Design of Green Freight China Program:
Program Design Report
FINAL

Clean Air Initiative for Asian Cities (CAI-Asia) Center

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About CAI-Asia

The Clean Air Initiative for Asian Cities (CAI-Asia) promotes better air quality and livable cities by translating knowledge to policies and actions that reduce air pollution and greenhouse gas emissions from transport, energy and other sectors. CAI-Asia was established in 2001 by the Asian Development Bank, the World Bank and USAID, and is part of a global initiative that includes CAI-LAC (Latin American Cities) and CAI-SSA (Sub-Saharan Africa).

Since 2007, this multi-stakeholder initiative is a registered UN Type II Partnership with more than 200 organizational members, eight Country Networks (China, India, Indonesia, Nepal, Pakistan, Philippines, Sri Lanka, and Vietnam) and the CAI-Asia Center as its secretariat. Individuals can join CAI-Asia by registering at the Clean Air Portal: www.cleanairinitiative.org. Its flagship event, the Better Air Quality conference, brings together over 500 air quality stakeholders.

EXECUTIVE SUMMARY

The design of a Green Freight China Program is supported through an Energy Foundation grant. The idea stems from the involvement of the Clean Air Initiative for Asian Cities in the World Bank Guangzhou Green Trucks Pilot Project that was carried out in 2009 and preparation of a GEF Guangdong Green Trucks Demonstration Project that will be launched in October 2011.

The purpose of this project is to design a Green Freight China Program (GCFP) focused on energy efficiency and reduced greenhouse gases and air pollutants from freight and logistics in relation to road freight, rail freight and shipping, that

- Provides a basis for nationwide efforts to reduce fuel use and emissions from the freight sector
- Builds on the 12th Five Year Plan and other existing efforts in China, including the Guangdong Green Trucks Demonstration Project, and fills gaps
- Makes use of international programs, especially the US SmartWay Partnership, and can also be used as a model for other developing countries establishing such programs

A design framework of the program was prepared based on background research, surveys and stakeholder consultations, and with strong support from Cascade Sierra Solutions from the US, and the US Environmental Protection Agency (US EPA). It consists of five components: **Clean Technologies, Freight Logistics, Financing Mechanisms, Knowledge & Capacity, and Collaborative Partnerships.** The Green Freight China Program was discussed at the 1st Green Freight Seminar with over ninety Chinese government officials, private sector and civil society representatives. The Seminar was organized by CAI-Asia with support from the Road Transportation Department of the Ministry of Transport (MOT), the Vehicle Emission Control Center of the Ministry of Environment Protection, Energy Foundation, US EPA, World Bank and Cascade Sierra Solutions.

The establishment of such a program cannot be done or funded by one organization only. Greater ownership by Chinese government agencies of a Green Freight China Program would facilitate bringing different initiatives together, and to enhance concrete collaboration initiatives between and among government agencies, the private sector and civil society.

For this reason the main recommended next step is the establishment of an Advisory Group that would include representatives from MOT, National Development Reform Commission, Ministry of Finance, Ministry of Environmental Protection, Energy Foundation, US EPA, CAI-Asia, World Bank and possibly others. Its role would be to provide advice on how to enhance cooperation between government and other organizations; quality control for the development of the GFCP and its components; and future Green Freight China Seminars.

For each of the five components, the main elements were selected as well as recommended next steps. Details of the program are available on the Green Freight and Logistics Website, which also features information on policies and programs, technologies and logistics, and data and contacts relevant to the freight sector, especially for developing countries: www.greenfreightandlogistics.org.

Clean Technologies

The objective of this component is to select and advance clean technologies for adoption, especially by truck carriers that improve fuel efficiency and reduce emissions. Main elements are summaries with information on clean technologies (tire and wheel; aerodynamics; idling control; and emissions control technologies), technology verification and certification system, and pilot projects.

Recommended next steps include:

- Additional technology supplier summary sheets for technologies that are available in China and translation into Chinese
- Additional technology pilot projects and conducting a survey to compile results of past pilot projects.
- Develop a technology verification and certification program specifically for technologies applicable to trucks, with associated test protocols for fuel and emission reduction technologies.

Freight Logistics

The objective of this component is to support the implementation of strategies that improve freight transport logistics and subsequently reduce the "empty miles" of trucks. Freight logistics is a broader economic issue beyond "green freight", and for this reason, in moving forward, it is important to identify areas within the sphere of influence of MOT where fuel and emissions can be reduced through improved freight logistics.

With this in mind, main elements of this component at present include preparing summaries of logistics solutions, and pilot projects. Recommended next steps are

- A pilot project involving several or all main players within a specific freight logistics supply chain to help determine what works and what does not work in China.
- A more comprehensive survey of pilots and best practices in China on freight logistics that reduced fuel use and emissions, because several private sector companies reported that ample logistics solutions have already been trialed or implemented by shippers, carriers and logistics providers in China. This can be combined with an assessment of what government policies are needed to scale good pilots up, for example, the establishment logistics platforms or help build consortiums between companies.

Financing Mechanisms

The objective of this component is to accelerate the adoption of technologies through financial mechanisms that help reduce the investment barrier especially for carriers. Main elements are development of

- Financing mechanisms, focusing on policy-based (taxes, subsidies) and market-based mechanisms (loans, emission credits, ESCOs) mechanisms
- Financing services (e.g. assist with grant applications)
- Publications with financial information, especially of technologies

Recommended next steps are:

- Establish a Working Group on Truck Technology Financing to discuss innovative financing mechanisms in China that could be applied to the freight sector and come up with concrete recommendation on mechanisms and how these should be designed, piloted and implemented.

- Conduct research on financing mechanisms for clean technologies for trucks and how government could facilitate financing. The Institute of Finance Sciences could take a lead role.
- Specifically explore funding opportunities through climate funds and schemes, such as Climate Trust. CO2 credits could provide additional funding and help guarantee loans.
- Explore whether additional demonstration projects can be carried out to increase the confidence of truck drivers and companies, similar to the Guangdong Green Trucks Demonstration Project.

Knowledge & Capacity

The objective of this component is to improve knowledge of especially shippers, carriers and 3PLs on green freight and the capacity to reduce fuel use and emissions. Main elements include a freight transport emissions methodology, green freight training, and a green freight website and database.

As a next step the China Road Transport Association (CRTA) and CAI-Asia plan to collaborate on

- Conducting a survey of truck companies in China that are CRTA members on (a) current green freight practices (b) barriers and priorities (c) the information / skills needs relevant to green freight.
- Develop emissions methodology for fuel and emissions measurement by carriers, based on existing methodologies but tailored to the inception stage in which many Chinese truck companies are at.
- Develop training modules for truck companies and drivers, based on an assessment of training needs and review of existing training materials. Modules should at least include green freight practices and the emissions methodology.
- Expand the Green Freight and Logistics Website with information relevant to the GCFP in English and Chinese. A newsletter with digests relevant to green freight could also be considered.

Partnerships

The objective of this component is to establish and facilitate partnerships and cooperation to improve interaction among shippers, carriers, suppliers, government and other stakeholders. Several partnerships could be established between freight companies (shippers, carriers, third party logistics providers/3PLs); technology manufacturers and suppliers; private sector and the Government; and could be supplemented with a Green Freight Network of all stakeholder organizations.

Recommended next steps are to

- Develop an overview of government agencies involved in freight and logistics and try to engage them with the aim to identify and align existing initiatives and plans relevant to green freight.
- Continue the dialogue between government and the private sector that was initiated at this seminar to find out the needs and challenges of both parties with regards to green freight.
- Bring industry partners on board, especially the CRTA and other relevant associations, in order to reach out to a larger number of companies. Similarly, shippers and 3PLs could be engaged.
- Continue holding Green Freight China Seminars as an annual dialogue on green freight between government, the private sector and other organizations in China.

LIST OF ABBREVIATIONS

3PL	Third-party Logistics
4PL	Fourth-party Logistics
A&WMA	Air & Waste Management Association
ACEF	All China Environment Federation
ADB	Asian Development Bank
AECEN	Asian Environmental Compliance and Enforcement Network
AIT	Asian Institute for Technology
BAC	Battery Air Conditioning
CAI-Asia	Clean Air Initiative for Asian Cities
CalCAP	California Capital Access Program
CCV	Closed Crankcase Ventilation
CDM	Clean Development Mechanism
CGTI	China Greentech Initiative
CNR	Institute for Atmospheric Pollution of the Italian National Research Council
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
CRTA	China Road Transport Association
CSS	Cascade Sierra Solutions
DEF	Diesel Exhaust Fluid
DOC	Diesel Oxidation Catalysts
DPF	Diesel Particulate Filters
EF	Energy Foundation
EGR	Exhaust Gas Recirculation
EMBARQ-WRI	World Resources Institute Center for Sustainable Transport - EMBARQ
EPA	Environmental Protection Agency
ESCO	Energy service companies
EU	European Union
GCFP	Green Freight China Program
GEF	Global Environment Facility
GHG	Greenhouse Gas
GIZ	German International Cooperation
HEI	Health Effects Institute
IDC	Interstate Distributor Co.
IEA	International Energy Agency
ITDP	Institute for Transportation and Development Policy
ITF	International Transport Forum
IUCN	International Union for Conservation of Nature
KPI	Key Performance Indicator
MOT	Ministry of Transport
NCFRP	National Cooperative Freight Research Program
NGO	Non-governmental Organization

NORAD	Norwegian Agency for Development Cooperation
NO_x	Nitrogen Oxide
PCFV	Partnership for Clean Fuels and Vehicles
pDPF	Partial Diesel Particulate Filters
PLACE-DL	PLACE Direct Loan program
PM	Particulate Matter
SCR	Selective Catalytic Reduction
Sida	Swedish International Development Cooperation Agency
SloCaT	Partnership on Sustainable Low Carbon Transport
TEEMP	Transport Emissions Evaluation Models for Projects
tkm	ton-kilometer
TSS	Thermal Storage System
UK DfT	United Kingdom Department for Transport
UNCRD	United National Center for Regional Development
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
US EPA	US Environment Protection Agency
US	United States of America
USAID	US Agency for International Development

CONTENTS

1. INTRODUCTION

The design of a Green Freight China Program is a project of the Clean Air Initiative for Asian Cities (CAI-Asia) that is supported with a grant from the Energy Foundation (EF). The idea stems from the involvement of the Clean Air Initiative for Asian Cities (CAI-Asia) in the World Bank Guangzhou Green Trucks Pilot Project (Dec 2008 – Feb 2010) and preparation of a GEF Guangdong Green Freight Demonstration Project (launch planned in September 2011), as well as the success of the SmartWay Transport Partnership in the US and steps towards a similar program in Europe. Efforts to improve environmental and economic performance of freight transport at the company, city and regional level will be successful and sustained only if a supporting policy and programmatic framework is in place nationally, due to the freight being carried across regional boundaries.

The purpose of this project is to design a Green Freight China Program (GCFP) focused on energy efficiency and reduced greenhouse gases and air pollutants from freight and logistics in relation to road freight, rail freight and shipping, that

- Provides a basis for nationwide efforts to reduce fuel use and emissions from the freight sector
- Builds on the 12th Five Year Plan and other existing efforts in China, including the Guangdong Green Trucks Demonstration Project, and fills gaps
- Makes use of international programs, especially the US SmartWay Partnership, and can also be used as a model for other developing countries establishing such programs

The main output of the project is this Green Freight Design Report that includes the design framework of the overall program (Chapter 2), and details of the various components of the proposed program including Clean Technologies (Chapter 3), Freight Logistics (Chapter 4), Financing Mechanisms (Chapter 5), Knowledge and Capacity (Chapter 6) and Green Freight Partnerships (Chapter 7). In addition, a number of background studies and surveys were carried out in support of the program framework design. These and other background information and contacts for green freight are available on a website established by CAI-Asia to support sharing of information and contacts on green freight and logistics (www.greenfreightandlogistics.org):

- Policy & Institutional Research Report for China
- Green Freight Survey for Organizations
- Review of Freight Logistics Solutions
- Overview of Green Freight Programs and Initiatives
- Summaries of selected programs
- Green Freight Technologies Suppliers - summaries for 15 suppliers
- Description of Technology Verification programs in the US and China
- Overview of key websites relevant to green freight

Furthermore, the findings and comments received at the 1st Green Freight China Seminar that was held in May 2011 and attended by over ninety government officials and representatives from the private sector and civil society were used to further develop the framework and identify recommended actions for the coming years.

2. GFCP DESIGN FRAMEWORK

2.1 Starting Points for a GFCP

The basis for a GCFP stems from

- Meetings and discussions with Ministry of Transport (MOT)[1]
- Workshops, meetings and discussions with selected shippers, carriers, third-party logistics providers, technology suppliers, truck and tire manufacturers and other organizations. Furthermore, a survey of organizations relevant to the freight sector was conducted to obtain their views.
- Review of existing green freight programs, especially US Smartway (see www.greenfreightandlogistics.org for an overview and summaries of the main programs).
- The trucks pilot project conducted for Guangzhou that identified reasons and considerations for a country wide program covering trucks.[2]
- Presentations, panel and group discussions at the Green Freight China Seminar that was held in Beijing on 23-24 May 2011, and the Private Sector Green Freight Workshop China, held in Beijing on 25 May 2011 (see www.greenfreightandlogistics.org for reports of both events.

Improving fuel efficiency and reducing emissions from freight transport in China is imperative and makes economic and environmental sense. A program for green freight transport would support this goal, and the main starting points for the design of the GCFP are

- **Build on existing efforts in China.** "Green freight", "green transport" and "eco-transport" are not new concepts in China. The aim of designing the Green Freight China Program is not to re-invent the wheel, but rather to develop a programmatic framework that builds on existing efforts to support China's objective for a fuel efficient and low emissions freight sector. The Chinese government, especially the Ministry of Transport (MoT) has developed a range of policies and plans, including the 12th Five-Year-Plan (FYP) and the "Guidance for the Establishment of a Low Carbon Transport System[3]." Key overall targets are 16% energy consumption and 17% CO2 emission reductions per unit of GDP in 2015 compared to 2005. For the trucking sector this translates to reductions of 12% of energy and 15% CO_2 emissions per 100 tkm. Five strategies will be employed to achieve these: alternative energy, energy efficiency, optimizing freight logistics and intermodal connections, low carbon technologies, and tax and fee adjustments. Private sector companies acknowledge that alignment with governmental policies and government endorsement is important. For this purpose, a separate Policy and Institutional Research Report was prepared, with an overview of the policy and institutional set-up in relation to freight in China, and a prioritized list of policy, institutional and other gaps to be further researched and filled as part of the future development of the GCFP.
- **Make use of existing programs but tailor to China.** A program should build on existing successful programs for freight and logistics. The most relevant programs are the US Smartway Program (www.epa.gov/smartway), ObjectifCO_2 in France and Freight Best Practice in the UK. However, a program should be tailored to China's situation, which also means that information should be

[1] Design of Green Freight China Program: Policy and Institutional Research Report – Draft 31 January 2011
[2] Guangzhou Green Trucks Pilot Project: Final Report for the World Bank "Truck GHG Emission Reduction Pilot Project"
[3] See the original document http://www.moc.gov.cn/2006/jiaotongjj/07jiaotjnw/wenjiangg/201103/t20110329_923118.html

translated into Chinese to ensure that it can be used widely in the freight sector and by other stakeholder groups

- **Focus on key benefits for the freight sector, environment and society**. With a growing international concern about climate change, programs tend to shift in focus to reducing CO_2 emissions, but thereby risk losing the focus on important national and local issues, most notably fuel costs and security, and air pollution and associated impacts. Similarly, a program should focus on and highlight specific benefits for shippers, carriers and logistic providers, including (a) reduced fuel costs, (b) improved carbon and other reporting (c) enhanced reputation with public, customers and suppliers and (d) government policies that consider the sector's needs (through voice / forum for interaction).
- **Develop a well-structured and managed program.** Private sector companies pointed out that a program will need a clear vision, scope, objectives and timeline that is supported by a clear governance structure and mechanisms and will need to be hosted by a neutral body.
- **Allow program to grow steadily**. The GCFP should not be designed in full from the outset, but a program framework should be established that is gradually filled in through studies and activities that work down a priority list of gaps and the needs of MOT and other stakeholders. This will allow the GCFP to remain agile and flexible and build up support and involvement from all stakeholder groups slowly but steadily. An important other reason is that several efforts are already in place by MOT, other government agencies and the private sector, and a program will be more successful and supported by stakeholders if it builds on, integrates and supports these efforts.
- **Focus on road freight, rail and shipping**. A program should in principle be designed to cover all modes of freight transport, to maximize the potential for intermodal freight efficiencies and transfer of freight to more efficient modes. Moreover, some solutions for trucks, such as standardized container sizes, will also affect freight carried by rail and ships, so there is not always a clear delineation possible. However, the program could start by going in more depth into trucks initially and later expand to rail and shipping.
- **Focus on different types of trucks.** Efforts to improve fuel efficiency and reduce emissions from trucks should focus differently on different types of trucks, again because freight is transferred between truck types, and thus for effective logistics solutions, all truck types should be included. Other reasons are that heavy and medium duty trucks are usually used for long-range freight travel and combined with higher fuel consumption per km, and therefore have the greatest potential for fuel and emissions reductions. On the other hand low and mini duty trucks have less, but still significant, potential for fuel and emissions reductions; new registrations in certain cities (e.g. Guangzhou) has risen more sharply than for other trucks; because these trucks often stay within cities or provinces there is better potential for particulate filters installation with the introduction of Euro IV fuel standards, and most air pollution reductions from these trucks would benefit cities.
- **Focus on technologies and logistics.** This was raised particularly by MOT. The percentage of empty hauls (i.e. percentage of truck trips without a load) as well as total empty miles (i.e. total distance driven by trucks without a load) is very high in China and much higher than the US or Europe. The cost-benefit ratio in China may therefore be better for logistics solutions that bring empty hauls down. This does not mean that technologies should be neglected, but that a program should not be centered on technologies only.
- **Ensure participation of all key stakeholder groups**. A successful program will require multi-stakeholder approach with clear benefits for relevant stakeholders. A trucks program should therefore consider freight companies, manufacturers, suppliers, main government agencies and

stakeholders/expert groups at the city, province, national and international levels. An important consideration is that the program should include partnerships and collaboration mechanisms to be effective, not solely private sector driven, not solely government driven, but one that is shared. The Green Freight China Program could thus be developed as a platform to collect and share efforts by different stakeholders who can take the lead in different activities.

- **Build knowledge and capacity**. Access to and exchange of information, expertise, success stories, good case study or best practice examples, as well as capacity to take action to reduce fuel and emissions from freight is critical to mainstream green freight practices. This affects all stakeholder groups. For example, governments need examples of good practices to develop workable policies; trucking companies need a database or other way to easily access information about technologies and logistics solutions and their suppliers; banks and financing institutions need information on innovative financing mechanisms that already exist and can be applied to the Chinese freight sector.
- **Make financing part of the program**. For many technologies and logistics solutions there will be good cost savings and favorable payback periods. However, this does not apply to all technologies and logistics solutions, plus their costs could be brought down if their scale of application were to be increased. In addition, truck companies may not invest because of high upfront investment costs, despite favorable savings. Therefore financing mechanisms must be part of the program design to overcome these challenges and realize rapid penetration of fuel and emissions reducing technologies and logistics solutions. As it is often with the introduction of new technologies, financial mechanisms are needed to help especially carriers make the transition.

2.2 Proposed GFCP Framework

The **impact** of the GFCP is reduced fuel use, GHG and air pollutant emissions from the freight sector in China to levels comparable to developed countries in terms of fuel use and emissions per km freight carried.

The desired **outcome** is a Green Freight China Program (GFCP) that is effective in helping government, the freight industry and other stakeholders to reduce fuel use and emissions of the freight sector in China.

Based on the considerations outlined in section 2.1, a **framework** for the GFCP is proposed with the following components and illustrated in Table 1:

Table 1. Proposed Framework for the Green Freight China Program

Components	Objective	Main Elements
Clean Technologies	• Selecting and advancing of clean technologies for adoption especially by truck carriers that improve fuel efficiency and reduce emissions	• Technology summaries • Technology verification and certification system • Pilot projects • Focus on tire and wheel; aerodynamics; idling control; and emissions control technologies
Freight Logistics	• Supporting the implementation of strategies that improve freight transport logistics and subsequently reduce the "empty miles" of trucks	• Logistics solutions summaries • Pilot projects • Focus on drop-and-hook, logistics information platform (also freight exchange), multimodal transport, fleet and fuel management, and freight company consortium
Financing	• Accelerate the adoption of	• Financing mechanisms development

Components	Objective	Main Elements
Mechanisms	technologies through financial mechanisms that help reduce the investment barrier especially for carriers	• Financing services development (e.g. assist with grant applications) • Publications with financial information especially of technologies • Focus on policy-based (taxes, subsidies) and market-based mechanisms (loans, emission credits, ESCOs)
Knowledge & Capacity	• Improve knowledge of especially shippers, carriers and 3PLs on green freight and the capacity to reduce fuel use and emissions	• Freight transport emissions methodology • Green freight training • Green freight website and database
Partnerships	• Establish and facilitate partnerships and cooperation to improve interaction among shippers, carriers, suppliers, government and other stakeholders	Different partnerships / collaboration between: • Freight companies (shippers, carriers, third party logistics providers/3PLs) • Technology manufacturers and suppliers • Private sector and the Government • Green Freight Network of all stakeholder organizations

However, instead of a detailed design of all components from the outset, not all elements within each component will be designed in detail from the start, but rather a few will be selected first based on priorities of the private sector and the government. This way the GCFP will be developed slowly but steadily.

It is therefore too early to talk about a governance structure, but instead the focus of the next year should be on establishing partnerships and cooperation mechanisms between stakeholder groups. This is described further in chapter 7 under the Partnerships component.

2.3 Recommended Next Steps

A coordinated effort on green freight, potentially in the form of a Green Freight China Program is relevant, timely and supported by MOT, the private sector and other relevant organizations. The full establishment of the Green Freight China Program would require approximately about five years after which all program components would be in full operation and aligned with other components. The establishment of such a program cannot be done or funded by one organization only. It is clear at the China government level what must be done to make the freight sector more efficient and green. However, coordination between relevant government agencies is limited, as well as between government, the private sector and other organizations. Greater ownership by Chinese government agencies of a Green Freight China Program would facilitate bringing different initiatives together, and to enhance concrete collaboration initiatives between and among government agencies, the private sector and civil society.

For this reason the main recommended next step is to ensure a stronger ownership by government through the establishment of an Advisory Group that would include representatives from MOT, NDRC, Ministry of Finance, Ministry of Environmental Protection, Energy Foundation, US EPA, CAI-Asia, and possibly others. The Advisory Group would meet several times per year and its role would be to:

- Discuss how cooperation and mutual support among government agencies and other organizations can be improved.

- Provide a quality control function of relevant work done under the five GFCP components through the issuance of quarterly Policy Briefs on the various topics relevant to green freight.
- Advise on the topic, speakers and agenda for future Green Freight China Seminars.
- Discuss the name and branding of a Green Freight China Program in the future.

3. CLEAN TECHNOLOGIES COMPONENT

This chapter describes the Clean Technologies component of the program.

3.1 Description of this Component

Technologies are the center piece of most existing programs and initiatives. Sometimes these are very specific, for example a program for retrofitting of diesel vehicles, but most programs focus on a wide range of technologies for trucks. While most programs and initiatives center on trucks, including the US SmartWay program, several cover the broader freight sector, such as the Nation Building Program in Australia that covers road and rail freight infrastructure but then does not focus on technologies. Hence the main message is that for China to establish its own green freight program, ideas and experiences will have to be sought from a wide range of programs and initiatives.

Programs and initiatives generally include the following for technologies and logistics:

- Information on different technologies and/or logistics solutions, including brands, suppliers, costs, technical details or fact sheets. This would need to be made available in Chinese and English.
- Case studies on their application
- Technologies testing and methods to test them
- Technology verification and certification systems to ensure that freight companies select the right technologies by providing them with complete and accurate information. In several countries, such as the US and the EU these systems exist at a national level (i.e. not necessarily tight to a specific program), although technologies specifically for trucks are included (and these can be presented on program websites and databases)

The Clean Technology component under a GFCP would provide mechanisms for selecting and advancing technologies and logistics solutions that will be important to improving fuel efficiency and reducing emissions. The next sections provide an overview of existing technologies for trucks, technology verification and certification systems in the US and China, and recommended next steps.

3.2 Technologies Overview

Measures to reduce fuel use and emissions from trucks at a high level include[4]

- Vehicle activity and driving pattern improvement
- Enhanced maintenance
- Tire and wheel technologies and equipment
- Aerodynamics technologies and equipment
- Idling control through technologies and behavior
- Fuel, oil and lubricant improvement
- Oil by-pass filtration system

[4] Described in more detail in "Guangzhou Green Trucks Pilot Project: Analysis Report for the World Bank *Truck GHG Emission Reduction Pilot Project*"

- Emissions control technologies
- Fleet and engine modernization

Table 2 lists the most important technologies and logistics solutions applicable to road freight in China.

Table 2. List of Technologies for Reducing Fuel Use and Emissions from Trucks[5]

Tire and Wheel Technologies	**Idling Reduction Technologies**
• Aluminum Rims • Automatic Tire inflation • External Signal Booster • Low Rolling Resistance Tires • Single Wide-base Tires • Tire Pressure Monitoring	• Automatic Shut-down/Start-up Systems • Auxiliary Power Units and Generator Sets • Battery Air Conditioning (BAC) Systems • Electrified Parking Spaces • Fuel Operated Heaters • Thermal Storage System (TSS)
Aerodynamics	**Emissions Control Technologies**
• Aero Profile Tractor • Cab Aerodynamic Mirrors • Car Air Dam Front Bumper • Cab Roof Deflector • Cab Roof Fairing • Cab Side Fairing • Cab-over-engine Tractor • Fairings • Flat Bed Trailer Tarps • Integrated Cab Roof Fairing • Nose cones • Skirts • Trailer Gap Reduction • Trailer Side Skirts • Trailer Boat Tail	• Diesel Exhaust Fluid (DEF) • Diesel Oxidation Catalysts (DOC) • Diesel Particulate Filters (DPF) • Partial Diesel Particulate Filters (pDPF) • Selective Catalytic Reduction (SCR) • Closed Crankcase Ventilation (CCV) • Exhaust Gas Recirculation (EGR) • Lean NOx Catalyst

For each of these technologies it will be important to obtain the following information from manufacturers and suppliers/vendors that manufacture these or have vendors in China:

- Product description
- Product costs
- Benefits including fuel use reduction, improved fuel efficiency, cost savings, maintenance savings, and reductions in CO_2 and air pollutant emissions.
- Product testing details
- Verification and Certification details
- Product registration details
- Awards received

[5] Modified from list prepared as part of the proposal for the GEF Guangdong Green Trucks Project

As part of the survey of organizations relevant to the freight sector, CAI-Asia also asked technology manufacturers and suppliers to provide these details and has prepared summaries for fifteen suppliers that operate in China.

3.3 Technology verification / certification process

The objective of clean technology verification is to evaluate the emission reduction (and energy-saving) effectiveness of a certain technology. Verification provides stakeholders with confidence that these technologies will achieve quantifiable emission reductions. The verification includes[6]

- Application and technology review
- Testing in accordance with test protocols and statistical analysis
- Durability requirements and manufacturer in-use testing.

This may be followed by certification, which is the process of generating a certificate that confirms a technology's eligibility in terms of fuel efficiency, emission reductions or other. Some of the technologies verified under the US SmartWay program are shown in Figure 1.

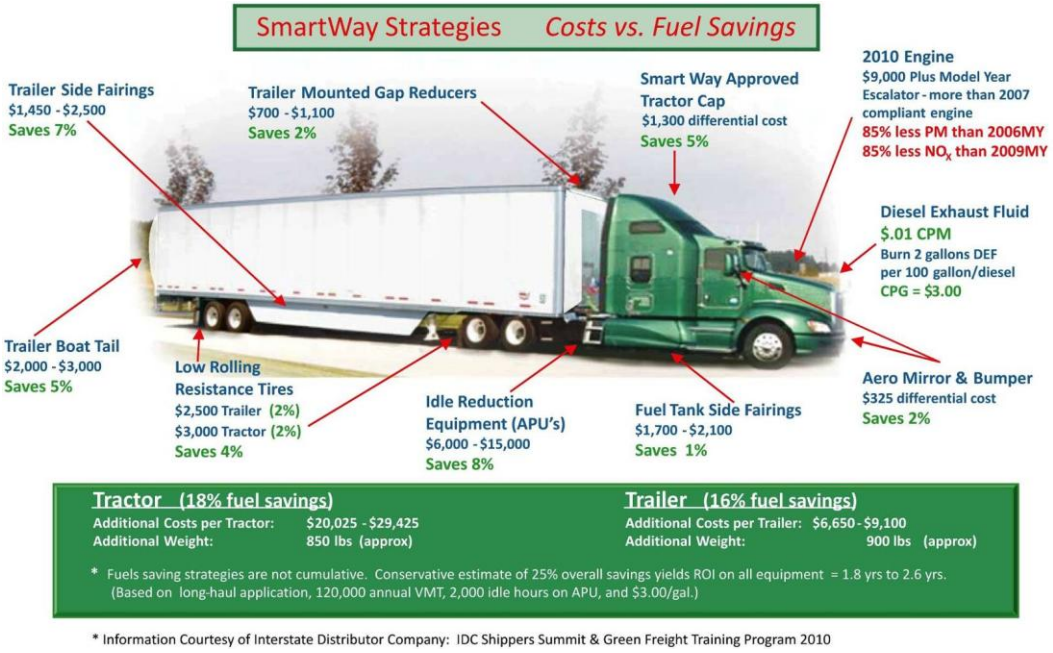

Figure 1. Verified Technologies

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

Figure 3A separate background report describes the technology verification systems in the US and China in more detail, and Table 3 summarizes the key features of each.

[6] http://www.epa.gov/cleandiesel/documents/verif-oppor-20071213.pdf

Table 3: Comparison of Technology Verification and Certification Systems in the US and China

	US	China
Responsible Department	• US EPA, SmartWay Transport Partnership	• Department of Policy Reforms & Regulations, Ministry of Transport
Scope	• Idle reduction technologies • Aerodynamic technologies • Low rolling resistance tires • Retrofit technologies • Heavy duty vehicles	• Only clean fuel, additives, and some electronic device for engine fuel savings, etc. • All types of commercial vehicles & ships, as well as port and road facilities
Key Test Methods	• Interim test protocol – Modified *Joint TMC/SAE Fuel Consumption Test Procedure – Type II (SAE J1321 Surface Vehicle Recommended Practice (October, 1986)* • *SmartWay Fuel Efficiency Test Protocol for Medium and Heavy Duty Vehicle: Working Draft"*	• *JT/T306-2007 Technical Specification of Fuel Saving Products for Automobiles* • *GB/T 14951-2007: Measurement Method of Fuel Saving Technology for Automobiles*
Certification	US EPA Certified SmartWay® Issued by the US EPA	 Issued by MOT and the China Communications Product Certification Center (CCPCC)

Source: CAI-Asia, based on various information from US EPA and PRC MOT.

Based on the analysis, the following areas for improvement were identified:

- Broader transport energy-saving technology categories: such as idle reduction technologies, aerodynamic technologies, low rolling resistance tires, and retrofit technologies (such as DPF).
- More specific test protocols for the technology categories listed as compared to a general testing protocol that currently exists. Private sector companies commented that currently technologies are being sold in China that do not result in the savings advertized, thus putting drivers/companies off to invest in technologies.
- Mechanisms to promote verified/certified technologies, such as financial incentives, involvement of other stakeholder especially the private sector, and enhanced marketing and promotion materials

3.4 Recommended Next Steps

The recommended steps are as follows:

- Additional technology supplier summary sheets for technologies that are available in China and translation into Chinese, in cooperation with US EPA and Cascade Sierra Solutions
- Additional technology pilot projects as well as conducting a survey to compile results of past pilot projects. Private sector companies would need to be heavily engaged in this, and several noted that it would be wised to start with technologies with good saving potential and low investment. This could be combined with the introduction and promotion by the Chinese Government of technologies in the short, medium and long-term, which would be more realistic. At the same time, stakeholders

also noted that technologies to reduce conventional pollutants are more difficult to introduce because they don't provide this financial benefit for the driver/company, however, the cost savings for society and many times greater.

- Develop a technology verification and certification program specifically for technologies applicable to trucks, with associated test protocols for fuel and emission reduction technologies. This could be combined with the identification of additional technologies for inclusion in the MOT catalogue of energy-saving technologies. The Research Institute of Highways that is affiliated with MOT, and the US EPA and Cascade Sierra Solutions would be key partners. It is noted that the technology verification and certification system should be linked to other interactions needed to advance clean technologies: supply of new technologies by manufacturers and suppliers, information on technologies, financing mechanisms, and legislation.

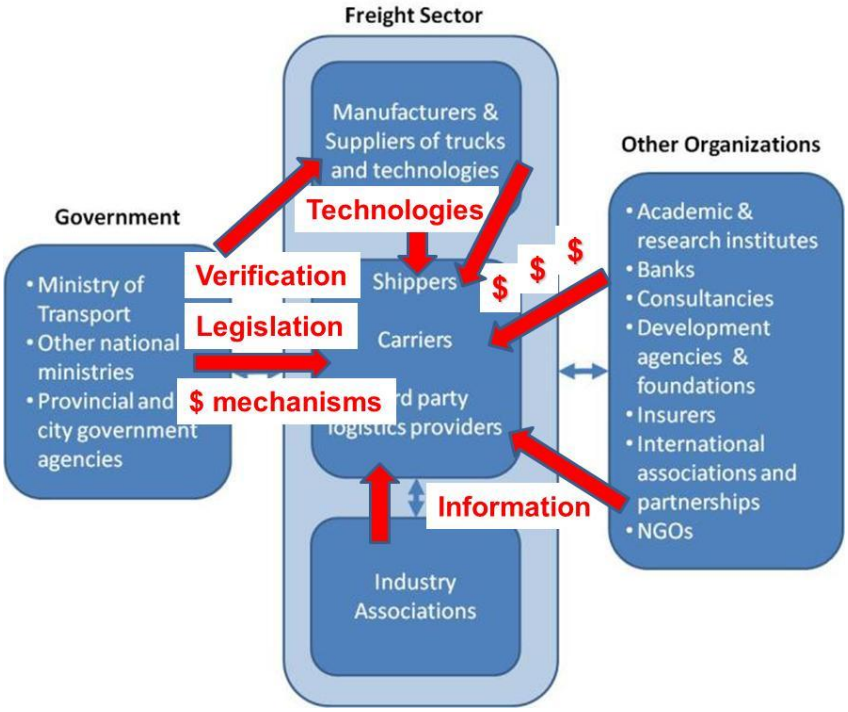

Figure 2: Roles of Different Stakeholders in Advancing Clean Trucks Technologies

4. FREIGHT LOGISTICS COMPONENT

This chapter describes the Freight Logistics component of the program.

4.1 Description of this Component

Throughout the freight supply chain, the purpose of the logistics is to "plan, implement and control the efficient, effective flow and storage of goods, services and related information from point of origin to the point of consumption for the purpose of conforming to customer requirements" (Council of Logistics Management, 1998).[7]

Supply chains involve different stages, and common stages are shown in Figure 3.

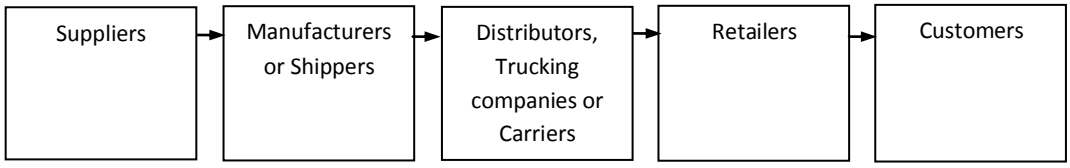

Figure 3: Supply Chain Stages

Source: Chopra et al, 2000 [8]

Improving the freight transport efficiency through improved logistics and organization is a priority for MOT in the 12th FYP. Almost 90% of trucks are owned by individual drivers and only 0.1% of companies own one hundred trucks or more. A survey by Changan University found that 40% of miles traveled by trucks on expressways are empty. For long haul this percentage is lower, around 20%, but trucks spend on average 3-4 days and up to ten days waiting for a new load.[9]

Fewer programs around the world focus on freight logistics as compared to technologies. One program specifically aimed at improving logistics is the Green Logistics Partnership Promotion Project by the Fujitsu Group of Companies in Japan, which would therefore be a good program to learn from for China.

The Logistics component will provide mechanisms for selecting and advancing logistics solutions that will be important to reduce "empty miles" and thus improve fuel efficiency and reduce emissions per ton-km (tkm) travelled. The Ministry of Transport (MOT) in its "*Mid- and Long-term Plan for Energy-saving in Road and Waterway Transport*" (MOT, 2008)[10] estimates that fuel and emissions savings will be higher through improving transport organization (category ii) as compared to efficient adoption of technologies (category iii).

[7] http://www.clm1.org/mission.html
[8] Chopra, S. and Meindl, P. Supply Chain Management – Strategy, Planning, and Operation. Prentice Hall, 2000.
[9] 1st Green Freight China Seminar – Summary Report. CAI-Asia, May 2011.
[10] http://www.moc.gov.cn/zizhan/siju/guihuasi/zhanlueyanjiu/fazhanzhanlue/200811/t20081104_533446.html

It is therefore important that issues are addressed that currently contribute to a low efficiency in freight transport logistics in China as follows:[11]

- Fragmented and unregulated market
- Limited information and organization
- Limited intermodal connections
- Lack of government coordination
- Limited knowledge and experience with logistics solutions

With the aim to inform the further development of the Logistics component, a separate report, "Review of Logistics Solutions", was prepared and provides a background to freight logistics; issues faces in China; a summary of the third-party logistics (3PL) and the fourth-party logistics (4PL) market in China and development barriers; and best practices for logistics solutions worldwide.

4.2 Logistics Solutions

Five logistics solutions that are more relevant to China to address logistics issues are:

- **Drop-and-Hook**, which is a method to organize transport to eliminate empty miles and optimize performance, 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.[12]
- **Logistics Information Platform** (also Freight Exchange) matches freight with available vehicle space. Haulers and truck drivers can search online for available freight – or post their available transport capacity. Similarly freight forwarders can offer freight for transportation, or search for suitable vehicles.[13]
- **Multimodal Transport**, which refers to the carriage of goods by at least two different modes of transport on the basis of a multimodal transport contract from a place at which the goods are taken in charge by the multimodal transport operator to a place designated for delivery.[14]
- **Fleet and Fuel Management**, which refers to systems used to maintain, control, monitor and a vehicle fleet and fuel consumption and stock in any type of industry that uses transport as a means of business, including rail, road, water and air[15]
- **Freight Company Consortium**, which is an association between usually small and medium carriers or distributors to pool their resources and strengths in order to win and manage larger and more lucrative logistics contracts.[16]

[11] For a detailed description see: CAI-Asia, 2010, Green Freight China Program - Review of Logistics Solutions. www.greenfreightandlogistics.org

[12] Interstate Distributor Co. (IDC). IDC's presentation ppt during the US study tour (June 2010) for the GEF Guangdong Green Truck Demonstration Project.

[13] http://www.teleroute.at/uk/en/Products-Services/What-is-a-Freight-Exchange/page.aspx/2748

[14] Modified from Article 1.1 of the United Nations Multimodal Convention on international multimodal transport http://www.jus.uio.no/lm/un.multimodal.transport.1980/doc.html#20

[15] Modified from http//en.Wikipedia.org

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

The key measures involved in each solution and benefits are described in Table 4. A more detailed analysis, examples and summaries of best practices from around the world are provided for these five logistics solutions in a separate report.[11]

Table 4: Measures and Benefits for Five Priority Logistics Solutions

Logistics Solution	Key Measures	Benefits
Drop & Hook	• Drop-and-hook movement • Trailer pool management • Information center (freight exchange) • Standardized tractors & trailers • Trailer rental/leasing • Trailer management (incl. tracking system)	• Less dwelling time (waiting time) • Less empty miles • Reduce overall energy-use and emissions • Saving warehouse spaces/facilities, less logistics cost
Logistics Information Platform	• Freight information exchange system • 3PL & 4PL value-added services	• Less empty miles • Less total social logistics cost • Optimized social resource, and enhanced transport efficiency
Multimodal Transport	• Modal shift suitability • Market dynamics • Rail and water freight policy • Environmental considerations • Standardization of containers, tractor-trailers, trays, and other means of carriers • Efficient fleet management	• Reduce engine emissions by shipping rail instead of suing over the road means of transportation • Optimized resources
Fleet & Fuel Management	• Key Performance Indicator (KPI) management • Route planning • Fleet manager training • Eco-drive training	• Less empty miles (empty backhaul) • Less overloading • More actual load factor • Improve fleet operational efficiency and fuel efficiency • Reduce total fleet emissions • Saving fuel use by 0.3-10%/100tkm
Freight Company Consortium	• Integrated fleet management • Information sharing • Facilities sharing • Profit sharing	• Improved competitive position • Greater resource and information sharing • Security for customers to engage in longer term contracts • Increased vehicle fill • Less empty running • Improved back-loading opportunities • Reduced vehicle and load theft • Increased customer satisfaction • Improved fleet utilization

4.3 Recommended Next Steps

Private sector companies involved in freight transport pointed out that freight logistics is a broader economic issue beyond "green freight". As MOT identified freight logistics as a top priority, in moving forward in developing this component further, it is important to identify areas within the sphere of influence of MOT where fuel and emissions can be reduced through improved freight logistics. Private sector companies also suggested that green freight could be the used as an opportunity to involve the different stakeholder groups to also look at the broader freight and logistics issues that exist in China – this is further discussed in Chapter 7 on Partnerships.[17]

With this in mind, next steps within the context of a Green Freight China Program development could include

- A pilot project involving several or all main players within a specific freight logistics supply chain to help determine what works and what does not work in China.
- A more comprehensive survey of pilots and best practices in China on freight logistics that reduced fuel use and emissions, because several private sector companies reported that ample logistics solutions have already been trialed or implemented by shippers, carriers and logistics providers in China. This can be combined with an assessment of what government policies are needed to scale good pilots up, for example, the establishment logistics platforms or help build consortiums between companies.

[17] Summary of the *Private Sector Green Freight Workshop China - 25May2011*

5. FINANCING COMPONENT

This chapter describes the Financing component of the program.

5.1 Description of this Component

Financing mechanisms are essential for widespread adoption of technologies. There is a wide range of financial and economic mechanisms or instruments that may be implemented to facilitate investment in technologies and logistics solutions that reduce fuel use and emissions. These mechanisms have an impact on investment decisions or on an entity's ability to invest by helping to reduce the overall costs of the investment (easing the decision to invest) or by facilitating financing of the investment (reducing barriers to and costs of commercial financing).

Financing is not part of all green freight programs and related initiative that were found thus far. With financing it is meant how the adoption of green technologies is financed (and not how the management and operation of the program is funded). Elements that have been included in other green freight programs include:

- Financing mechanisms of green technologies (more than logistics solutions), especially for trucks. This includes subsidies, grants, demonstration funds, and others. This is linked to the website/database under some programs with information on what agencies or institutions provide financing and how to apply.
- Financing services, such as the Finance Center under the US Smartway Program and assistance in applying for loans, grants or subsidies for the chosen technology package for trucks under the CSS program.
- Financing publications (linked to Knowledge & Capacity component), for example the module developed by GIZ on "Financing Sustainable Urban Transport" (although not specifically for freight alone) that presents different financing instruments and ways in which they can be best used, and how to optimally combine them.[18]

The Financing component under a GFCP could focus on these three elements. The next sections describe the financing mechanisms that could be applied, which are divided into policy-based and market-based financing mechanisms as shown in Table 5. This is followed by recommended next steps.

Table 5. Types of financial mechanisms[19]

Mechanism group	Financial mechanism	Examples
Policy-based	Tax	• Taxes • Tax credits

[18] "Financing Sustainable Urban Transport", Ko Sakamoto for GIZ, http://www.sutp.org/index.php?option=com_content&task=view&id=2293&Itemid=1&lang=en

[19] These mechanisms are described in detail with examples in the following publication: Improving energy efficiency in industry in Asia - A review of financial mechanisms as part of the *Energy Efficiency Guide for Industry in Asia.* www.energyefficiencyasia.org. United Nations Environment Programme (UNEP), June 2006

Mechanism group	Financial mechanism	Examples
	Subsidies	• Subsidies • Grants
Market-based	Debt financing or Lending programs	• Bank loans • Soft loans / revolving funds • Guarantee funds • Energy efficiency "Bank windows"
	Emissions credits	• Clean Development Mechanism (CDM)
	Energy service companies (ESCOs)	• Guaranteed savings • Shared savings • Pay from savings • Other

5.2 Policy-based Financing: Tax Credits, Subsidies, Grants

5.2.1 Characteristics

While many clean transportation technologies provide an excellent return on investment for vehicle owners, several technologies such as those endorsed by the US EPA SmartWay Transport Partnership are only now beginning to become commonplace in the United States and are little known in China. The transportation industry tends to be slow in adapting changes, and while clean technologies similar to those verified by SmartWay are supported by a strong business case, they remain both unknown and often costly.

Incentives will be required to persuade trucking operators to adapt these green technologies if the Chinese pubic is to enjoy the clean air and fuel efficiency benefits they can deliver. Based on international experience, some of the most powerful market incentives delivered to date for the adoption of green trucking technologies are tax credits, grants, emissions offset financing, and affordable debt financing.

Tax credits provide a reduced tax burden for those companies who adopt preferred technologies. While they provide a strong incentive, the reward is typically delayed until the time companies complete annual tax returns. One significant advantage is that they can be administered through existing tax structures, and if set up with a streamlined process, do not require participation of additional parties, just owners and their tax accountants.

Grants provide an immediate cash incentive to purchase eligible technologies or services. While funds will typically originate from public coffers, they may be administered either by public agencies, or by NGOs operating in the space of the transportation industry who can be more responsive to the needs of industry than government agencies can. In the US, public agencies typically issue grants to pay a percentage of the cost of technologies for recipients, who are required to find the balance of the cost from their own funds or third-party sources.

The percentage paid by the grant typically varies based on the benefit to the public and benefit to the operator. A smaller incentive (under 40%) might be required to persuade owners to adopt fuel efficient tires or aerodynamics which provide an incentive of their own through fuel savings. For measures such as exhaust filtration which provide an excellent benefit to public health, but no direct and immediate benefit to trucking operators, the only effective incentives are 100% grants or regulations.

While the nominal value of a grant and a tax credit might be equal, industry operators may favor the grant over the tax credit as the benefit of the grant can be immediately realized. Grants do require additional work to administer, either through issuing agencies, equipment distributors, or third-party NGOs.

5.2.2 Examples

a) Oregon Business Energy Tax Credits

The US State of Oregon offers the Business Energy Tax Credit program which provides a tax credit (varying percentage) for businesses conducting energy saving measures. These include wind or solar power generation, energy efficiency measures in buildings, or SmartWay technologies on diesel trucks. When the measures are completed according to state procedures, recipients are issued a tax credit certificate that may be used in place of cash to fulfill their tax obligations.

b) EPA Grants

The Diesel Emissions Reduction Act passed by the US Congress in 2005 has since issued hundreds of millions of dollars in grants to incent public and private diesel fleets to reduce their emissions with clean new trucks, SmartWay technologies and exhaust filtration. US EPA administers the program and estimates that for every dollar invested into it, $13 in public health benefits are saved as a result of the emissions saved.

EPA calls for applications from eligible NGOs and public agencies (state, local, county, municipal, tribal governments) and ranks those applications, eventually choosing the most effective. Some typical grants issued provide incentives to pay 25% of the cost of replacing a pre-2000 truck with a new 2007 truck reducing diesel PM emissions by 85%, or paying 18% of the cost of an auxiliary power unit which provides drivers an alternative to overnight engine idling.

5.2.3 Opportunities for China

A number of conditions make China a highly favorable market to implement clean transportation technologies already tested in other countries.

- The high price of fuel in China relative to the US provides operators proportionally greater benefit for implementing fuel-saving technologies.
- A culture of employee accountability in China, where employee drivers are responsible for the amount of fuel they use, gaining benefits for fuel efficiency and facing consequences for inefficient driving, means both owners and operators are acutely interested in fuel savings.
- A government commitment to providing incentives for efficiency which has already been put into place at the national level with incentives for electric or alternative fuel vehicles, for example, has set an example for a system of incentives for clean diesel.

- An enormous and growing potential market for clean transport technologies which can lower the cost per unit through volume production, and a skilled yet inexpensive manufacturing base to produce those technologies domestically.
- A central government with the power to devote significant resources to reducing emissions and fuel use, and the power to implement regulations mandating the use of clean technologies.

5.3 Debt Financing or Lending Programs

5.3.1 Characteristics

The high cost of clean and efficient transport vehicles and technologies constitutes a significant barrier to entry, especially for small trucking firms which comprise the majority of the Chinese transportation system. Debt financing can significantly lower the barrier to entry, reducing the amount of initial capital needed to acquire technologies, while still providing long-term positive return on investment for most fuel-saving technologies.

With the right systems in place, owners can pay a portion of the cost of clean trucks or equipment up front as a down payment and pay off the remainder over time, with fuel savings equaling or exceeding the cost of monthly payments on many technologies.

In the US, financing systems in this field have arisen as a result of market demand in this field, but many lenders have limited understanding of the transportation economy or the particular technologies concerned. As a result the market varies widely with predatory for-profit lenders on one end charging undereducated borrowers interest of up to 30% on loans designed to fail so the lender can repossess the vehicle and grant equity, to not for profit lenders lending at affordable rates with the objective of promoting clean diesel benefits for the breathing public in communities worst affected by diesel pollution.

5.3.2 Examples

A pilot financing program in China could be established to open the doors to clean diesel financing, accelerating the implementation of technologies to dramatically improve air quality in the worst affected areas and reduce fuel consumption per ton of freight transported. This lending mechanism could be one in which the government of China, World Bank, GEF or another institution directly provides principal which is lent to truck owners, providing enticing terms and conditions (low rates, low down payment, extended periods) to achieve low monthly payments, which would be exceeded by fuel savings.

Another approach would be for a funding organization (national government, provincial government, World Bank, GEF, Energy Foundation...) to provide seed capital to leverage private funds for clean diesel lending. Private funds would be leveraged from banks or private investors. Socially responsible investing is a rapidly growing international sector of investors who, like all investors, are seeking a financial return on their funds, but also wish to achieve social and environmental objectives.

The initial investment of seed capital could serve either as a loss reserve/loan guarantee, which would provide investors the security of having third-party funds available to cover losses from bad debt, or as an additional equity investment in a revolving loan fund, providing what would effectively be a down payment in addition to the borrower's down payment, reducing the private lender's loan-to-value ratio.

a) Government Lending

The State of California will in the summer of 2011 be issuing the PLACE Direct Loan program (PLACE-DL), in which the State provides a pool of several million in principal to be loaned out only to targeted borrowers, namely small fleets and owner-operators who would otherwise have difficulty securing loans. A third party services the loans, which are issued at preferential rates and terms relative to the market, incenting borrowers to purchase clean diesel trucks and aftermarket upgrades that would have been out of reach otherwise. Interest earned is used to pay the cost of administering the program.

b) Loan Guarantee

The California Capital Access Program (CalCAP) provides a loan loss reserve of between 14-20% of the value of a qualifying loan, which is deposited into an escrow account in the name of a qualified CalCAP lender. These loans are restricted to targeted borrowers, small trucking companies, and to certain technologies, clean trucks replacing dirty ones and exhaust filtration. In the event of a default, the lender may draw the amount of the loss from its CalCAP escrow account into its operating account. With this security lenders can broaden their underwriting standards and make loans available to a much larger number of borrowers.

c) Revolving Loan Fund

With revolving loan fund capital from the US EPA, US NGO Cascade Sierra Solutions (CSS) has successfully implemented a revolving loan fund in which 10% of funds come from EPA grants and 90% come from banks and private investors. Interest on the 90% is returned to investors as profit and interest on the 10% is returned to CSS to pay for administration of the fund including, origination, loan servicing and default management. Borrowers are required to pay a minimum of 10% down, either through cash, or commonly in the form of grants received. Either way, the borrower's own investment and potential to lose that investment greatly mitigates risk of default. As the 10% of fund principal belonging to CSS is repaid, it is in turn lent out again and again to other borrowers as a renewable financial resource.

5.3.3 Opportunities for China

Cultural traditions concerning borrowing and the finance culture in China and the US differ considerably. US consumers are accustomed to highly leveraged debt, often borrowing the maximum amount possible. In the Chinese transportation industry, companies are accustomed to making purchases in cash or in limited cases, taking out loans for short periods of time only, usually one to two years at most, with much higher down payments.

As China's economy and consumer appetites grow, lending is also growing, and this trend may help accelerate the implementation of clean trucking technologies if it can encourage owners to implement those technologies earlier than if they had waited to pay for them in cash. Key to implementation are a clear verification method guaranteeing fuel savings results based on testing under local conditions in China and an effective marketing campaign to communicate the benefits to users.

5.4 Emissions Credits

5.4.1 Characteristics

Emissions credits are another important opportunity to fund clean trucking solutions for China. Buyers of emissions credits pay for the right to claim ownership of reduction of those emissions. Through the Clean Development Mechanism (CDM) or voluntary markets, carbon offsets and other emissions credits can be sold into the European market. With offsets historically selling in the range of €0-30/metric ton CO_2e in Europe, this mechanism can provide a significant source of funds for clean transportation in China. Black carbon from diesel emissions is gaining further recognition as a greenhouse gas, and emissions credits from black carbon as well as CO_2 may be marketable in the near future. All forms of carbon offset trading require a high degree of measurement and verification of emissions reductions, as well as relatively large scale (hundreds of thousands of tons saved) in order to be viable.

In certain areas of the US, other pollutants arising from diesel transport operation are regulated and markets exist for their purchase and sale. As with greenhouse gas credits, buyers with an obligation or desire to lower their overall emissions footprint may partially fund activities to reduce those emissions and buy the right to claim those reductions as their own, either for public image benefit or more likely, to meet their regulatory obligations. Should China decide to regulate airborne pollutants in this way, emissions offsets will provide an excellent clean transportation financing mechanism.

5.4.2 Examples

US NGO Cascade Sierra Solutions conducted the sale of approximately 100,000 metric tons of carbon offsets through a trucking efficiency project in 2008 in the US voluntary market. Further offset sales have been hampered by lack of a certified third-party offset verification for truck transportation through a methodology recognized by Verified Carbon Standard, Gold Standard, CDM or California Climate Action Reserve. At time of writing, the Central Interior Logging Association of British Columbia, Canada, and its sister organization, the Carbon Offset Cooperative, are in the process of establishing an internationally recognized third-party methodology which will enable these offsets to be quantified and sold.
To date, only five CDM projects were approved worldwide.

5.5 Transport ESCOs

5.5.1 Characteristics

Energy Service Companies (ESCO) performance contracts are innovative financial arrangements that have been successfully applied to energy efficiency projects especially in industry. The combine the design and implementation of energy efficiency projects with financing and the guarantee of performance (i.e. the customer is guaranteed that he/she will get energy savings out of the project).

In the case of performance contracting, the ESCO will perform an energy efficiency audit and develop recommendations and designs based on the audit. The ESCO will then secure financing for the project (upon

agreement with the customer concerning recommendations). That financing typically will be based on the stream of energy cost savings that are expected as an outcome of the recommended changes. The ESCO then implements the project. The ESCO assumes the risk of the performance of its recommendations. If the changes do not produce savings then the customer does not pay the ESCO. Typically, all costs associated with the project -- beginning with the audit and design -- are bundled together so the customer does not incur any costs until the stream of savings begins. The appeal of performance contracts is that the customer incurs almost no upfront costs for its energy efficiency investments -- all payments come out of energy savings.[20]

5.5.2 Examples

There are no known examples of ESCOs for truck fleets. However, there are ample examples of successful ESCOs for energy efficiency in industry in Asia, particularly in China.[20]

5.5.3 Opportunities for China

An ESCO performance contracting model that is being successfully applied for energy efficiency projects in industry, could in theory be applied to fuel efficiency for trucks or preferably truck fleets. However, in practice this arrangement would need to be tested at a micro-level or as a pilot project because of (a) the complexities in the transport sector and interventions to reduce emissions, (b) the many steps with associated uncertainties and assumptions that link emission reductions from transport interventions to reduced payouts by health insurers, and (c) the unfamiliarity, and most likely lack of confidence, of both government and the insurance sector in applying innovative financing models together.

5.6 Recommended Next Steps

Recommended next steps are:

- Establish a Working Group on Truck Technology Financing to discuss innovative financing mechanisms in China that could be applied to the freight sector and come up with concrete recommendation on mechanisms and how these should be designed, piloted and implemented. Such a Working Group could include financial institutions in China, Cascade Sierra Solutions, the World Bank, Asian Development Bank, a relevant government agency or association in China, and other organizations as required. This could also be the starting point for the establishment of specialized service providers for China that offer advice and services on technologies and financing, similar to Cascade Sierra Solutions in the US that has a profound understanding of the financial market and road freight.
- Conduct research on financing mechanisms for clean technologies for trucks and how government could facilitate financing. Examples of mechanisms that government could provide as suggested by stakeholders are (a) providing subsidies for energy efficient technologies and trucks similar to the subsidies provided for electric cars (b) expanding the trade in vehicles scheme with energy efficient trucks (c) including green trucks in the government procurement list (d) enhancing guarantees or collateral, for example by establishing a collateral risk fund (e) exploring new tax options such as

[20] UNEP (2006) Financial Mechanisms for improving energy efficiency in industry in Asia. http://www.energyefficiencyasia.org/docs/tools/training_materials/Financing_EE_Review_2006.pdf

direct or indirect preferential treatment, reducing value added tax, environmental impact tax for CO_2, PM_{10} and NOx. There are examples of such mechanisms for energy efficient technologies in the industrial sector. Under the 12th FYP, a Special Fund is established for road transportation reduction and energy efficiency. The Institute of Finance Sciences could take a lead role in this, and such research could feed into a programmatic approach for technology adoption through MOT.

- Specifically explore funding opportunities through climate funds and schemes, such as Climate Trust. CO2 credits could provide additional funding and help guarantee loans. The program development could benefit from someone who knows a lot about the carbon credit market.
- It could be explored whether additional demonstration projects can be carried out to increase the confidence of truck drivers and companies. This is a main purpose of the Guangdong Green Trucks Demonstration Project with funding support from GEF, through which technologies will be piloted for about 1000 trucks. Carriers will receive subsidies for installed technologies subject to proof that technologies have been installed, adequate monitoring records, and attendance of training courses. It was acknowledged that the GEF project can provide seed capital to get this started but that securing collateral funds will be a challenge.

6. KNOWLEDGE & CAPACITY COMPONENT

This chapter describes the Knowledge & Capacity component of the program.

6.1 Description of this Component

Elements that have been included in other green freight programs include:

- Award schemes
- Awareness campaigns
- Case studies
- Databases (sometimes integrated in websites)
- Dedicated websites
- Marketing
- Outreach Centers to provide a face-to-face contact with drivers directly
- Technical documents, videos
- Tools and methodologies for fuel and emissions calculation of companies
- Tools to calculate fuel use and emissions and the impact of options to reduce these
- Training courses and materials, including guidelines, and capacity building and institutional strengthening activities

The main barriers identified that are relevant for knowledge and capacity are

- Lack of agreed methodologies for fuel and emission measurement which makes it difficult to estimate emissions, potential emission reductions and monitor actual reductions following the implementation of policies and measures
- Lack of accessible information and knowledge especially on green freight technologies and logistics improvements
- Lack of capacity of carriers, associations and several other stakeholder groups

Based on these barriers, the following are described in more detail for this component:

- Freight transport emissions methodology
- Green freight website and database
- Green freight training

6.2 Freight transport emissions methodology

Quantifying air pollutant and CO_2 emissions in the freight sector has increasingly become important as its contribution to the total CO_2 and as well as particulate matter emissions are substantial. Road freight can easily account for half of all CO_2 emissions from diesel use in many developing countries. This is especially true in developing countries where the freight sector, particularly road freight, is beset by inefficient operations leading to more empty miles and as well as inefficient technologies leading to higher fuel consumption.

There are various methodologies that can be used to estimate emissions from freight. The choice for the appropriate methodology highly depends on the geographic scope (e.g. regional, national, local) and transport modes involved (e.g. road, rail, marine, and aviation). For roads, these are usually considered as vehicle fleet methodologies and can be adopted at the company level.

Table 6, adapted from the US National Cooperative Freight Research Program of the Transportation Research Board, provides an overview of the types of emissions measurement and analysis by geographical scope, the transport modes usually covered and as well as potential users or beneficiaries. It also includes a few examples of existing models that can undertake such analyses. In some cases, the model or tools are applicable to different types of analysis.

Table 6. Types of Analysis for Emissions Measurement from Freight

Type of Analysis	Objective	Modes	Potential Users/ Beneficiaries	Examples of Models and Tools
Global/ Regional/ National	Calculate freight emissions inventories associated with large geographic areas	All	• Environmental Regulatory Agencies • Regional Agencies	• 2006 IPCC Guidelines for National Greenhouse Gas Inventory/ Software for GHG Inventories (UNFCCC) • National Emissions Inventory
Freight Corridor	Calculate freight emissions associated with a specific corridor	Typically trucks and rail	• Transportation Agencies • Private Industry State/Local Environmental Agencies	• Transport Emissions Evaluation Model for Project (CAI-Asia/ ITDP)
Metropolitan/ City	Calculate freight emissions inventories within a metropolitan area	Typically truck only, but other modes can be included	• Transportation Agencies • City Authorities/ Air Quality Districts	• GREET Fleet Calculator (Argonne National Laboratory, US)
Facility	Calculate emissions from freight activity at a specific facility (truck terminal, railyard, port, airport)	Varies, depending on the facility	• City Authorities/ Air Quality Districts • Private Industry Environmental Organizations	• Port Air Emissions Inventory (Port of Long Beach, US)
Supply Chain	Calculate freight emissions associated with the logistics of a product	Varies, depending on the supply chain	• Private Industry	• www.freightemissionscalculator.com
Company	Calculate emissions from company vehicle fleet logistics operations	Trucks and other modes	• Private Industry	• SmartWay Transport Partnership Freight Logistics Environment and Energy Tracking Performance Models • UNEP PCFV/ CAI-Asia Clean Fleet Management Toolkit • Fuel Consumption Monitoring Devices

Source: Adapted from NCFRP. 2010. Representing Freight in Air Quality and Greenhouse Gas Models

What is also important to understand is that depending on the scope and transport modes, a decision needs to be taken on whether to use a "top-down" or "bottom-up" approach. The top-down approach is often based on the total fuel consumed and/or in the case of freight, the total tkm and energy consumption by liters of fuel or kilowatt-hours of electricity used per tkm.

The bottom-up approach, exemplified by the ASIF approach is defined as emissions (G) being dependent on the level of travel activity (A) in passenger kilometers (or ton-km for freight), across all modes; the mode structure (S); the fuel intensity of each mode (I), in liters per passenger-km; and the carbon content of the fuel or emission factor (F), in grams of carbon or pollutant per liters of fuel consumed.

Methodologies can be developed for the following three levels.

6.2.1 Companies

This methodology can be based on the methodology and supporting tool developed under the US Smartway program to establish a baseline and monitor fuel use and emissions from a particular fleet. The Clean Fleet Management Tool developed by UNEP and adapted by CAI-Asia for the Asia situation, allows companies not only to estimate fuel use and emissions but also the impact of subsequent measures on fuel use, costs and emissions[21]. If ships or rail freight would be included then a separate methodology would be needed. Collaboration would be sought with the Consignment Carbon initiative of the World Economic Forum that aims to come up with a common method across the freight sector. Feedback from some of the private sector companies operating in Asia was that a simple tool is needed at first that could be easily applied by most carriers and that the tool can be made more sophisticated and in-depth over time as the capacity of carriers grows.

It is also noted that an approved methodology for verification of CO_2 emission reductions from trucks is was launched in the US earlier in 2011 that can be used for CO_2 credits. An on-board diagnostics (OBD) system is needed for CO_2 verification.

6.2.2 Freight supply chain

The freight supply chain was introduced in chapter 4. A methodology for estimating emissions from a freight supply chain can build on the "Transport Emissions Evaluation Models for Projects (TEEMP), which were initially developed by CAI-Asia and ITDP for evaluating the emissions impacts of ADB's transport project and have been modified and extended for GEF projects.[22] Such a methodology will be important especially for shippers or logistics providers that operate across the supply chain, and could also be developed and tested as part of a pilot project for a specific freight supply chain.

[21] http://cleanairinitiative.org/portal/CleanFleetManagement
[22] http://cleanairinitiative.org/portal/TEEMP

6.2.3 Entire freight sector

This may be useful to MOT to determine a baseline and assess the impact of policies and measures or a wider program such as GFCP in the future. This could be a measurement model for energy use, CO_2 emissions and air pollutant emissions for the road freight sector but also for shipping and rail freight. An emissions inventory using top-down approach based on fuel use is usually the basis. In the US the EPA uses the National Emissions Inventory that includes air pollutants and the GHG Inventory that includes CO_2 emissions from transport.[23] For freight corridors, or routes, emissions can be estimated based on the number of freight vehicles and volume transported. At the metropolitan or city level, various freight activities from trucks and medium-sized vehicles are considered, such as delivery vans. Facilities can be considered as areas of operation where freight is involved and are specific to certain type of use such as transport freight terminals, airports, seaports, etc.

6.3 Green Freight Training

"Smart Drivers for Trucking in China" training materials for truck fuel efficiency were developed and tested, which can be the basis of a training system or activities under the GCFP. A one-hour summary course in the form of 72 presentation slides in English and Chinese tailored to Chinese drivers based on feedback received from 20 drivers and operators from the Guangzhou pilot companies who took the course was prepared. Further information is provided in six supporting presentation modules based on an existing Smartway course (planning; truck specifications; components and accessories; maintenance and inspection; driving practices; smart driving summary).

Internal training exists for large carriers and some technology/truck manufacturers provide training for carriers. However, there is no training system that is certified by government or any other organization in China.

Training opportunities also exist for promoting eco-driving and maintenance, and was recommended by several participants of the Green Freight China Seminar. Examples for tires include alignment of tires, proper tire pressure, and tire thread depth. Driver training is a priority area because the fuel efficiency difference between the best and worst driver in the US was found to be 25%.

6.4 Green Freight Website and Database

A website was established, www.greenfreightandlogistics.org, as a basis for the further development of the GCFP and also for the development of similar programs in other countries. This website is structured around the GFCP components and contains information relevant for each component.

Table 7. Structure of Green Freight and Logistics Website

Section	Content

[23] NCFRP. 2010. Representing Freight in Air Quality and Greenhouse Gas Models

Section	Content
Programs	• Overview of green freight programs and initiatives, and a 1-2 page description for each
Policies	• Overview of policies in different countries relevant to freight, starting with China
Technologies	• Overview of technology types • Brief description for each technology and either a link to a website or to a document for more information • List of suppliers that have notified CAI-Asia that they provide this technology and link to a file with technology details
Logistics	• Overview of types of logistics solutions • For each logistics solution there will be a brief description and either a link to a website or to a document for more information • Case studies of best practice case studies
Financing	• Overview of type of financing mechanism and examples
Green Freight Network	• Overview of different stakeholder organizations relevant to green freight (government, freight companies, manufacturers and suppliers of trucks and technologies, and other organizations
Resources	• Main publications, articles, tools, other websites on green freight, etc.
Events	• Relevant seminars, workshops and other events to green freight, especially in China and Asia

Under the US SmartWay program, a sophisticated database is in place that carriers use to submit data on their fleet and shippers use to assess and compare the carbon footprint of different carriers as part of their carrier selection process. In China, however, a different culture exists in terms of sharing data publicly or even within a closed group of organizations on a voluntary basis. Therefore if a database is designed for China then this has to be kept in mind. A database could be added to the website that builds on experience from existing databases but tailored to China.

The development of the website in Chinese is also required.

6.5 Recommended Next Steps

The recommended next steps are, and the China Road Transport Association (CRTA) and CAI-Asia could play a lead role in implementing these:

- Survey. Conduct a survey of truck companies in China that are CRTA members on (a) current green freight practices (b) barriers and priorities (c) the information / skills needs relevant to green freight.
- Emissions methodologies. It is recommended to focus first on an emissions methodology for fuel and emissions measurement by carriers, based on existing methodologies but tailored to the inception stage in which many Chinese truck companies are at. The methodology would be used for these companies to improve their own understanding of fuel use and emissions, and thus allow them to identify improvement options, as well as initial reporting to shippers for those truck companies that are targeting contracts with large or multinational shippers. This would be conducted in collaboration with a global methodology development lead by the World Economic Forum, as well the Vehicle Emissions Control Center of the MEP that conducts research into vehicle emissions. A first step could be to (a) meet with companies, as a supplement to the survey mentioned earlier, and understand their capabilities and needs (e.g. for many companies measurement is done to help

improve internal performance rather than due to a requirement to report to shippers) (b) establish a collaboration between enterprises to collect data and do this in a harmonized way -- perhaps there are frontrunners in China who would be interested in collaboration (c) develop a standardized methodology for road freight in China (d) collecting and sharing best practices.

- Green freight training.
    - A first next step is to conduct a more thorough analysis of the current capacity and training needs of truck companies in China (see above description)
    - Review of existing training materials and courses provided by universities, truck manufacturers and others.
    - Decide (a) what training materials or courses need to be developed and (b) what needs to be done to establish a training system or process to make training available in a systemic manner in China.
    - Develop training modules. As a minimum it is expected that two training modules will be needed: (a) green freight practices, taking into account the results of the survey; and (b) the emissions methodology.
- Green Freight and Logistics Website. Information on this website could be expanded with information relevant to the recommended next steps for China described in this report, and should be made available in both English and Mandarin. Once available in Chinese, relevant information could also be linked in websites of websites of Chinese organizations for greater reach. A newsletter with digests relevant to green freight could also be considered in combination with the website, or CAI-Asia could create a section on green freight in its fortnightly news digest on air quality, climate, energy and transport for China.

7. PARTNERSHIPS COMPONENT

This chapter describes the Green Freight Partnership component of the program.

7.1 Description of this Component

In order for green freight to work in China, partnerships are essential. These partnerships should involve all stakeholder groups, including government agencies, the private sector and other organizations as illustrated in Figure 4 and described in Table 8. However in practice there will be a number of partnerships, including formal and informal ones, between different stakeholder groups.

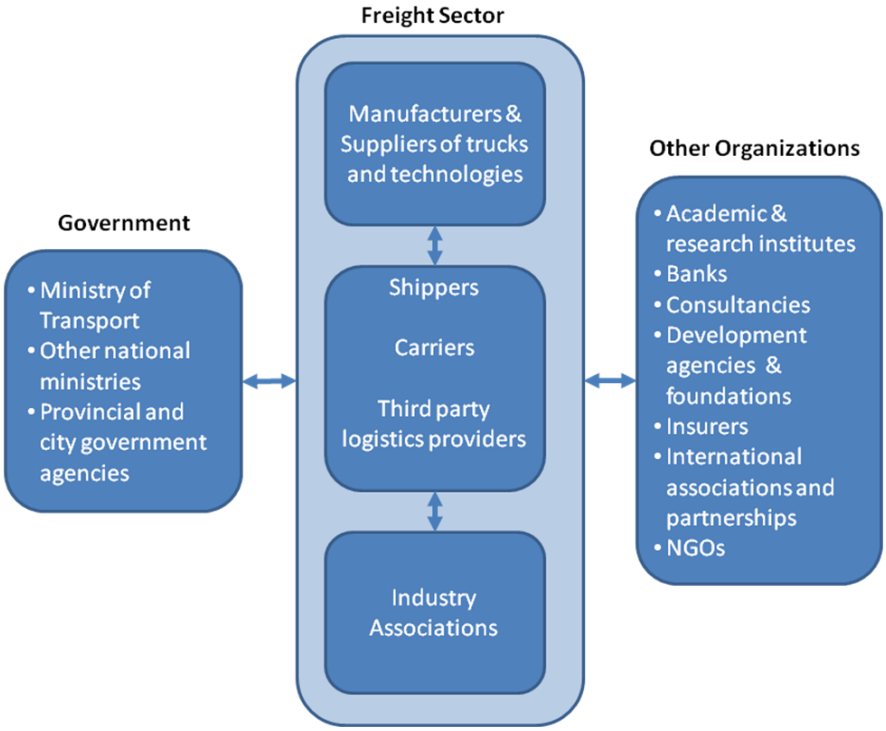

Figure 4. Green Freight Stakeholder Organizations

Table 8. Freight sector and other organizations relevant to the Green Freight

Organization type	Description

Freight companies	• Shippers = primary logistics providers (1PL) = manufacturers or producers of goods or products
	• Carriers = secondary logistics providers (2PL)
	  ◦ Trucking companies
	  ◦ Railway companies
	  ◦ Shipping companies
	• Third party logistics providers (3PL)

Organization type	Description
Manufacturers and Suppliers	• Truck manufacturers, including tractors, trailers, containers and chassis • Tire manufacturers • Suppliers of technologies and related services
Chinese Associations	• China Road Transportation Association • Logistic Committee of the Transport Sector Association • Other associations
Government agencies	• Ministry of Transport • Other national ministries • Provincial and city government agencies
Private sector	• Banks • Insurers • Consultancies
International associations and partnerships	• Asian Environmental Compliance and Enforcement Network (AECEN), Air & Waste Management Association (A&WMA), International Transport Forum (ITF), Partnership on Sustainable Low Carbon Transport (SloCaT), Partnership for Clean Fuels and Vehicles (PCFV), Regional Forum on Environment and Health
Development agencies and foundations	• Multilateral development agencies: World Bank, Asian Development Bank (ADB), International Energy Agency (IEA), United Nations Environment Programme (UNEP), United National Center for Regional Development (UNCRD), US Environment Protection Agency (US EPA), US Agency for International Development (USAID) • Bilateral development agencies: German International Cooperation (GIZ), Institute for Atmospheric Pollution of the Italian National Research Council (CNR), Norwegian Agency for Development Cooperation (NORAD), Swedish International Development Cooperation Agency (Sida), • Foundations: Energy Foundation, FIA Foundation, Hewlett Foundation
NGOs	• Cascade Sierra Solutions, All China Environment Federation (ACEF), Business for Social Responsibility, Civic Exchange in Hong Kong,
Academic and research institutes	• Asian Institute for Technology (AIT), Chinese Academy for Environmental Sciences, Health Effects Institute (HEI), Hong Kong Polytechnic University, Institute for Transportation and Development Policy (ITDP), Tsinghua University, Tongji University, International Union for Conservation of Nature (IUCN), World Resources Institute Center for Sustainable Transport - EMBARQ (EMBARQ-WRI)
Cities	• The GEF Guangdong Green Trucks Project (2011 – 2015) includes Guangzhou and several other cities in the Guangdong Province • CAI-Asia works with a network of 13 Chinese cities: Changsha, Chengdu, Chongqing, Guangzhou, Guiyang, Hangzhou, Harbin, Luoyang, Qingdao, Tianjin, Urumqi, Suzhou and Lanzhou.

The Partnerships component of the program will focus on establishing and facilitating such partnerships and mechanism for shippers, carriers, suppliers and other stakeholders in the freight sector to interact, and for government to engage with these stakeholder groups. These are to be worked out in more detail following the Green Freight China Seminar, but the main ones are described in the next section.

7.2 Green Freight Partnerships and Collaborations in China

7.2.1 Freight companies

Collaboration is needed within the freight sector, i.e. shippers, carriers and logistics providers, especially to improve freight logistics and address the issues described in the report Review of Freight Logistics Solutions.[24]

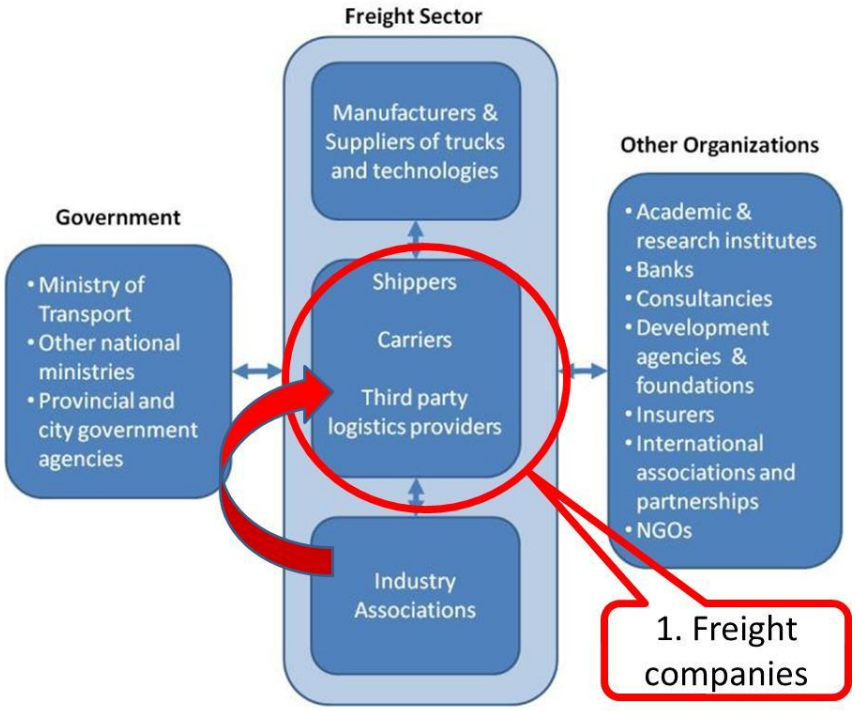

Figure 5. Partnership between Freight Companies

It could be based on the partnership of almost one hundred shippers and 3PLs that underpins the establishment of a SmartWay Europe Program. This program is being built through six working groups addressing key topics including: vision & scope; anti-trust; stakeholder management and funding; tool development; certification; and marketing and communication. The governance structure of this program in development is illustrated in Figure 6.

[24] CAI-Asia 2011. Design of Green Freight China Program: Review of Freight Logistics Solutions. www.greenfreightandlogistics.org

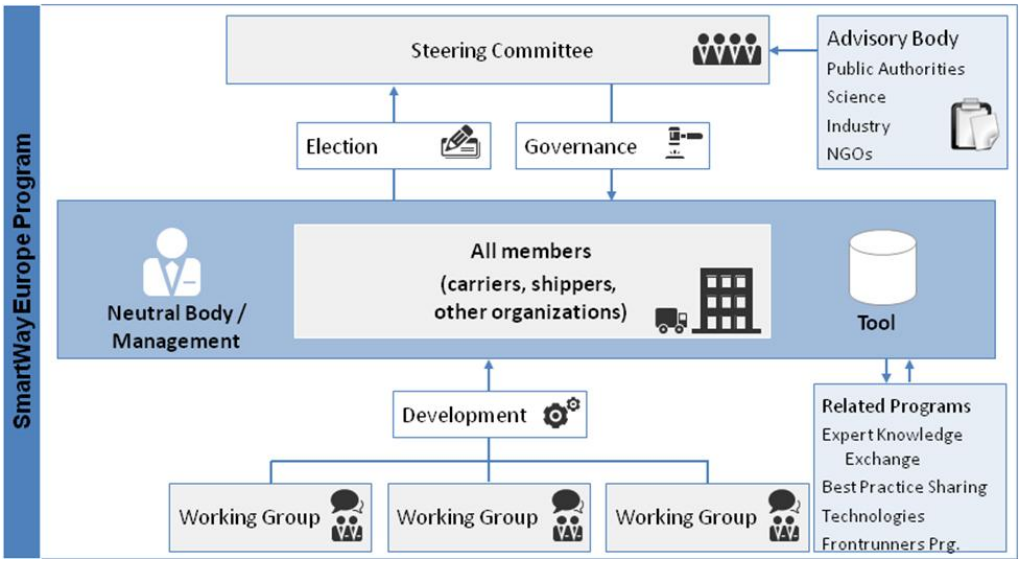

Figure 6. Governance Structure of the SmartWay Europe Program

Source: SmartWay Europe Working Group

7.2.2 Technology Manufacturers and Suppliers

Collaboration is also needed between technology suppliers. This could be achieved through, for example, existing associations, of which there are several, or through a neutral organization. The objective would be to be able to better inform especially carriers on the technologies that are available. Secondly, it would provide a basis for providing input into government policies and plans and have a voice in improving the existing technology verification/certification system for truck technologies.

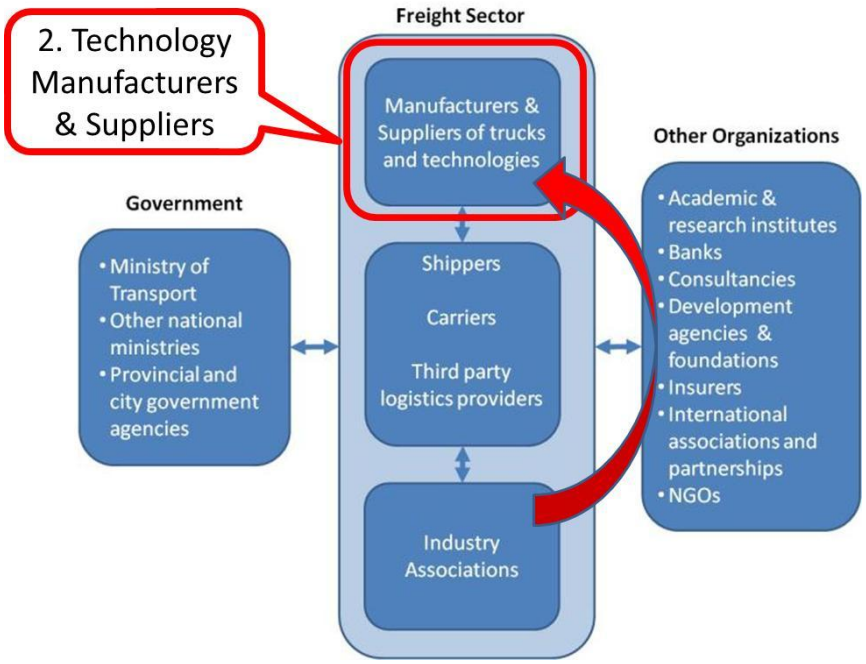

Figure 7. Partnership between Technology Manufacturers and Suppliers

7.2.3 Private Sector and the Government

The private sector, especially shippers, carriers and 3PLs, need a mechanism to interact and exchange ideas with the government, especially MOT. One option is to set up a US SmartWay type of partnership (see Box 1). In the US or Europe, partnerships between the government and the private sector is already very common, and take many forms such as covenants, joint programs, or formal.

Box 1. Features of the US SmartWay program partnership

- Sometimes called Public-Private Partnership or Market Transformation Program
- Structured relationship between government agency or administrator & private sector entities to address a public-policy problem
- Program participants "Partners" commit to specific verifiable action beyond "business as usual" and monitoring and sharing information
- Government commits to barrier removal, technical support, public recognition, and providing other incentives
- Formalized in a Memorandum of Understanding or Partnership Agreement whereby SmartWay Partners agree to benchmark and report their freight activity and environmental performance. EPA agrees to assist Partners with quantifying the emissions; assist Partners with achieving emissions goals; and publicize Partner efforts and increase public awareness of these efforts

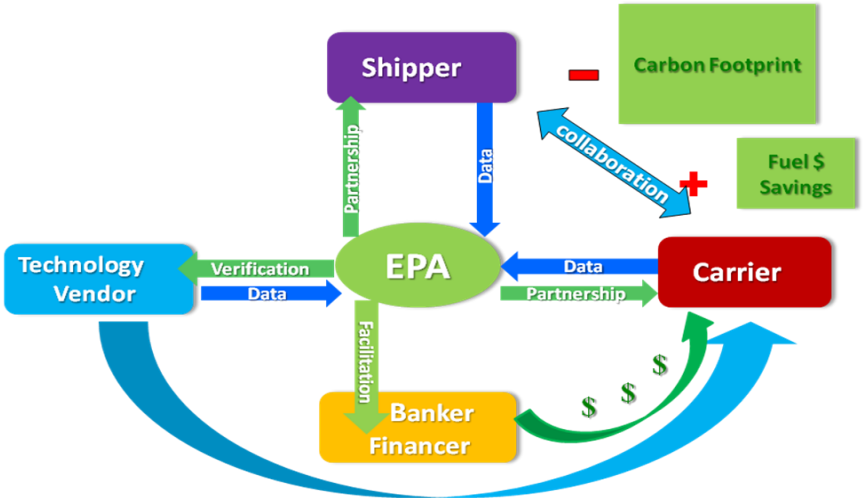

Figure 8. Collaboration Mechanisms within the SmartWay Transport Partnership

Source: B. Polovick, US EPA. SmartWay Transport Partnership - the US Experience. Presented at the Green Freight China Seminar, Beijing, 23-24 May 2011.

However as this is not yet very common in China, an alternative arrangement is to start with less formal mechanisms and build on that. The Green Freight China Seminar to function as an annual event with the specific purpose of interaction and information exchange between the Chinese Government and the private sector on freight issues. Another way is to strengthen associations' ability to communicate with its members and thus be able to improve its ability to collect and synthesize the views of private sector companies on

specific government policies and plans. A third example is a mechanism for government to give recognition to companies that are performing better in terms of fuel efficiency and emissions.

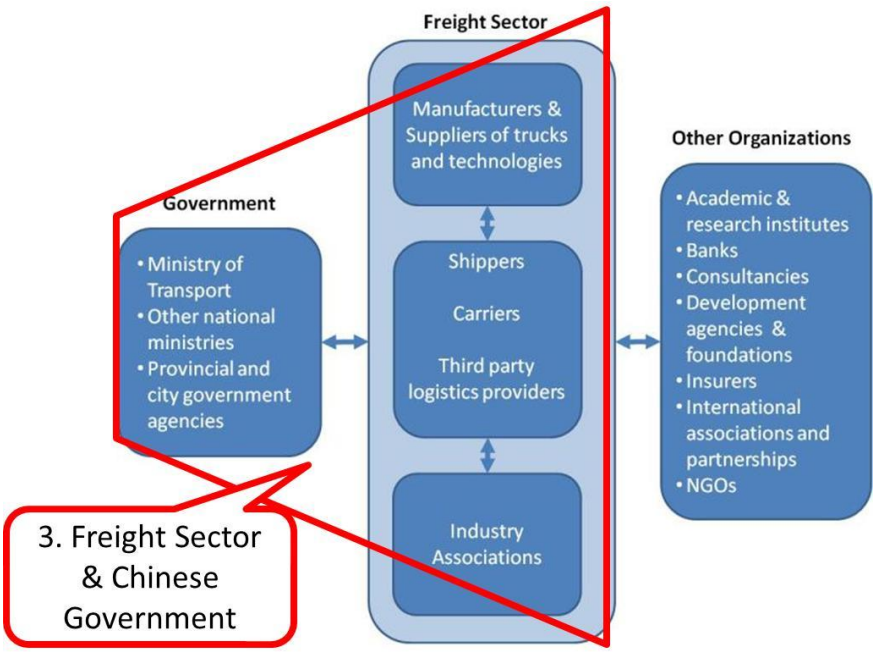

Figure 9. Partnership between the Freight Sector and China Government

7.2.4 Green Freight Network

The survey of 140 organizations involved in green freight that was conducted by CAI-Asia found that there are many international organizations that have an interest in China or offices in China. This survey, together with CAI-Asia contacts from past green freight and broader transport projects, has helped to establish expand our database on contacts relevant to green freight.

A broad Green Freight Network could be established to supplement the partnership consisting of other organizations within China and international organizations for information exchange and access to expertise and support for the program as well as the GEF Guangdong project. Such a global network would not only benefit China but also other countries in Asia that seek to establish programs for green freight and facilitate harmonization of or at least ensure greater consistency between different green freight programs around the world. A Green Freight Network could be set up informally simply by organizations being included in a database. The purpose is to be able to bring organizations with a certain knowledge or experience more quickly in touch with shippers, carriers, government organizations and other when needed.

A specific example is associations again, such as the China Road Transportation Association and the Logistic Committee of the Transport Sector Association. They could be supported by undertaking an in-depth survey of their members on how they can help them in achieving green freight.

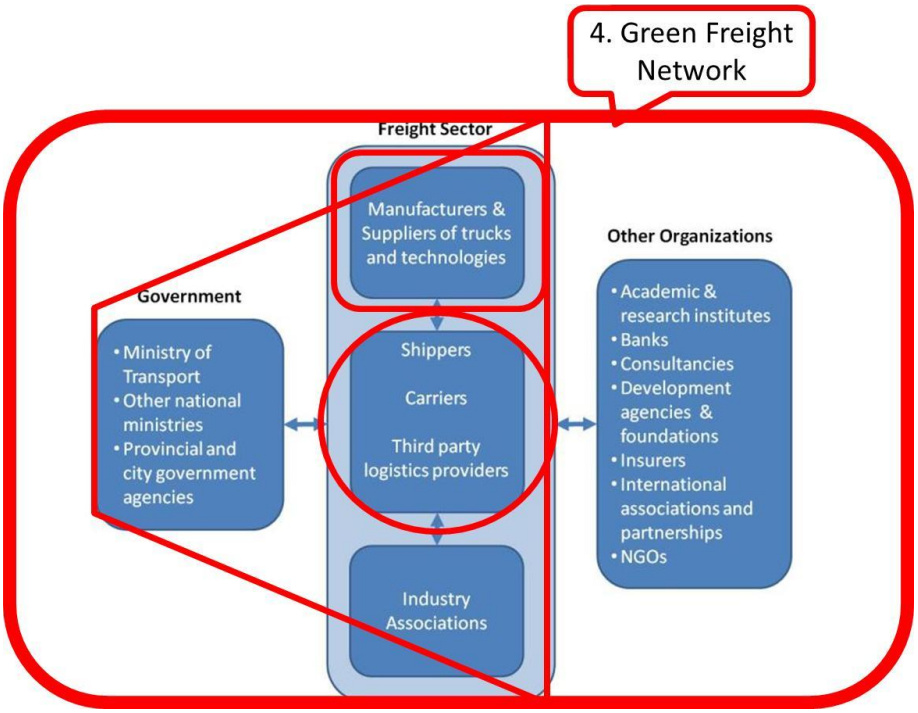

Figure 10. Green Freight Network

7.3 Recommended Next Steps

Stakeholders at the 1st Green Freight China Seminar and the Private Sector Green Freight Workshop China made the following suggestions on what should be the focus in the coming year:

- Develop an overview of government agencies involved in freight and logistics and try to engage them with the aim to identify and align existing initiatives and plans relevant to green freight. The reason given was that it is not the lack of initiatives but the lack of coordination and alignment that could slow down efforts to reduce fuel and emissions from the freight sector. These agencies could be engaged through the Advisory Group, meetings, and the 2nd Green Freight China Seminar.
- Continue the dialogue between government and the private sector that was initiated at this seminar to find out the needs and challenges of both parties with regards to green freight. Dedicated meetings or seminars could be held between specific groups or on specific topics within green freight, such as freight logistics or technologies.
- Bring industry partners on board, especially the CRTA and other relevant associations, in order to reach out to a larger number of companies.
- Similarly, shippers and 3PLs could be engaged. A specific example mentioned was a survey or meetings could to find out what the main reasons are for shippers to select carriers. The results could be used to communicate and educate carriers on this, so that they work on this and then the shippers can add them to their pool of carriers. Furthermore, meetings with shippers and carriers could be held in to understand each other's needs or on specific topics, such as technologies.
- Continue holding Green Freight China Seminars as an annual dialogue on green freight between government, the private sector and other organizations in China.