heavy-duty trucks. The EU, US and other developed countries have experience in establishing these, involving many of the private sector companies that also operate in China.

#### Truck technology verification

The US EPA, in support of the SmartWay Program, has implemented a comprehensive and trusted truck technology verification system. The US EPA has evaluated the fuel saving benefits of various devices through grants, cooperative agreements, emissions and fuel consumption testing, demonstration projects and technical literature review. As a result, US EPA has been able to verify fuel, cost and emission savings for technologies in four categories: idling reduction, low rolling resistance tires, aerodynamics, and retrofits for emission control, as shown in the Figure 1.[51]Such verification can provide users with confidence that these technologies will achieve quantifiable emission reductions, and help them make informed decisions.

[51] CAI-Asia Center, 2011. Design of Green Freight China Program: Program Design Report, and sub-report Technology Verification Review. http://cleanairinitiative.org/portal/projects/GreenFreightChinaProgram

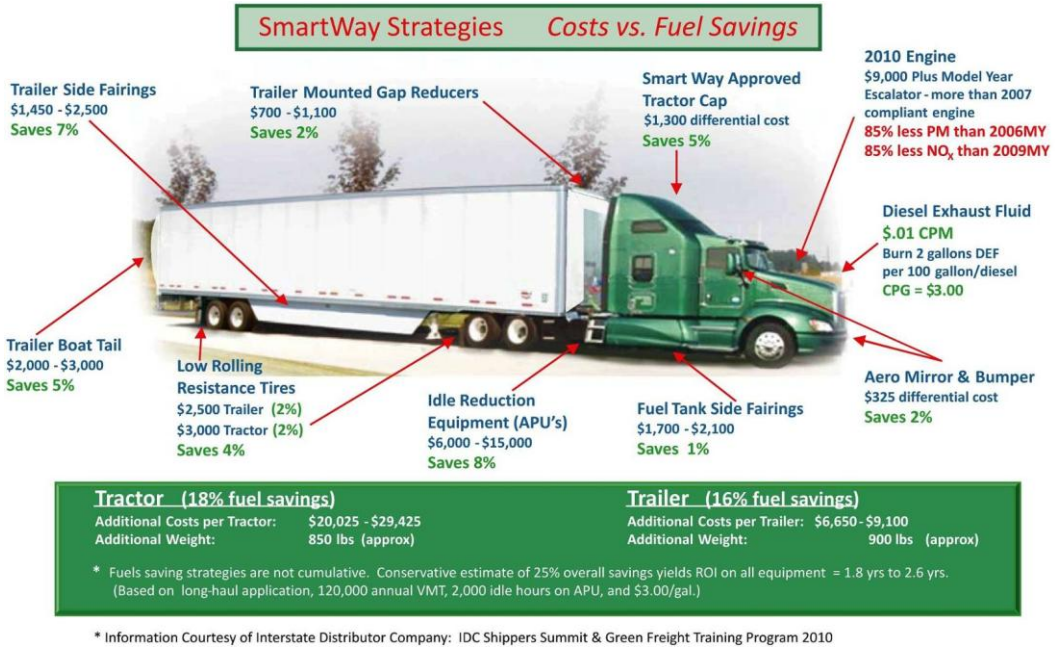



**Figure 1. Verified Technologies under the US Smartway Program**

Source: B. Polovick, US EPA. SmartWay Transport Partnership - Design, Build & Implement a Freight Sustainability Program. Presented at the Green Freight China Seminar, Beijing 23-24 May 2011

**Table 14. Comparison of Technology Verification and Certification Systems in the US and China**

| | US EPA SmartWay | PRC MOT | Remarks |
|---|---|---|---|
| **Responsible Department** | SmartWay Program | Department of Policy Reforms & Regulations | |
| **Scope** | Technologies<br>• Idling reduction technologies<br>• Aerodynamic technologies<br>• Low rolling resistance tires<br>• Retrofit technologies<br>Heavy duty vehicles | • Only clean fuel, additives, and some electronic device for engine fuel savings, etc.<br>• All types of commercial vehicles & ships, as well as port and road facilities. | MOT's verified technology category is narrow and does not include categories in SmartWay system. |
| **Key Test Methods** | • Interim test protocol – Modified Joint TMC/SAE Fuel Consumption Test Procedure – Type II (SAE J1321 Surface Vehicle Recommended Practice (October, 1986)<br>• SmartWay Fuel Efficiency Test Protocol for Medium and Heavy Duty Vehicle: Working Draft | • JT/T306-2007 Technical Specification of Fuel Saving Products for Automobiles<br>• GB/T 14951-2007: Measurement Method of Fuel Saving Technology for Automobiles | MOT needs to develop specific test protocols for more technology categories. |
| **Identification** | US EPA Certified SmartWay | (MOT & CCPCC) | |

Source: Clean Air Asia, based on information from US EPA and PRC MOT.

Based on a comparison with US EPA SmartWay's verification/certification system, MOT (and CCPCC)'s system could be improved as follows:

- ***Broader energy-saving technology categories:*** In the future, MOT (and CCPCC) should cover more technologies in their verification/certification categories. Technologies, such as idling reduction technologies, aerodynamic technologies, and low rolling resistance tires should be under consideration. Moreover, retrofit technologies (such as DPF), which reduce emissions but without fuel saving (some might increase fuel consumption), are not considered in MOT's primary list. However, in the future these should be verified and well applied in China's truck and vessel fleets;
- ***More specific test protocols:*** MOT's current test protocol is too general, partially explaining why the technology verification/certification category is very narrow. It is noted that MOT and CCPCC have started to develop detailed test protocols for specific energy-saving technology categories;
- ***Financial incentives and market mechanisms:*** The US government has a financial incentive program to encourage the fleet to use SmartWay's verified/certified technologies (http://www.epa.gov/smartway/financing/govt-funding.htm). For example, certain SmartWay verified idling reduction devices are now exempt from the federal excise tax when purchased with a new truck;
- ***Stakeholder involvement:*** Coordination between MOT, MEP, NDRC and other agencies as well as collaboration between government, the private sector, development agencies, and civil society, can help promoting application of verified technologies;
- ***Public identification:*** MOT made a good start by promoting energy-saving technologies using a "recommendation/certification list" and the energy-saving certification label. An area of improvement is the branding and image with industry and the general public, for example, by introducing a more attractive and recognizable label and by publishing case studies factsheets.

### Eco-driving

With regards to eco-driving, UK experience shows that the use of electronic driver monitoring systems and incentive schemes to embed good driving practice is crucial, because without them the effects of the driver training can quickly wear off. As to the application of truck simulators, UK experience also suggests that it was relatively expensive and offered little additional benefit when compared with on-the-road training.[52]

### Vehicle phase-out mechanism

Compulsory vehicle scrappage is very unusual and not applied in Europe, US and Japan. Hong Kong has a vehicle scrappage scheme that also includes trucks (see box). Rather than imposing an age limit, vehicles are tested, and only those that fail to meet the legal fuel efficiency and emission standards are retired: vehicles should be retired because they do not perform well, not merely because of the vehicle age. China policy makers need to take into account the fact that vehicles will become cleaner because of the implementation of higher emission standards in the future. Setting an age limit to retire vehicles does not take this development into account and risks retiring vehicles unnecessarily that continue to meet current standards.

[52] This is indicated by international experts who contributed to the study.

Research in the UK suggested that giving companies financial compensation to scrap old vehicles can be very expensive and potentially divert government funds from other more cost-effective ways of 'greening' the truck fleet.[53]

**Hong Kong Vehicle Scrappage Scheme**

In Hong Kong, trucks represent high PM and $NO_x$ emissions relatively to their numbers. Its phase 1 scrappage scheme lasted from April 2007 until March 2010, targeting pre-Euro and Euro 1 commercial diesel vehicles. With a budget of HKD 3.2 billion (~USD 450 million) grants were provided to truck and bus owners to cover 12-18% of annual average vehicle taxable values of newly registered vehicles. As a result, 17,000 vehicles or 29% were replaced.

As part of a phase 2, the aim is to phase out 80,000 commercial diesel vehicles that do not meet Euro IV standards. This is done in three complimentary ways. First, no new license issued from 2016 for pre Euro I vehicles, from 2017 for pre-Euro II vehicles and from 2018 for pre-Euro III. Second, to ease the financial burden of truck and bus owners, the government allocated a budget of HKD 10 billion (USD 1.3 billion) to provide grants to replace trucks and buses equivalent to 18-30% of replacement costs. If the truck or bus is not replaced then a grant equivalent to 10-18% of new vehicle costs is provided. Third, mandatory retirement will be imposed on newly registered vehicles after 15 years.

Sources:
A Clean Air Plan for Hong Kong, March 2013
http://www.eltis.org/study_sheet.phtml?study_id=1532&lang1=en
http://www.scmp.com/news/hong-kong/article/1129717/old-trucks-face-scrapheap-curb-airoollution
http://www.scmp.com/news/hong-kong/article/1134648/transport-operators-make-demands-over-plan-scrap-old-diesel-trucks

[53] This is indicated by the international experts who contributed to the study.

# 4. POLICIES: STRATEGIES TO REDUCE EMISSIONS FROM FREIGHT TRANSPORT

Fuel efficiency and emission reduction from road freight movement can be realized by implementing better logistics management. During the 12th FYP period, to address empty hauls, a major problem of inter-city freight transport, the China government issued policies supporting the development of drop-and-hook practices (using articulated vehicles) and logistics information platforms. With regards to urban freight, a guidance document was released in early 2013, providing guidance on how to improve urban freight to deal with the difficulties of truck movement, parking and loading and unloading. This chapter discusses the above-mentioned main policies that support more effective freight logistics. Policies analyzed in this chapter are listed in Table C–3 in Annex C.

The main ministries relevant to road freight logistics are MOT, NDRC and Ministry of Commerce (MOFCOM). Overall logistics management requires the involvement of a multitude of ministries. MOT is the agency responsible for freight logistics, but this sits in a context of much broader logistics management. For this reason, the Inter-Ministerial Joint Meeting for logistics was established and approved by the State Council in 2005. It consists of

- 13 central government ministries and agencies: NDRC, MOFCOM, MOR (which now is absorbed by MOT), MOT, MIIT, CAAC, MPS, Ministry of Finance (MOF), General Administration of Customs (GAC), State Administration for Industry and Commerce (SAIC), State Administration of Taxation (SAT), General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ), and the Standardization Administration of China (SAC)
- Two associations: China Federation of Logistics & Purchasing, China Communications and Transportation Association.

This Joint Meeting is hosted once or twice every year to understand the overall situation of national logistics development, analyze development challenges, and coordinate the plans, strategies and policies of modern logistics development.

## 4.1 Inter-city Freight Logistics

A recent article in the Chinese media reported that more than 40% of trucks run empty for inter-city road freight in China and that the average loading and unloading time of trucks is 72 hours.[54]How to reduce empty running, increase truck efficiency and thus reduce emissions and energy consumption is therefore a key concern to the China government.

### 4.1.1 Drop-and-hook Transport (Articulated trucks)

China has been promoting and supporting the use of articulated trucks or “drop-and-hook” transport since the 11th FYP period. The *“Mid- and Long-term Plan of Energy Saving in Road and Waterborne Transport”* requires that the FTK of drop-and-hook transport should reach 12% in 2015 and 15% in 2020 of the total FTK

[54]http://energy.people.com.cn/n/2013/0304/c71890-20670527.html

of road freight transport compared to the level in 2005, and the energy consumption per FTK of road freight transport is expected to be reduced by 1.2% in 2015 and 1.8% in 2020.

Several important policy documents have been issued by various ministries to promote the development of drop-and-hook transport in China. Firstly, MOT in cooperation with other related ministries issued one regulatory document in 2009 to request that obstacles to drop-and-hook implementation to be cleared, including: reduce trailer inspection frequency; adjust trailer insurance charges; improve/adjust the customs supervision system of drop-and-hook vehicles; improve/adjust the tolls collection of drop-and-hook vehicles; standardize tractors and trailers; improve the trailer permit management; encourage transport enterprises to expand transport network; and, encourage logistics enterprises to strengthen cooperation.

Next, in 2010 MOT and NDRC established a scheme providing drop-and-hook pilot enterprises with financial incentive measures granted by both central and regional governments, including:

- A special fund and subsidies for drop-and-hook pilot enterprises covering: a) drop-and-hook loading/unloading platforms; b) stations and roads for drop-and-hook implementation; c) loading and unloading facilities, standard plates and supporting equipment; d) information systems and operation platforms; e) trailer and tractors recommended by the MOT; and, f) terminal hubs equipped with drop-and-hook infrastructure and equipment modification capacity;
- Reduce highway charges: a) reduce charges on container-mode trucks and sealed heavy duty trucks; and b) issue round-trip tickets or discount annual tickets for long-term operators; and
- Local government financial support to pilot enterprises, covering: a) upgrading of tractors and trailers; and b) drop-and-hook stations, information system equipment and technology development and improvement.

Subsequently, MOT issued the First Batch of the Recommended Vehicle Models for Drop-and-hook Road Transport at the beginning of 2012, selecting 16 vehicle types from 11 vehicle manufacturers, and providing preferential policies to the recommended vehicles on toll charges. In April 2012, MOT and MOF issued a policy to grant allowances to the purchase of tractors and trailers recommended by MOT.

According to the MOT statistics[55], 26 pilot projects and 40 drop-and-hook stations have started; enterprises purchased 4225 new tractors and trailers, and 83% are recommended models; 9453 vehicles were used in pilot projects and over 130 drop-and-hook routes have been opened, reaching out to more than 20 provinces. In 2011, the unit cost of drop-and-hook transport decreased by 10%-20% compared to that of traditional transport modes, and the energy consumption per FTK has been reduced by 15%-20%. Through the 26 pilot projects, diesel savings equivalent to 100,000 tons of standard coal and 220,000 tons of $CO_2$ emission were saved.

### 4.1.2 Logistics Information Platform

The establishment of a logistics information platform, which enables companies that need goods to be transported to find freight carriers online, is another policy measure to optimize freight movement in China.

[55] Feng Zhenglin, "Strengthen the Development of Drop-and-Hook Transport, Accelerate the Upgrade of Road Freight", in the "World of Transport Managers", Issue 6, 2012

Tools/elements of the logistics information platform typically include: An internet platform for on-line freight information exchange that is normally subscription-based with a small charge for advertising (posting) and searching; Freight exchange software with on-line chat windows; Freight maps; Local legislation and regulation databases; Transport company directory; Carrier rating system and reliable carrier verification/certification; and Transport route planning and Debt management.[56]

The *"Plan of Logistics Industry Adjustment and Renaissance"* states that enhancing the level of logistics information provision is one of the key tasks of developing logistics between 2009 to 2011, with specific measures as follows: formulate standards of logistics information technologies and information resources, and establish collecting, sorting, serving and exchanging mechanisms of logistics information; accelerate the establishment of logistics information platforms, and promote the construction of a national road transport information network and air freight public information system; promote the establishment of logistics information platforms for different regions, and encourage information sharing between logistics platforms of different cities; and support the development of logistics information service enterprises.

Under the *"Opinions on Policy Measures of Promoting Logistics Industry Development"* issued by the State Council in August 2011, supporting measures for logistics development are provided. With regards to logistics information platforms, this policy document points out that independent research and development should be strengthened to support technical breakthroughs in logistics information platforms; local governments should provide support to logistics enterprises for the establishment of logistics information platforms; and, promote the construction of regional logistics infrastructure and sharing of information platforms.

There are currently three major logistics clusters (Beijing-Tianjin-Hebei region, Pearl River Delta, and Yangtze River Delta). In addition, there are seven emerging logistics clusters, including three rapidly developing coastal logistics clusters (central and southern Liaoning, the Shangdong Peninsula, and the west Taiwan Strait region), and other four emerging inland logistics city regions (central Shanxi; the central plain region, centered on Henan; the middle reach of the Yangtze River, focused on Hubei (including the port of Yueyang in Hunan but not Changsha); and the Sichuan-Chongqing region).

**Example: Henan Anyang Modern Logistics Information Development, PR China**

This company was established in 2006 as an online logistics information platform. By providing freight information exchange services and other value-added services, the platform has helped trucking companies in Anyang city (Henan Province in China) to reduce the empty mile percentage from 53 per cent in 2006 to 38 per cent in 2008. The total freight empty mileage saving in Anyang is about 137.5 million km, saving 27.5 million liters of fuel (~RMB 165 million) in the same period. The platform has since expanded to the entire province with more than 50,000 deals made per month, with average savings per month of 43.9 million km, 8.8 million liters of fuel and 52.7 million CNY (about USD 8.2 million).[57]

[56] UNCRD and Clean Air Asia (CAI-Asia), 2011. "Best Practices in Green Freight – for an Environmentally Sustainable Road Freight Sector in Asia,"

[57] This example was written up in UNCRD and CAI-Asia, 2011. "Best Practices in Green Freight – for an Environmentally Sustainable Road Freight Sector in Asia," based on http://www.8glw.com/

## 4.2 Urban Freight Logistics

In February 2013, MOT in association with MPS, NDRC, MIIT, Ministry of Housing and Urban-rural Development (MOHURD), MOFCOM, and the State Postal Bureau issued a regulatory document to the local counterparts of the 7 ministries, providing guidance on how to improve urban distribution. The document states clearly that in large and middle-sized cities, urban distribution has encountered difficulties such as truck movement, parking, and loading and unloading, which reduces efficiency and increases costs of logistics. In response to these difficulties, the document sets the overall objective that within 5 years, a management system and operation mechanism with clear functions between competent authorities, efficient operation and strong enforcement should be established.

To meet the overall objective, the document provides the guidance in the policy areas designed to improve urban distribution as listed in Table 15.

**Table 15. Guidance for the Improvement of Urban Distribution**

| Policy Area | Guidance |
|---|---|
| Improve management system | • Identify clear functions between competent authorities on urban distribution at both national and local levels<br>• Establish coordination mechanisms at local levels, with local government taking the lead |
| Plan well | • The urban distribution development plan should be developed by the city planning authority in association with the 7 authorities involved in urban distribution management<br>• The urban distribution development plan should be incorporated into overall city planning, and linked with other relevant plans such as land, commerce, transport, logistics and express mail. |
| Enhance infrastructure | • Build infrastructure for urban distribution channels and terminals<br>• Improve parking and loading and unloading facilities<br>• Issue rules and standards for conducting transport impact assessment of urban distribution, and make transport impact assessment of urban distribution obligatory for any new, renovation or extension projects of urban roads, commercial areas, residential areas and large public areas when applying for approval at the planning stage |
| Strengthen the management of transport market | • Promote the standardization of trucks for urban distribution<br>• Establish a licensing system for urban distribution enterprises<br>• Regulate the behaviors of enterprises leasing trucks for doing urban distribution<br>• Establish trust review systems for urban distribution enterprises and express mail enterprises |
| Optimize movement control measures | • Use a permit system to control access of trucks to congested urban roads at peak periods<br>• Provide more parking areas for urban distribution trucks |
| Strengthen enforcement | • Eliminate existing unnecessary or illegal charges throughout the entire logistics process<br>• Supervise urban distribution prices to direct reasonable market pricing<br>• Impose punishment for violations<br>• Ensure safety of logistics enterprises |
| Accelerate promotion and application of science and technology | • Encourage and guide logistics enterprises to integrate resources for cost reduction and efficiency improvement through centralized storage and warehouse management, demand-based distribution, and planned delivery<br>• Encourage the application of advanced technologies and equipment for urban distribution<br>• Accelerate the construction of an urban distribution information platform |
| Speed up implementation | • Local government should take the lead in organizing the urban distribution development<br>• Implement pilot projects<br>• Monitor performance of competent authorities through the logistics inter-ministerial joint meeting system |

Source:"Opinions on Strengthening and Improving Urban Distribution Management".

## 4.3 Challenges and Gaps

### 4.3.1 Institutional challenges

To achieve more efficient freight movement, both inter-city freight transport and urban freight face institutional challenges. Three examples are described below of how different priorities or mandates between ministries lead to conflicting, misaligned or policies are ineffective.

Different priorities between different ministries can lead to misaligned policies. For inter-city freight transport, MOT promotes large trucks such as full-trailer trucks, dual-trailer trucks and vehicle trains, so that trucks can carry more cargo per trip. However, currently MPS forbids full-trailer trucks, dual-trailer trucks and vehicle trains to enter highways for road safety reasons. During meetings between MPS and MOT it became clear that if had there been solid research on road safety of large trucks on highways in China, MOT could have won MPS' support.

Conflicting mandates or interests of MIIT and MOT has delayed the standardization of tractor and trailer types that is required for the adoption of drop-and-hook practices. MOT issued two batches of the recommended list in 2012, and provided financial incentives for the purchase of the recommended types. But so far only 80 tractor and trailer types on the recommended list were approved by MIIT for manufacturing and sale, compared to the approximately 3,000 truck types that have been approved in total. The MOT list is merely recommended, which means manufacturers of new trucks can choose whether to follow these specifications. MIIT itself has not yet issued uniform parameters for the standardization of tractors and trailers for drop-and-hook transport.

Government agencies and other organizations involved in urban and transport planning pay much less attention to freight than to passenger transport. A combination of under-regulation and the complexity of involving up to 15 authorities that have a role to play in urban logistics, urban freight management is a major challenge for cities. For this reason the Inter-Ministerial Joint Meeting system for logistics was established at the national level in 2005. However, urban freight remains a huge challenge in mega-cities and big cities in China, which have been experiencing fast growing urbanization and ensuring new urban economies. Against this backdrop, MOT in association with six other ministries issued the "Opinions on Strengthening and Improving Urban Distribution Management" to local counterparts, which calls on local government to take the lead in urban freight, involve all relevant agencies and establish a coordination mechanism. It is too early to see the effect of coordination between local government agencies in addressing urban distribution at this moment.

### 4.3.2 Policy challenges

#### Drop-and-hook (articulated trucks)

Drop andhook, which makes use of articulated vehicles, has as the key policy measure promoted to reduce empty-miles encountered some problems during its implementation. For instance, by the end of 2012, Liaoning Province achieved great results by engaging 26 logistics enterprises to participate in drop-and-hook practices in 8 cities and counties, and drop-and-hook transport reached 0.67% of total road freight volume.

However, the articulation ratio (the average ratio of trailers to tractors) is only 1:1.35, much lower than the international best practice of 1:3.[58] These problems need to be further addressed at the policy level.

- Vehicle standardization: Tractors and trailers need to be standardized to make them compatible for drop-and-hook practice. The best approach to standardize tractors and trailers, as suggested by experts interviewed, is through the amendment of the Limits of Dimensions, Axle Load and Masses for Road Vehicles (GB1589-2004), which was started in 2012.[59]
- Liability system: Logistics enterprises are hesitant to adopt drop-and-hook practices where it involves other companies, because it has not been legally defined yet who is liable if their trailers and goods get lost during transportation by other companies' tractors.
- Trailer use cost: Costs associated with trucks that have a tractor-trailer combination are high because currently separate registration and insurance is required for tractors and trailers. As a result, truck companies tend to favor buying smaller trucks that do not have separate tractors and trailers. Although policies have been issued to clear policy barriers to drop-and-hook adoption, these are not compulsory and their implementation is often poor.
- Freight stations cannot meet the demand: First, there are too few freight stations to meet the demand of drop-and-hook transport. Second, stations are frequently located far away from goods resources and markets and limited connections with surrounding transport networks. Third, existing freight stations are too small and ill-equipped to provide the services required for drop-and-hook transport.[60]

#### Logistics information platform

Existing logistics information platforms in China are mainly private platforms for information exchange. During the interviews, logistics enterprises expressed that they do not fully trust the information available at these private logistics information platforms, and are concerned about fraudulent conduct and ambiguity about which party, platform provider or the carrier, bears the liability if cargos get lost.

### 4.3.3 Gaps between Chinese international practices

In Europe where 'drop-and-hook' using articulated trucks has been standard practice for decades, there is still significant empty running of trucks (around 27% of truck kms). So it will be necessary to supplement this measure with others. For instance, use of load-matching services (also referred to as 'online freight information exchange').The main gap is that China could expand piloting and promoting a broader range of freight logistics solutions. Examples are provided below for freight consolidation centers, small freight company cooperation and fleet fuel management.[61]

#### Freight consolidation centers

Freight consolidation centers are the place where goods from different suppliers with the same origin and destination are combined into single shipments, thereby improving efficiency and reducing vehicles on the road. Consolidation centers have been piloted in several countries including China, a few of them have

[58] http://www.moc.gov.cn/xinxilb/xxlb_fabu/fbpd_liaoning/201301/t20130122_1358210.html
[59] http://zbs.miit.gov.cn/n11293472/n11295142/n11299183/14872991.html
[60] http://www.cvworld.cn/zjlcp/zjlc82-20120320/
[61] This section is taken from UNCRD and CAI-Asia, 2011. "Best Practices in Green Freight – for an Environmentally Sustainable Road Freight Sector in Asia." http://cleanairinitiative.org/portal/projects/ESTForums

succeeded but a large number of freight center projects have failed due to poor design, high cost, location and non-participation by key stakeholders.[62]

The London Construction Consolidation Center (LCCC) acts as a distribution center and delivery service area for construction materials to four major building projects in Central London, based on delivery requests from construction site contractors. It encompasses 5,000 square meters of space and is 40 minutes away from construction sites. The vehicle fleet consists of six different vehicle sizes to accommodate different loading, and has GPS tracking and telematics systems installed. Monitoring surveys showed that nearly 96 per cent of deliveries are on time, $CO_2$ emissions reduced by 74 per cent, and construction traffic around Central London by 70 per cent. However, the LCCC has been closed for a few years now. The main reason is costs. Energy and environmental savings do not translate into real revenue for stakeholders, therefore undermining the willingness to support the costs associated with consolidation centers. There still is a company called Wilson James which is still operating a construction consolidation centre commercially.[63]However, across Europe many freight consolidation centers for urban freight have been tried in Europe in the 1990s early 2000s, but many failed due to their high costs (urban land is expensive, adding transshipment operations to a supply chain is also costly).[64]

It is worth noting that in European countries and North America most of the existing consolidation centers have been set up by large retailers who have extended their logistical control back along the supply chain. This has completely rationalized the distribution of supplies to shops and reduced the need for urban consolidation centers. One of the most successful urban consolidation centre initiatives in Europe that works with multiple retailers, small scale shopkeepers and manufacturers is the Binnestadservice ("Inner city service") which now operates on a franchise basis in 12 Dutch towns and cities.[65]As part of this initiative all deliveries from different suppliers are delivered to shop keepers in city centers as part of one load. Shopkeepers thus only have to handle one delivery load that is delivered at a predictable time and have more time left for customers and running their shops. Moreover, plastic and cardboard waste is taken as part of the return trip, reducing the need for garbage trucks and reducing waste collection costs for shopkeepers. The city centers enjoy less freight traffic and because the delivery trucks of this service run on gas and electricity, air pollution and noise is reduced also. Importantly, this urban freight consolidation center only required one year of subsidy when it started in 2008 before it could operate independently. This means that logistics consolidation centers can be financially viable if designed and operated well.

[62] See http://webarchive.nationalarchives.gov.uk/20110505121228/http://www.freightbestpractice.org.uk/london-construction-consolidation-centre-tool
[63]http://www.wilsonjames.co.uk/logistic-support-services/logistics/consolidation-centre-services
[64] Leatitia LeBlanc, written communication
[65]http://www.binnenstadservice.nl/english

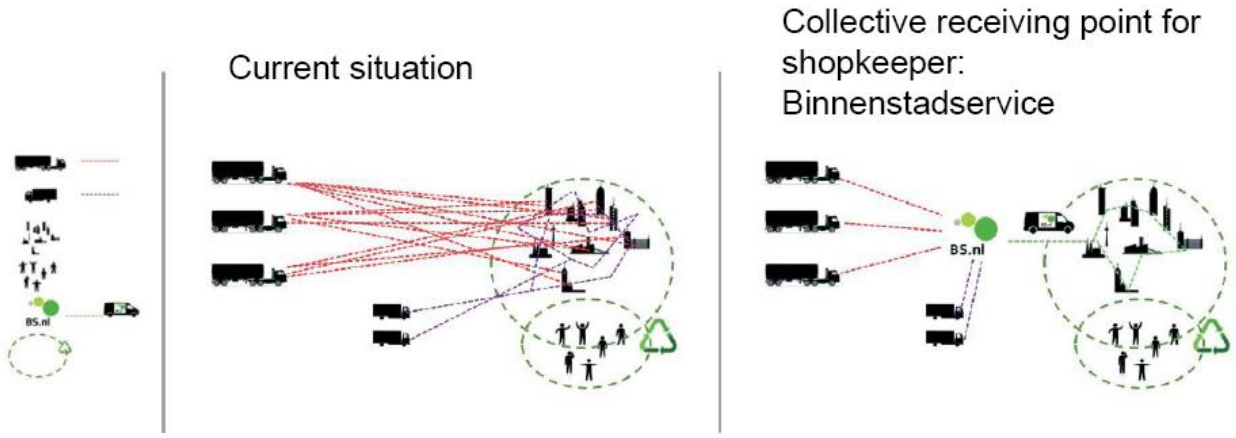



**Figure 2. Logistics improvement as part of an urban freight consolidation center in the Netherlands**
Source: Quack, H. and Hendriks B. (2008) Towards an urban freight consolidation centre network Binnenstadservice lessons learnt[66]

### Small freight company cooperation

Small distribution/trucking companies find it increasingly difficult to compete against larger operators, particularly for higher value contracts. One way to compete is that joining forces to form a haulage consortium allows small and medium businesses to pool their resources and strengths in order to win and manage larger and more lucrative logistics contracts.[67]For a road freight sector as highly fragmented as in China, small operators could form a consortium to improve back loading, reduce empty loads, improve fleet utilization and create greater opportunities to compete against large operators. Key features are integrated fleet management, information sharing, facilities sharing, and profit sharing.[68] China's ministries could enact policies to promote the formation of freight company cooperation. For urban areas, the urban freight consolidation center described above could be a suitable model also.

[66]http://www.bestfact.net/download/12_06_21_Amsterdam/Cluster1/BESTFACT_Amsterdam_Cluster1_12_06_22_TNO_BINNENSTADSERVICE.pdf
[67] UK DfT Freight Best Practice program: Case Study – Profit Through Partnership (2006). http://www.freightbestpractice.org.uk/case-studies
[68] See http://webarchive.nationalarchives.gov.uk/20110505121228/http://www.freightbestpractice.org.uk/profit-through-partnership

**Example: Freight company cooperation - Wisbech Roadways Ltd, United Kingdom**

In Wisbech Roadways Ltd.'s case[69], by joining the trucking company consortium, the company gained the benefits as quantified in table below. Comparing with UK's national average, this best practice has significant improvements on vehicle fill, empty mile reduction, and average weight-based factor.

| Key Performance Index | Wisbech Roadways Ltd. | National Average |
|---|---|---|
| Vehicle fill | 85 per cent | 69 per cent |
| Empty running | 16 per cent | 19 per cent |
| Average weight-based factor | 82 per cent | 53 per cent |

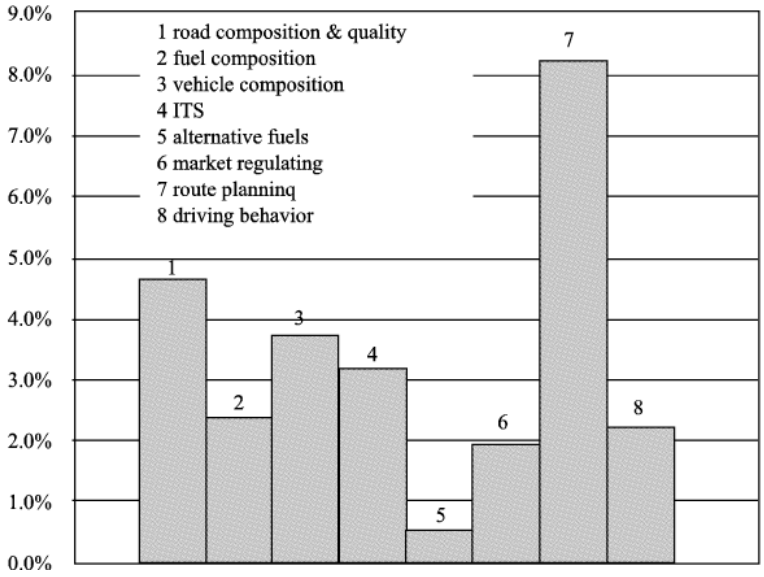
### Fleet fuel management

Fleet fuel management is an approach to monitor and manage fuel consumption and stock in any type of industry that uses transport, including rail, road, water and air. It is an important approach to improve fleet fuel efficiency. Technological tools, such as vehicle routing software, radio frequency identification tags (RFID), and global positioning systems (GPS), can support fleet fuel management, which can make a big contribution to cutting vehicle kms, and thus fuel use and emissions.

Due to direct and visible results, relatively low investments and high cost-effectiveness, fleet fuel management strategies can be adopted by small companies. Benefits from fleet fuel management vary depending on the different measures applied, fuel and $CO_2$ reduction of which can be from 0.3 to 10% per 100 tkm traveled as shown in Figure 3.[70] Of all measures, route planning achieved the biggest reduction - more than 8%. A computerized vehicle routing and scheduling (CVRS) software can be applied to help optimize routes with multiple deliveries and pick-ups.

[69] UK DfT Freight Best Practice program: Case Study – Profit Through Partnership (2006). http://www.freightbestpractice.org.uk/case-studies

[70] China Academy of Transportation Sciences (CATS), 2008. "*Study of Mid-, Long-term Planning for Energy-saving in Road and Waterway Transport*"




*Source*: ADB TA4877-PRC: Green Transport: Resource Optimization in the Road Sector in the People's Republic of China (ADB, 2009)[71]

**Figure 3. Percentage of Fuel and $CO_2$ Reduction per 100 tkm under Different Measures**

[71] http://www.adb.org/Documents/Books/Green-Transport/default.asp

# 5. POLICIES: INTERMODAL FREIGHT TRANSPORT

Road transport has shouldered around 75% of freight volume in China since 1990. In 2012, among the 41.2 billon tons of freight volume, road transport accounts for 78.2%, waterborne and rail transport share respectively 11.1% and 9.5%, and air and pipeline transport take the rest of 0.013% and 1.3%.[72] In respect of FTK (17,314.51 billion), the highest share (46.6%) is taken by waterborne transport because maritime transport is included, followed by road transport with 34.7%.[73]

Studies have shown that rail-based freight haulage can be more energy efficient and less carbon intensive than freight carried by road on trucks. Freight movement by rail is especially suitable for the transportation of bulk goods between, for example, a mine and a factory, or ports and distribution centers, but is less suitable for door-to-door delivery. Similarly, freight can be shifted to transport via inland waterways, which also is suitable for heavy bulk goods. Bulk goods transport between coastal cities with maritime freight is also common.[74] Intermodal services, such as rail/road for domestic containers, swap bodies, trailers, can be used for an extended market, including door to door services, parcels, etc.

Therefore, a freight shift from road to rail, inland waterways or maritime freight in China is the third area through which energy consumption and emissions can be reduced in the road freight sector in China, and improvement of intermodal freight transport can facilitate such modal shift. Policies covered under this chapter are listed in Table C–4 in Annex C. Freight intermodal transport development needs the coordination of various authorities that are involved with city planning, infrastructure construction, comprehensive transport system development and transport management. At the national level, NDRC and MOT are the most relevant authorities along with their provincial and local counterparts.

## 5.1 Freight Modes Development Comparison

### Road

The road network has expanded rapidly since 1995 in China. By the end of 2012, the length of highways in China surpassed 4.23 million kilometers (km), and the highway density is 44.14 km/100 square kilometers. In comparison, by the end of 2012 the length of commercial railways is 98,000 km, and the railway density is 101.7km/10000 square kilometers [75]The total length of inland waterways is 125,000 km, there are 5623 berths at sea ports (an increase of 91 berths from 2011), and the number of berths at inland waterways ports for production are 26239 (197 berths decrease from 2011).[76] The wide coverage of road network makes road transport the first and only choice in the absence of railways or inland waterways.

[72]Road has transported the most majority of freight volume in China since 1990, being 78.2% in 2012, 76.5 in 2000 and 74.6% in 1990.
[73] National Statistics Yearbook (2012), National Bureau of Statistics of China.
[74]UNCRD and CAI-Asia, 2011. "Best Practices in Green Freight – for an Environmentally Sustainable Road Freight Sector in Asia."
[75]Statistical Communiquéof Railway Sector Development (2012), Ministry of Railways.
[76]Statistical Communiquéof Road and Waterborne Transport Sector Development (2012), Ministry of Transport.

### Rail

For freight routes covered by both road and railway networks, carriers' key decision factors for freight mode choice is cost, time, and availability as indicated by stakeholders interviewed. Based on these factors, the current railway freight service fails to meet carriers' needs for three reasons.

- Rail container transport, it is expensive and inflexible. The service is not on a daily basis, and is generally unscheduled with unreliable times of departure and arrival. Moreover, it can take up to 10 days for one train to get fully loaded before departure, and trains stop during the journey to unload cargos.
- Non-container express railway service is fast and offers daily service, but the service is small in scale and thus very competitive and relatively expensive.
- Since the railway network is underdeveloped in China compared with Europe and the US, the former MOR, which manages and operates the national railway system, gave priority to special resources cargos such as coal, metallic ore and steel. This means that it is difficult for carriers to transport other non-priority cargo by railway within the required delivery schedules.

### Waterborne

As for freight transport via inland waterways, costs are generally lower than road and railway transport, but have less flexibility with regards to routes. Maritime freight is relatively inexpensive but transport by sea is slow, and the loading and unloading of cargos between trucks and ships also takes time and adds to the overall transport costs. Even though express maritime freight services are now available in China, its market ratio is still too small to meet carriers' needs.

## 5.2 Policies

Recently, NDRC and MOT both pay attention to the development of intermodal transport systems. Table 16 summarizes the policies and measures to improve the intermodal transport in China, based on plans from NDRC and MOT.

**Table 16. Polices and Measures on Intermodal Transport System**

| Policies/Measures | Description | Resources |
|---|---|---|
| Seamless connection of intermodal transport facilities | • Enhance the compatibility of port, rail, road, and air freight<br>• Standardize and improve the compatibility of different modes, hubs, and facilities.<br>• Enhance the running ability of intermodal hubs<br>• Enhance the transport ability of railway containers<br>• One-stop logistics service of international hubs | Plan of Logistics Industry Adjustment and Renaissance (2009)[77] |
| Network plan of regional intermodal facilities | • Regional hub plan (ports, distribution centers, logistics parks)<br>• Route network plan (including inland waterways, highways, and railways) | Mid- and Long-term Plan of Energy Saving in Road and Waterborne Transport (MOT, 2008)[78]<br>Plan of Logistics Industry Adjustment and Renaissance (2009) |
| Integrated information platform of intermodal transport | • Integrate and share information of all transport modes. | The 12th Five-Year Plan of Energy Conservation and Emission Reduction of Road and Waterborne Transport (2011) |
| Guidance and regulation on intermodal transport market | • Formulate standards of intermodal transport; promote advanced transport organization patterns such as container intermodal transport<br>• Establish and improve the standards of technologies, services and management of intermodal transport | The 12th Five-Year Plan of Transport Development (2011) |

Source: Integrated Design Report for Green Freight China Program. http://cleanairinitiative.org/portal/projects/GreenFreightChinaProgram

## 5.3 Freight Intermodal Transport Development

Intermodal transport in China is still under development, and container transport is more developed than non-container transport. The three main types of intermodal container transport are road-sea, road-rail, and sea-rail.[79]

### 5.3.1 Road-Sea

Road-Sea transport is the dominant method for handling import/export containers. Road-Sea container transport is concentrated in eastern coastal areas, where over 90% of the container transport companies are located.[79]

[77] http://www.gov.cn/zwgk/2009-03/13/content_1259194.htm
[78] http://www.moc.gov.cn/zizhan/siju/guihuasi/zhanlueyanjiu/fazhanzhanlue/200811/t20081104_533446.html
[79] Main Report of Policy Study on Transport Efficiency through Logistics Management, Transport Planning and Research Institute, China Economic Publishing House, 2012, p. 26.

### 5.3.2 Road-Rail

The China Railway Container Transport Company (CRCTC) was founded in late 2003, and as the exclusive rail container transport operator has a monopoly position. CRCTC established branch companies in 18 regional railway administration headquarters and owns six depots.

As a general practice, CRCTC outsources all door-to-rail and rail-to-door container drayage to local trucking enterprises under long-term contracts. Road transport distances are generally less than 200 kilometers, which is within the operating range of railway container processing stations. However, in many places, cargo sources are controlled by local logistics enterprises and CRCTC encounters major challenges in selling and marketing its services to end users.

CRCTC uses designated regular container train freight routes to improve reliability and capacity of its service. In 2007, railway container routes with "five fixed" characteristics (meaning the route has a fixed service point, fixed route, fixed container number, fixed time schedule and fixed price) completed a total volume of more than 1 million 20-foot equivalent units, accounting for 28.6% of the total volume of railway containers transported.[79]

### 5.3.3 Sea-rail

Sea-rail transport has experienced a relatively slow development. Except for a few rail-sea intermodal through-routes serving Beijing-Tianjin-Tanggu, Jiangsu, Shanghai and Zhejiang, most of the container transport is disjointed and is handled section by section by different parties. Portside rail access is rare and sea-rail linkages are poor. In 2011, MOT and the former MOR jointly released the Opinion of Strengthening Rail-Sea Intermodal Transport Development with the objective to reach a 20%annual increase in container rail-sea intermodal transport quantity by 2015.

Currently, freight intermodal transport is developing slowly for the following reasons:

- Interconnections between rail and ports are generally inefficient. Portside rail connections, common in Europe and North America, are rare in China.
- China Railways has not developed container repair or container interchange agreements with international ocean carriers. Without such agreements, ocean carriers are reluctant to ship their containers to interior locations by rail. In addition, due to the unbalanced flow of imported and exported commodities, the empty container reposition rate in rail container transport is relatively high. Moreover, it is difficult to establish rate and service agreements with China Railways to serve interior provinces. Therefore, most ocean carriers refuse to allow their containers to go inland. As a result more than 80% of imported cargo is unloaded from ocean containers at ports and then reloaded into different China Railways containers for inland transport. This significantly increases overall logistics cost and complexity, making sea-rail transport less attractive.[80]

[80] Main Report of Policy Study on Transport Efficiency through Logistics Management, Transport Planning and Research Institute, China Economic Publishing House, 2012, p. 28-29.

## 5.4 Challenges and Gaps

### 5.4.1 Institutional challenges

Before the former MOR was merged into MOT early 2013, different transport modes were managed by different ministries. Systematic planning of the four transport modes was challenging as it required coordination between different agencies, affecting especially the planning of intermodal transport linkage facilities.

A good example is the Shanghai Yangshan deep water port, which is situated on an island, through which a large number of container cargos are transported. The port is connected to land via the 32.5 km Donghai Bridge. A railway freight terminal was constructed on land, designed to transport cargo from the Yangshan port to inland locations. However, there is no rail connection between the port and the railway terminal, and trucks cannot handle large cargo volumes fast.

**Figure 4. Shanghai Yangshan Deep Water Port**

### 5.4.2 Policy challenges

Current policies in support of intermodal transport are macro-level policies that are not legally binding and do not have detailed measures and timetables for implementation. The main policy challenge is therefore to formulate policies that can truly improve intermodal transport development in China. For instance, policy makers need to study what policies should be in place to guide and encourage the shift from road freight to rail and waterborne transport.

### 5.4.3 Gaps between Chinese and international practices

#### Intermodal transport development strategy

The absence of a strategy supplemented with a set of practical policies to promote and improve intermodal transport represents a key gap with international policy practice. First, clear definition of targets and timescales is needed. The latest EU Transport White Paper sets a target of “30% of road freight over 300km …

shift to other modes such as rail and waterborne transport by 2030, and more than 50% by 2050."To achieve these targets a set of measures must be put into place.[81]

- For instance, in Germany, the introduction of road-user charging for trucks has achieved a 6% shift in long-distance FTK to these alternative modes. Switzerland, a thorough fare for road freight movement, has had similar success with road-user charging for trucks.
- In the UK, the Freight Facilities Grant Scheme, which has been in operation in the UK since 1974, provides capital support for rail freight investment where it can be demonstrated that environmental benefit will result from the use of rail rather than road. This benefit is calculated financially by estimating the number of 'sensitive lorry miles' that will be removed from different classes of road and multiplying them by appropriate monetary values for the environmental impact per mile. The grants awarded on the basis of this calculation effectively 'buy the removal of lorries from the road system' (DfT, 2009a: 55).
- For much of the 20th century, governments of developed countries tried to use quantitative controls on the capacity and pricing of the road freight sector to protect rail freight operations from intermodal competition. This strategy proved largely ineffective, however, and was abandoned with the deregulation of the trucking industry in most developed countries between 1970 and 2000.[82] Instead priority is now given to the liberalization of rail freight operations and the creation of commercial conditions in which rail can compete more effectively with road. Within Europe the EU and individual member states are also trying to improve the 'inter-operability' of rail freight services among national rail networks to allow rail to exploit its comparative advantage in long-distance freight transport more effectively.

### The Last Freight Mile: Cargo Bikes

Intermodal freight transport should expand to include urban freight transport modes that can replace trucks. Cargo bikes are designed and constructed specifically for transporting cargo and are generally used for first mile/last mile connections, providing opportunities to small entrepreneurs to collect garbage or provide daily grocery supply etc. In Europe the use of bikes for freight delivery, particularly of non-food products, is a new niche and still account for a tiny proportion of urban freight movements. In China, there is a long tradition of bikes being used to carry large quantities of freight, and thus should be kept against this greater background of motorized urban development.

[81] McKinnon, AC, Browne, M. and Whiteing, A.Green Logistics: Improving Environmental Sustainability of Logistics, 2nd edition, 2012.

[82] McKinnon (1998) #full ref needed#

**Example: Cycle Logistics Project, Europe**

One of the largest initiatives in understanding and promoting cargo bikes in Europe is CYCLE Logistics project. It is an EU funded project implemented from May 2011 to 2014, spanning across 12 countries. The main stakeholders in this project partnered by the European Cyclists' Federation (ECF) are local authorities, the private sector, cyclists' groups, communications experts and energy agencies. In order to promote this shift, CYCLE Logistics will push for behavioral change across a broad spectrum of stake-holders:

- Individuals will be informed on how to use their bicycle to transport goods;
- Businesses will be motivated to use bikes or cargo bikes for delivery, with the goods sector being pushed be pressed to increase deliveries by cycle;
- City governments would be encouraged to facilitate the cycle movement by providing sympathetic infrastructure.

CYCLE Logistics aims to save 1300 tons of fuel resulting in savings of 3500 tons of $CO_2$, have 2000 new cargo bikes in use in European urban areas and see at least 10,000 trips shifted to intermodal transport chains.[83]

[83] http://www.ecf.com/misc/filePush.php?mimeType=application/pdf&fullPath=http://www.ecf.com/files/2/121/CYCLE_Logistics_press_release.pdf

# 6. CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the main conclusions from the study and recommendations, which are grouped into long-term and short-term recommendations. Under both groups of recommendations, the problems and challenges are described, and next steps are suggested, including which agencies could take the lead.

## 6.1 Conclusions

**Conclusion 1. There is an urgent need to improve the efficiency and reduce adverse social and environmental impact from freight movement in China, especially for road freight.** China's road freight volume and freight ton kilometers (FTK) has grown at 11.1% and 9.4% respectively from 2008 to 2012, faster than GDP at 9.3%. While waterborne freight accounts for a higher proportion of FTK (46.6%) compared to road freight transport (34.7%), the inefficiencies and impacts of road freight are most felt. The number of truck types on Chinese roads exceeds 3000. The 11 million commercial trucks were owned by 700,000 carriers and over 6.5 million owner-operators in 2011: on average, operators owned only 1.6 trucks and only 2.9% of carriers owned more than 50 trucks. In 2011, trucks accounted for 36.8% of CO, 41.2% of HC, 59.8% of NOx, and 76.3% of PM of total road transport emissions. Reportedly, more than 40% of trucks run empty for inter-city trips and it takes on average 72 hours to unload and load a truck.

**Conclusion 2. A balanced mix of proven strategies exist and can be piloted and applied to China, aimed at trucks and vessels ('improve' strategies), improving freight logistics ('avoid' strategies) and transfer of road freight to intermodal and rail, inland waterways and other modes ('shift' strategies).**

- 'Avoid' strategies reduce the overall need for transport or the distance traveled by road freight vehicles and mostly relate to improved logistics. Logistics solutions for road freight, including the use of articulated trucks ("drop-and-hook"), loading on return trips (backloading), matching vehicle capacities to loads, logistics information platforms, consortia between freight companies, and freight consolidation centers. Similar strategies can be applied to other freight modes. Broader urban and transport planning can also be effective avoid strategies;
- 'Shift' strategies aim to transfer freight movement to more energy-efficient and/or environmentally-friendly modes. This especially relates to shifting road freight to intermodal transport, rail, inland waterway and maritime freight transport; and,
- 'Improve' strategies improve the energy efficiency of vehicles and vessels through technologies and management. Technologies for trucks, including tires and wheels, aerodynamics equipment, idling reduction technologies, emissions control technologies, fuel and oil, and engines and vehicles. For marine and inland vessels, some of the most important strategies relate to low sulfur fuel, emission control devices, and on-shore power supply while ships are at berth. For air freight, the use of alternative fuels to kerosene is a potential area of improvement.

**Conclusions 3. Existing plans and policies provide a solid mandate and basis for government agencies and other stakeholders to focus on green freight.** The most relevant national overarching policies and plans are the 12$^{th}$ FYP of Transport Development by the Ministry of Transport, the 12$^{th}$ FYP of Comprehensive Transport System by the National Development and Reform Commission (NDRC) supplemented by mode specific development plans and environmental/energy/emissions plans for road, rail and waterborne

transport. For urban freight, MOT and six other ministries issued the "Opinions on Strengthening and Improving Urban Distribution Management" to local governments. Most importantly, China has set energy-intensity and $CO_2$ emissions-intensity targets for the four main transport modes – road, waterborne, air and railway transport, and for road transport separate targets are specified for passenger and freight transport. A set of policies and schemes to further help achieve these targets for the areas listed in the following table, and some are supported by pilot projects.

**Table 17: Chinese Policies and Schemes In Support of Road Green Freight Development and Emissions Reductions**

| Trucks (Improve) | Freight Logistics (Avoid) | Intermodal Transport and Modal Shift (Shift) |
|---|---|---|
| • Vehicle fuel consumption, emissions and fuel standards<br>• Alternative fuels (CNG, LPG, LNG)<br>• Fuel efficiency and emission reduction technologies<br>• Eco-driving<br>• Vehicle phase-out schemes (compulsory scrappage and yellow sticker vehicles) | • Drop-and-hook (use of articulated vehicles)<br>• Logistics information platforms<br>• Improvement of urban distribution | • Promoting intermodal transport<br>• Promoting rail-sea development<br>• Promoting waterborne transport |

**Conclusion 4. China has initiated national and local programs on which green freight efforts can build.**
China has initiated green freight programs at both local and national level. A small green truck pilot project was started in 2008 in Guangzhou, followed by a Guangdong Green Freight Demonstration Project (2011–2015) focused on truck technology, drop-and-hook logistics, and a logistics information platform demonstration. At the national level, the China Green Freight Initiative (CGFI) was launched in April 2012 as a national program to improve fuel efficiency and reduce $CO_2$ and air pollutant emissions from road freight. The CGFI is managed and implemented by the China Road Transport Association (CRTA), the Research Institute of Highway (RIOH) of the Ministry of Transport, and Clean Air Asia, and guidance is provided by a Steering Group of five key ministries and an Expert Group. The three main components cover the avoid-shift-improve strategies mentioned earlier: green management (avoid/shift), green technologies (improve) and green driving (improve), which will be promoted first among road freight enterprises through standards development, piloting, demonstration and training.

**Conclusion 5. Policy and institutional barriers must be addressed to achieve national targets relevant to green freight.** In general the national institutional framework comprises ministries that are responsible for the formulation of strategies, plans and policies. Ministries are supported by affiliated scientific and research institutes to provide research support for policy-making and associations to act as a bridge between government and enterprises. The national institutional set up is also reflected in the institutional arrangements at the provincial and local levels. Since 2005, an Inter-Ministerial Joint Meeting for logistics has been in place comprising 13 ministries and two associations, and that meets twice per year.

Due to various institutional and policy challenges, the development and adoption of advanced truck technologies and management options, logistics strategies, and intermodal and other transport modes are likely to be adversely affected. In turn this affects China's ability to achieve its energy savings and emissions intensity targets.

Some of the key institutional and policies challenges are:

- Responsibilities relevant to green freight are spread across different ministries, their mandates are conflicting, and coordination between them and between their affiliated institutions is minimal;
- Before the former MOR was merged into MOT early 2013, different transport modes were managed by different ministries, making coordination more complex;
- Freight has received less attention than passenger transport by government authorities;
- In some cases, especially where infrastructure is required, funds are lacking to implement policies effectively;
- Policies in support of intermodal transport are macro-level policies that are not legally binding and do not have detailed measures and timetables for implementation

This has contributed to

- Delays and ambiguities in the development and introduction of fuel consumption standards and to the delayed implementation of tighter vehicle emission standards;
- Limited infrastructure for the supply of natural gas resulting in delayed adoption by carriers;
- Limited use of full-trailer trucks, dual-trailer trucks and vehicle trains despite their promotion because they are prohibited from entering highways;
- Delays in the standardization of tractor and trailer types for articulated vehicles that is required for the adoption of drop-and-hook practices;
- Urban freight remaining a major challenge for cities especially in the face of growing urbanization;
- Gaps in the planning of intermodal transport linkage facilities and a lack of concrete measures to increase intermodal transport and a shift from road freight to other modes, and of timetables for their implementation.

A similar challenge exists for the research institutes that are affiliated to various ministries, resulting in

- Lack of basic data of transport modes, and data released by different research institutes are conflicting;
- Lack of solid research makes sound policy formulation impossible, for instance, MOT needs strong research results to illustrate that large trucks running on highway will not cause road safety issues, otherwise MPS is in no position to support large truck development in China;
- Results from research conducted by different research institutes are not mutually shared, either leaving research blank areas or causing repeated or conflicting research.

**Conclusion 6. Ample international best practices exist on which China can draw to design its own policies and strategies and fill gaps.** The best practices described in the report that are of most relevance to China's gaps are

- A supply and distribution network is needed for Adblue that is required for Euro 4, 5 and 6 vehicle emissions standards and exists in Europe, the US and several other developed countries;

- The technology verification system of the US EPA in support of the SmartWay Program, covering a wider range of truck technologies, detailed and specific test protocols, financing mechanisms to promote certified technology adoption, and a recognizable certification logo for public recognition of companies that apply certified technologies;
- Eco-driving schemes in the UK that involve training, electronic driver monitoring systems and incentive schemes;
- Consideration of alternative schemes to compulsory vehicle scrappage because of the high costs involved. Where scrappage schemes exist, the decision to retire vehicles is based on emissions tests rather than age limits;
- Combining drop-and-hook by using articulated vehicles with other measures to reduce empty runs, especially load-matching services ('online freight information exchange');
- Freight consolidation centers by retailers and for urban freight especially from Europe;
- Small freight company consortia to pool resources and strengths in order to win and manage larger and more lucrative logistics contracts;
- Fleet fuel management, especially through route planning;
- Measures to stimulate a shift from road freight to other modes, especially in Europe, through truck road charges, capital investments in railway infrastructure and connected networks, and the use of cargo bikes for urban freight.

## 6.2 Recommendations for Specific Policy Areas

The following recommendations are meant to deal with the challenges of existing policies and actions.

### 6.2.1 Policies for Trucks

#### Fuel consumption and emission standards

**Challenge:** Vehicle fuel consumption and emission standards are compulsory measures that companies must abide by to reduce energy consumption and emissions coming out from trucks. However, problems exist with the standards:

- Two parallel fuel consumption limit standards issued by MOT and MIIT use different test methodologies and fuel consumption limit values;
- The implementation of China IV emission standard has been delayed due to inadequate supply of fuel that can be used to meet the China IV standard; and,
- Monitoring of in-use vehicles in compliance of the two standards is very poor.

**Recommendation:**

- Enhance coordination between MOT and MIIT on fuel consumption standards to improve consistency, and between MEP and NDRC for China IV emission standard implementation and fuel supply;
- MOT and MEP should place more emphasis on and allocate more resources to monitoring in-use vehicles' standard compliance.

### Technologies for trucks

**Challenge:** The current products and technologies included under the vehicle energy saving verification system and recommended list in China are very limited and their energy-saving potential relatively small. Furthermore, the verification system does not have a strong credibility among companies.

**Recommendation:** China Green Freight Initiative (CGFI) is designed to test, pilot and issue a catalogue of energy-saving and emission reduction products and technologies. The products and technologies of such a catalogue could cover a wider range, while credibility is established through a strict testing process and protocols. US SmartWay's technology verification system and the technology demonstration results from Guangdong Green Freight Demonstration Project can be used as starting points. Improvement opportunities are further explained in the earlier section on truck technology verification .

### Vehicle scrappage schemes

**Challenge:**

- The compulsory vehicle scrappage requirement and yellow label phase-out plan would create a problem of how to deal with so many scrapped trucks;
- With the production of cleaner trucks, an age limit of compulsory scrappage would waste many trucks while they still demonstrate good performance.

**Recommendation:**

- A study should be initiated on the disposal of scrapped trucks to prevent illegal disposal. This should include a cost-benefit analysis of this vehicle scrappage plan (taking account of vehicle life cycle energy use and emissions). The relative cost per ton of emissions saved should be compared with other green freight initiatives.
- Revisit the age limit scrappage requirement considering the timeline of cleaner trucks production and sale, and consider using vehicle emissions test results as the basis for deciding on truck retirement instead.

## 6.2.2 Freight logistics

### Drop-and-hook (articulated vehicles)

**Challenge:** Drop-and-hook logistics, as the priority measure to reduce emptyloads, has encountered problems during implementation. One major problem is the incompatibility of tractors and trailers between different freight companies, and the other is legal uncertainty about who should bear the liability if cargo is lost or damaged when transported by another company's tractor.

**Recommendation:**

- Address the incompatibility issue of tractors and trailers through the amendment of GB1589-2004;
- Identify liability parties over cargo lost or damaged during drop-and-hook practice through laws and regulation.

### Support for small freight carriers

**Challenge:**

The majority of road freight enterprises are small, making it difficult for them to compete with large-scale freight companies for getting contracts, and to join drop-and-hook programs..

**Recommendation:** Set up small freight company consortia to allow small companies to compete with large companies for contracts and to take part in drop-and-hook practices using articulated trucks. Consortia may also offer opportunities for better access by small carriers to finance for upgrading trucks.

### Route planning

**Challenge:** Route planning is the main fleet management strategy to save fuel but has not been widely applied in China.

**Recommendation:**
Pilot the application and promote through incentive schemes computerized route planning software to reduce fuel consumption for carriers running multiple collection and delivery rounds (Note: Many small operators will find it too expensive to acquire and install this software).

### Urban goods distribution

**Challenge:** Urban distribution is a major emerging issue in mega-cities, in particular in meeting new urban economy needs such as express delivery of on-line shopping products.
**Recommendations:**

- Agency coordination is definitely needed, as currently up to 13 agencies are involved in logistics management. This could be accomplished, for example, through the establishment of working groups;
- Restricting truck operating hours in mega-cities like Beijing is severely undermining truck and urban distribution efficiency. One solution could be to lift access restrictions for certified green trucks (CGFI is developing a green truck standard) in mega-cities while for other trucks restrictions remain in place;
- Revisit the current consolidation centers practice, which is constructed and managed by government. Most successful consolidation centers in US and Europe have been set up by large retailers who have extended their logistical control back along the supply chain, and tailored urban freight consolidation centers working with shopkeepers in city centers; and,
- Conduct a study to learn from Japanese experience on urban freight management. Examine the deployment of pick-up point networks in Europe and Japan to see how they can be deployed in China. Pick-up point networks are a very efficient way to optimize online shopping deliveries to households, preventing many truck-trips in residential neighborhoods

## 6.2.3 Intermodal transport development

**Challenge:** To shift freight from road to rail and waterborne transport modes, rail and waterborne transport must be able to meet carrier's needs: mainly cost, time and availability. The current situation is that the road network covers much larger areas than the rail and inland waterways networks which currently cannot meet carriers' needs.

**Recommendations:**

- Expand the networks for railways and inland waterways. This requires extensive coordination between national and local governments concerning city planning, land approval, and infrastructure (railway, inland waterways, intermodal hubs) construction;
- The newly created China Railway Corporation could explore how to improve rail freight services and open the railway market up to private sector players. The UK and US experience shows that liberalization of railway market successfully leads to increase of railway freight market share.

## 6.3 Systemic Recommendations

Systemic recommendations are aimed at sustainable green freight development in the long run and addressing systemic institutional and policy challenges. These recommendations are formulated around four cornerstones: agency coordination, research coordination, private sector engagement, and channels for international experience learning for better policy development and implementation.

### 6.3.1 Agency coordination mechanism

**Challenge:** Various agencies are involved in truck management, freight logistics and intermodal transport, leading to institutional and policy challenges in several aspects as described in the conclusions section.

**Recommendations:**

- Improve agency coordination through the existing Steering Committee under China Green Freight Initiative (led by MOT, and comprised of MIIT, MEP, NDRC, MPS and MOF)
- Address the above-mentioned policy challenges first
- Decide on the long-term direction of green freight developments in China in the long term.

### 6.3.2 Research institutes coordination network

**Challenge: D**ata, solid research, and sharing of research between agencies is lacking and results in inconsistent data sets and adversely affects policy formulation, as explained under the conclusions.

**Recommendations:**

- Establish a coordination network between the key research institutes related to freight studies, and suggest that at least these institutes be included: CATS, RIOH, TPRI, WTI, CATARC, VECC, and ICT. Under the network, institutes can rotate to take the lead in coordination year by year and finish the following key activities:
    - Compile existing studies and set up a database for freight studies;
    - Collect baseline data and statistics on the four main transport modes, and integrate these data into the database;
    - Analyze experience and lessons learned from existing pilot and demonstration projects related to green freight, and integrate the results into the database;
    - Identify priority research areas, combine resources to conduct joint and in-depth studies to support green freight policy formulation and evaluation.

### 6.3.3 Channels for more private sector participation

**Challenge:** Currently, it is mainly government authorities and research institutes that work together to formulate policies concerning freight, with very limited private sector participation. However, the freight sector, and in particular, road freight, is mainly a private sector undertaking with a seriously fragmented structure. Increased private sector participation in policy development and green freight implementation would help government understand the sector status and needs, and thus government would be better able to develop policies that can be more needs focused and receive better implementation from company level.

**Recommendation: A**llow associations to play a bigger role and channel private sector needs back to government. It is recommended to involve at a minimum the following associations more actively:

- China Road Transport Association: CRTA is currently the leading implementation agency of China Green Freight Initiative, and the perfect channel to engage road freight enterprises
- China Communications and Transportation Association: CCTA's connection with companies covers all five transport modes in China
- Green Freight Asia (GFA): A private sector association involving shippers, carriers and logistics service providers in Asia, with a majority of members operating in China as well.

### 6.3.4 International experience learning channel

**Challenge:** China's green freight development is at an early stage but requires an urgent impetus to develop fast in order to meet the inefficiency, fuel and emissions challenges China's freight sector faces. There is a great deal that can be learned from other countries, which have formally established green freight-related national programs, such as the US, Canada, Europe, and South Korea, or from countries which have best practice models in certain areas related to truck technologies and management, logistics strategies and intermodal freight and freight transfer to other modes (as listed in under the conclusions).

**Recommendations:** It is recommended that the following channels be used for international experience learning:

- Expert Group under the China Green Freight Initiative, which consists of international experts from leading agencies in green freight development such as US EPA, World Bank, and Energy Foundation
- Green Freight Asia: Many GFAN member companies are world leading in reducing emissions and increasing energy efficiency at company level, and can share best practice
- A focused seminar on international experience learning and sharing can be held once a year as a back-to-back activity to the annual seminar of China Green Freight Initiative.

# ANNEX A. Selected Recent Studies on Truck Technologies

1. PricewaterhouseCoopers, 2008, The Truck Industry's Green Challenge: Headwind or Competitive Edge?
2. Low Carbon Vehicle Partnership, 2010, Low Carbon Technologies for HGVs: Presenting the winners of the LowCVP Technology Challenge 2010.
3. Recardo-AEA, 2011, Reduction and Testing of Greenhouse Gas (GHG) Emissions from Heavy Duty Vehicles – Lot 1: Strategy.
4. Law, K., Jackson. M., Chan. M., TIAX LLC, 2011, European Union Greenhouse Gas Reduction Potential for Heavy-Duty Vehicles.
5. Faber Maunsell, 2008, Reducing Greenhouse Gas Emissions from Heavy-Duty Vehicles.
6. 21st Century Truck Partnership, 2006, Roadmap and Technical White Papers.

# ANNEXB. List of Experts and Stakeholders

**List of Experts and Stakeholders Consulted and Interviewed**

| No. | Name | Title | Organization |
|---|---|---|---|
| 1 | Wang Limei | Deputy Director-General | China Road Transport Association |
| 2 | Tan Xiaoping | Director | Division of Strategy and Policy Study, Transport Planning and Research Institute |
| 3 | Tang Dagang | Director | Vehicle Emission Control Center of Ministry of Environmental Protection |
| 4 | Tang Hui | Deputy Director | Logistics Center, Research Institute Of Highway |
| 5 | Zhao Chengfeng | Deputy Director-General | Zhejiang Supply Chain Association |
| 6 | Li Liancheng | Division Chief | Institute of Comprehensive Transportation |
| 7 | Wang Yangkun | PhD | Institute of Comprehensive Transportation |
| 8 | Zhang Guanghe | Director | China Road Transport Association |
| 9 | Yang Dongbo | PhD | Automotive Transportation Technology, Research Institute Of Highway |
| 10 | Chen Linqing | Deputy Director | Green Freight Demonstration Project Management Office, Department of Transport of Guangdong |
| 11 | Cheng Guohui | Deputy Director | Green Freight Demonstration Project Management Office, Department of Transport of Guangdong |
| 12 | Su Jun | Project Officer | Green Freight Demonstration Project Management Office, Department of Transport of Guangdong |
| 13 | Cao Peng | Senior Transport Manager | SINOTRANS Jiuling Transport and Storage Co. Ltd. |
| 14 | Jiang Zaixian | Deputy General Manager | SINOTRUCK Power Division |
| 15 | Shao Sidong | General Manager | Weichai-Westport |
| 16 | Peng Lixin | Chief Technical Officer | Cummins (China) Investment Co. Ltd |
| 17 | Hong Yun | Regulatory and Verification Manager | Cummins (China) Investment Co. Ltd |
| 18 | Robert Frederrick Veit | Executive Vice President | Daimler Northeast Asia Ltd, Mercedes-Benz (China) Ltd. |
| 19 | Liang Guojun | Engineer | Qingdao CIMC Special Reefer Co. Ltd. |
| 20 | Lu Wei | CEO Assistant | Guangdong Linan Logistics Group |
| 21 | She Wenzhen | Deputy Director | Department of Equipment Industry, MIIT |
| 22 | Lin Tan | Freight and Logistics Division | Department of Road Transportation, MOT |
| 23 | Huang Zhihui | Air Division | Department of Pollution Prevention and Control, MEP |
| 24 | Cui Jianxiang | Deputy Director | VECC, MEP |
| 25 | Wang Yangkun | Doctor | Institute of Comprehensive Transportation, NDRC |
| 26 | Li Zhongkui | Chief Engineer | China Academy of Transportation Sciences |
| 27 | Jin Yuefu | Vice Chief Engineer | China Automotive Technology & Research Center |
| 28 | Gong Huiming | Transport Program Director | Energy Foundation |
| 29 | Mats Harborn | Executive Director, China Strategic Center | SCANIA |
| 30 | Liu Jingjing | Truck Marketing Department | Daimler Northeast Asia Ltd. |
| 31 | Laetitia Dablanc | Director of Research | French Institute of Science and Technology for Transport, Development and Networks, Université |

| No. | Name | Title | Organization |
|---|---|---|---|
| | | | Paris-Est |
| 32 | Anne Goodchild | Associate Professor | University of Washington |
| 33 | Alan McKinnon, | Professor, Head of Logistics and Dean of Programs | Kühne Logistics University |

# ANNEXC. List of Policies, Laws, Regulations and Standards

**Table C - 1 List of Overarching Policies**

| No. | Policy Title | Issuance Date | Implementation Date/Period | Issuing Authority | Brief Description |
|---|---|---|---|---|---|
| 1 | Outline of the Medium and Long Term Plan for Technological and Scientific Advancement within the Road and Water Transport Industry (2006-2020) | 2005-09-21 | 2006-2020 | MOT | There are overall six focus points included in this development plan, namely: Smart Digital Transport Management, Infrastructure Construction and Maintenance under Harsh Natural Environments, Intermodal Transport, Science Related Policy Support, Transport Safety Improvements and Green Transport Technology |
| 2 | Mid- and Long-term Plan of Energy Saving in Road and Waterborne Transport (JiaoGuiHuaFa [2008] No. 331) | 2008-09-23 | 2005-2020 | MOT | This Plan determines the overall target and main tasks of long-term energy-saving of road and waterborne transport, and puts forward the recent major projects and safeguard measures, taking 2005 as the basic year and 2015 and 2020 as the target years. |
| 3 | Guidance for the Development of Low Carbon Transport System (JiaoZhengFaFa [2011] No. 53) | 2011-02-21 | 2011-2020 | MOT | This guidance on the construction of low carbon transport system is to accelerate the development of modern transportation, promote industry structure adjustment, and promote the energy saving and emission reduction of transport. |
| 4 | The 12th Five-Year Plan for Civil Aviation Development in China | 2011-04 | 2011-2015 | CAAC | This plan defines the strategy, overall goal and main tasks of civil aviation development in China. It is the programmatic document of industry development. |
| 5 | The 12th Five-Year Plan for Transport Development | 2011-04-13 | 2011-2015 | MOT | This plan included management of comprehensive transportation, road transport, waterborne transport, civil aviation, postal service and urban passenger transport, it carried carries out the action platform of the development of transportation, and was is of great significance to the development of transportation in the 12th Five-Year. |
| 6 | Road and Water | 2011-04-27 | 2011-2015 | MOT | As a key component of the '12th Five-Year Plan for Transport Development', |

| | | | | | |
|---|---|---|---|---|---|
| | Transport Sector Informatization Plan for the 12th five year plan period | | | | this document provides guidance to the informatization of the road and water transport structures, such as in emergency response, services, market administration and policy support. |
| 7 | Road and Water Transport Scientific and Technological Advancement plan for the 12th five year plan period | 2011-06-07 | 2011-2015 | MOT | A continuation of the namesake plan from previous five year plan period, this document aims to further encourage Self Innovation, as well asScientific and Technological breakthrough within the Chinese transport industry |
| 8 | The 12th Five-Year Plan of Energy Saving and Emission Reduction for Road and Waterborne Transport | 2011-06-27 | 2011-2015 | MOT | This plan plays a fundamentally guiding role in furthering energy saving in transport industry, developing low-carbon transportation system and accelerating the transformation of transport developing pattern. |
| 9 | The 12th Five-Year Plan of Railway Development (TieJi [2011] No.80) | 2011-07-01 | 2011-2015 | MOR | This plan defines the overall goal, main tasks and policies of railway development. It is the guiding document of the 12thfive-year development of railway. |
| 10 | The 12th Five-Year Plan of Road Transport Development | 2011-10-20 | 2011-2015 | MOT | This plan is to promote the development of modern road transportation. |
| 11 | The 12th Five-Year Plan of Environmental Protection of Road and Waterborne Transport | 2012-01-13 | 2011-2015 | MOT | This plan defines the goal and main tasks of the development of environmental protection in road and waterborne transport in the 12th Five-Year. It is the overall plan of transportation pollution control, ecological protection, resource conservation, environmental protection management, scientific research and other areas, and put forward the policies and measures that ensure the implementation of this plan. |
| 12 | The 12th Five-Year Plan of Comprehensive Transport System (GuoFa [2012] No. 18) | 2012-07-23 | 2011-2015 | NDRC | This plan determines the overall target, main tasks and policies of comprehensive transport system. |

**Table C - 2 List of Policies related to Trucks**

| No. | Policy Title | Issuance Date | Implementation Date/Period | Issuing Authority | Brief Description |
|---|---|---|---|---|---|
| 1 | Specification for the inspection and Maintenance of motor vehicles (GB/T 18344—2001) | 2001-03-26 | 2001-12-11 | AQSIQ | An improved version of the earlier document JT/T201—1995, it sets new practice standards for motor vehicle inspection, maintenance and diagnosis. |
| 2 | Limits and Measurement Methods of Exhaust Pollutants for Emissions from Light-duty Vehicles(III,IV) (GB18352.3-2005) | 2005-04-15 | 2007-07-01 | MEP, AQSIQ | This standard sets the requirements of the approving the form of pollutant emission from light-duty vehicles at the III and IV stages, and the inspecting and determining method of the consistency and compliance of vehicles. It also sets the special requirements of commercial vehicles using LPG pr NG. It is suitable for light-duty vehicles that use spark ignition engine or compression ignition engine, with the maximum design speed greater than or equal to 50 km/h. |
| 3 | Limits and Measurement Methods of for Exhaust Pollutants from Compression Ignition and Gas Fuelled Positive Ignition Engines of Vehicles (III, IV, V) (GB17691-2005) | 2005-05-30 | 2007-01-01 | MEP, AQSIQ | This Standard regulates the limits and measurement methods of exhaust pollutants from of vehicles in the III, IV and, V stage. |
| 4 | Limits of Fuel Consumption for Light-duty Commercial Vehicles (GB20997-2007) | 2007-07-19 | 2008-02-01 | AQSIQ | This standard sets limits of fuel consumption for light-duty commercial vehicles with different total masses and engines and proposed the requirements of measuring and recording CO2 emission, which could provide date for CO2 emission control.<br>This is the first national mandatory standard on limits of fuel consumption for light-duty commercial vehicles |
| 5 | Measurement Methods of Fuel Consumption for Light-duty Commercial Vehicles(GB/T19233- | 2008-02-03 | 2008-08-01 | AQSIQ | This standard regulates the measurement methods of fuel consumption for light-duty commercial vehicles. It applies to M1 and N1 vehicles with max design speed over 50km/h and M2 vehicles with max total mass less than 3500kg. |

| | | | | | |
|---|---|---|---|---|---|
| | 2008) | | | | |
| 6 | Limits and Measurement Methods for Exhaust Pollutants from Gasoline Engines of Heavy-duty Vehicles (III, IV) (GB14762—2008) | 2008-04-02 | 2009-07-01 | MEP, AQSIQ | This standard sets the limits and measurement methods for exhaust pollutants from of gasoline engines of heavy-duty vehicles, and the technical requirement and experiment method of On-Board Diagnostics (OBD) system at the III stage. This standard set the requirements of the approving the form of pollutant emission from heavy-duty vehicles at the III and IV stages, and the inspecting and determining method of the vehicle production consistency and compliance of vehicles compliance. |
| 7 | Limits and Measurement Methods of Fuel Consumption for Commercial Vehicle for Cargos Transportation(JT719-2008) | 2008-06-05 | 2008-09-01 | MOT | This standard sets limits and measurement methods of fuel consumption for commercial vehicles for cargos transportation, and is applied to commercial vehicles for cargos transportation with a weight of 3500kg-49000kg and using gasoline or diesel. |
| 8 | Testing and Administration Methods of Fuel Consumption for Road Transport Vehicles | 2009-06-26 | 2009-11-01 | MOT | This measurement is formulated for enhancing the management of Road transport vehicles' energy saving. It applies to the detection, supervision and management of the fuel consumption in road transport vehicles |
| 9 | Policy on Development of Automotive Industry (2009 revision) | 2009-08-15 | 2009-09-01 | MIIT; NDRC | This policy has been formulated in order to promote the adjustment and upgrading of the structure, comprehensively enhance the international competitiveness, and promote the healthy development of the automobile industry. |
| 10 | Policy on Tire Industry | 2010-09-15 | 2010-09-15 | MIIT | The policy has been established to regulate the development of tire industry, prevent low-level redundancy, improve the efficiency of resources comprehensive utilization, promote the technology of tire industry and update the structure, including encouraging the use of radial tire. |
| 11 | Interim Administration Measures of the Administration of Special Fund for Energy saving and | 2011-06-20 | 2011-06-20 | MOT,MOF | The measures are to strengthen the regulation of the Special Fund for energy saving and emission reduction in transport, increasing the efficiency of fund use and promoting smooth development of energy saving and emission reduction in transport special funds management of energy saving and emission reduction of transport, improve the funding returns, and promote the development of energy saving and emission reduction o transport.. |

| | | | | | |
|---|---|---|---|---|---|
| | Emission Reduction of Transportation | | | | |
| 12 | Measurement Methods of Fuel ConsumptionTest Methods for Heavy-duty Commercial Vehicles(GB27840-2011) | 2011-12-30 | 2012-01-01 | MIIT | This standard is the first important standard on vehicle energy-saving in China. This standard will improve the vehicle energy-saving management standard system, and promote energy saving techniques for heavy-duty commercial vehicles. |
| 13 | Fuel Consumption Limits of Fuel Consumption for Heavy-duty Commercial Vehicles (QC/T924-2011) | 2011-12-31 | 2012-07-01 | MIIT | This standard sets the fuel consumption limits for heavy-duty commercial vehicles. It applies to commercial vehicles with max design total mass over 3500 kg and using gasoline and or diesel, including trucks, semi-trailers and buses. It also sets the total requirements of fuel consumption.. |
| 14 | Notice on Implementing the Management of Fuel Consumption for Heavy-duty Commercial Vehicles | 2012-1-6 | 2012-2-1 | MIIT; MOT | This standard is China's first important energy saving standard which is formulated independently. The promulgation and implementation of the standard play an important role on improving China's automotive products energy management notice gives clear instructions on the management of fuel consumption for heavy-duty commercial vehicles standard systempromoting the development of energy saving technology for heavy commercial vehicles and promoting our country's energy saving work. |
| 15 | Notice of the State Council on Issuing the Planning for the Development of the Energy-Saving and New Energy Automobile Industry (2012-2020) (GuoFa [2012]No.22) | 2012-06-28 | 2012-2020 | State Council | This Planning has been formulated for the period of 2012-2020 to implement the State Council's decisions and arrangements for the development of strategic emerging industries and strengthening energy conservation and emission reduction and accelerate the fostering and development of the energy-saving and new energy automobile industry. |

**Table C - 3 List of Policies related to Road Freight Movement and Logistics Management**

| No. | Policy Title | Issuance Date | Implementation Date | Issuing Authority | Brief Description |
|---|---|---|---|---|---|
| 1 | Highway Law of China (2004 Amendment) | 1997-07-03 (Original) 2004-8-28 (Amendment) | 2004-08-28 | Standing Committee of the National People's Congress | The law is made to strengthen the construction and management and stimulate the development of highways so as to make their development to adapt to the need of socialist modernization and people's daily living.The law is applicable to the planning, construction, maintenance, operation, use and management of highways inside the territory of the People's Republic of China.This law is to strengthen the construction and management of highway, and promote the development of highway business. This law applies to the schedule, construction, protection, maintaining, using and management of highway. |
| 2 | Limits of Dimensions, Axle Load and Masses for Road Vehicles (GB1589-2004). | 2004-04-01 | 2004-10-01 | AQSIQ, SAC | This standard specifies the limits of the outside dimension, axle load and masses of automobile, trailer and automobile train. This standard applies to automobile (except the crane truckswith a maximum design gross mass exceeding 26000kg), trailer and automobile train used on road.This standard sets the limits of dimensions, axle load and masses for road vehicles, and applies to cars (except for truck cranes over 26000kg), trailers, and trailer trains. |
| 3 | The Regulation of the People's Republic of China on Road Transport (State Council Order No.406) | 2004-04-30 | 2004-07-01 | State Council | The present Regulation is formulated to maintain the order of road transport market, ensure the safety of road transport, protect the legitimate rights and interests of all parties involved in road transport and promote the healthy development of road transport.This regulation is to maintain the order of road transport market, guarantee the safety of road transport, protect the legitimate rights of relevant interested parties, and promote the healthy development of road transport. |
| 4 | Provisions on the Administration of the Road Transport of Dangerous Goods | 2005-06-03 (Original) 2013-01-23 (Amendment) | 2005-08-01 (Original) 2013-07-01 (Amendment) | MOT | This regulation is to regulate market order of road transport of dangerous goods, protect the safety of people's life and property, protect the environment, and maintain the legitimate rights and interests of the parties of road dangerous goods transport. The document is to regulate the market order of road transport of dangerous goods, safeguarding the people's lives and property, protecting the environment and maintaining the lawful rights and interests of all parties involved in the road transport of dangerous goods. |
| 5 | Rules for Provisions on Motor Vehicles Registration (MPS Order No. 102) | 2008-04-21 | 2008-10-01 | MPS | This item regulates the specific business scope and conditions of automobile registration. |

| | | | | | |
|---|---|---|---|---|---|
| 6 | Plans of Adjusting and Accelerating the Logistics Industry (GuoFa[2009]No.8) | 2009-03-10 | 2009-03-10 | State Council | The plan of logistics industry adjustment and renaissance would not only promote the development and industry adjustment of logistics industry, but also service to and support the adjustment and development, increasing consumption, and attracting employment of other industries. It has important meaning of promoting industry structure adjustment, transforming economy development mode and fostering the competitiveness of national economy. |
| 7 | Notice onIntensified Promotion of the Development of Drop-and-Hook Transport | 2009-12-31 | 2009-12-31 | MOT; NDRC; MPS; GAC; CIRC; | Developing drop-and-hook transport is important to reducing logistics cost, promoting the development of modern logistics and comprehensive transport, promoting energy-saving and emission reduction, and improving the integrated quality of economy running.It abolishes items and contents that hurdles for the development of drop-and-hook transport |
| 8 | Implementation Scheme of Pilot Projects of Drop-and-Hook Transport (JiaoYunFa[2010]No.562) | 2010-10-18 | 2010-10-18 | MOT, NDRC | Develop drop-and-hook transport, gradually expand the range and scale of drop-and-hook transport, and contribute the development of modern logistics and the realization of energy saving and emission reduction. |
| 9 | Interim Measures of the Administration of Special Fund for Drop-and-Hook Road Transport Pilot Projects | 2012-04-06 | 2012-04-06 | MOT, MOF | It regulates management of special capital for highway drop-and-hook transport on trial basis. The measures are to strengthen special funds management of highway drop-and-hook transport pilots, improve the funding returns, and promote the development of drop-and-hook transport pilots. |
| 10 | OpinionGuidelines on Strengthening and Improving Urban Distribution Management (JiaoYunFa[2013]No.138) | 2013-02-26 | 2013-02-26 | MOT, MPS, NDRC, MIIT, MHUD, MOF, SPB | This regulatory document focuses on issued to the local counterparts of the 7 ministries, providing guidance on how to strengthen and improve urban distribution management at local level. |

**Table C - 4 List of Policies related to IntermodalTransport**

| No. | Policy Title | Issuance Date | Implementation Date | Issuing Authority | Brief Description |
|---|---|---|---|---|---|
| 1 | Plans of Adjusting and Accelerating the Logistics Industry (GuoFa[2009]No.8) | 2009-03-10 | 2009-03-10 | State Council | The plan of logistics industry adjustment and renaissance would not only promote the development and industry adjustment of logistics industry, but also service to and support the adjustment and development, increasing consumption, and attracting employment of other industries. It has important meaning of promoting industry structure adjustment, transforming economy development mode and fostering the competitiveness of national economy. |
| 2 | The 12th Five-Year Plan of Logistics Development of Railways | 2011-11-22 | 2011-11-22 | MOR | This plan determines the strategy, target and main tasks of logistics development of railways during the 12$^{th}$ five-year. It aims at guiding the development of railway logistics, and regulating logistics market. |