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Case studies on national policies and measures to promote efficient use of truck and modal shift of freight transport

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Content

Index of tables

Index of figures

1. Introduction

This report provides an overview of good practices of policies and measures (eight case studies) addressing the improvement of truck energy efficiency, i.e. the reduction of fuel consumption and emissions per ton transported, and the increase of modal shift from road freight transport to more environmentally friendly transport modes (generally, rail freight transport over medium-long distance).

The case studies have been identified in order to provide as far as is possible an overview of good practices around the world, distinguishing between OECD countries and non OECD countries. Policies and measures object of this report cannot be intended as "best practices": firstly, due to the lack of information that can lead to overlook other measures disseminated across the world, and secondly, due to the fact that even a best practice in itself, i.e. showing good short-term results, can in a longer term be counterproductive, e.g. subsidies for cleaner fuels.

The definition of HDVs (High Duty Vehicles) used in this report is of a vehicle with a permissible maximum mass greater than 12 tonnes and trailers with a mass greater than 10 tonnes (vehicle categories N3 and O4 as defined by the UNECE Classification and Definition of Power-Driven Vehicles and Trailers, or Class 7 (26 000- 33 000 lbs) and Class 8 (33 001 lbs and up) trucks in North America). The many goods vehicles with a permissible maximum mass less than 12 tonnes, which are typically used for a variety of transportation tasks in urban areas, are not specifically considered here, although they present many of the same policy challenges typical of the HDVs, e.g. air pollution.

The chapter 2 provides the introduction to the national case studies, suggesting possible criteria for their interpretation in the light of their wide geographical scope and characteristics.

The chapter 3 looks at the individual case studies according to specific aspects, specifying their context, objectives, management practices, results, main problems encountered and accompanying measures. Besides, in appendix, the national case studies are described according to a common standard.

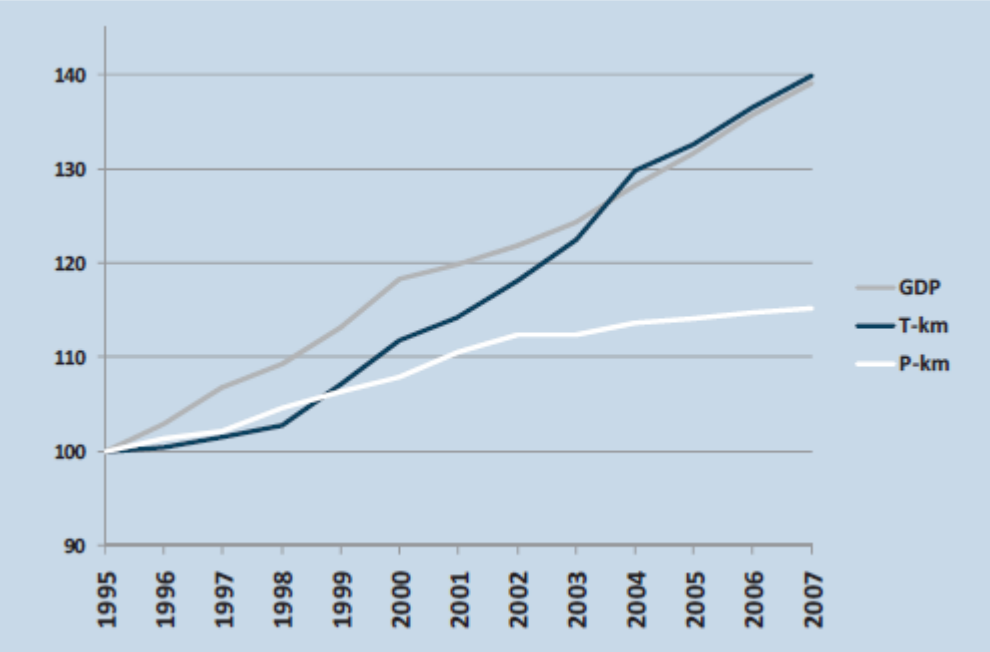
The chapter 4 focuses on transferability aspects, i.e. the identification of the most important pre-conditions for the applicability of measures and policies in accordance with the framework described in the chapter 2.

The chapter 5 draws conclusion.

2. Overview of policies and measures to improve energy efficiency and modal shift in different regions

The important role of HDVs in the more general dynamic of global economy has been widely recognised (CARS 21, 2012). Over the past years, the demand for freight transport has significantly increased in most countries. In particular, it has grown faster than the demand for passenger transport, in line with GDP for OECD countries as an aggregate (OECD, 2011).

Figure 1: Freight and Passenger Transport Growth in ITF Member Countries (GDP in 2005 Euros−1995=100)



Source: OECD, 2011

In Europe, the economic downturn in 2008 has slowed the road freight growth pace. Quick signs of recovery, however, have been reported as soon as the economic cycle has started to reverse, as shown in the table below showing the 2001-2010 annual variation of international road freight haulage (tkm) at EU27 level (DG MOVE, 2012). In particular, the unfortunately short-lived recovery in 2010 has been accompanied by the growth in the international road haulage.

Table 1: International road haulage (EU27)

2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
% var 2000	% var 2001	% var 2002	% var 2003	% var 2004	% var 2005	% var 2006	% var 2007	% var 2008	% var 2009
5,4%	***5,0%***	***2,3%***	***12,4%***	***3,3%***	***6,4%***	***3,5%***	***-1,7%***	***-12,2%***	***7,8%***

The extreme sensitivity of road freight transport to economic cycle and GDP growth is particularly pronounced in the non OECD countries, for which the elasticity of road freight transport is projected, over the short-medium term, to be higher than in the OECD countries, as showed the following table.

Table 2: Road Freight Transport Growth versus GDP Growth, by Time Period and OECD Region (ratio)

Region	2000-2007	2010-2020	After 2020
OECD North America	1.00	0.95	0.90
OECD Europe	1.00	0.95	0.90
OECD Pacific	1.00	0.95	0.90
Eastern Europe	1.25	1.10	0.95
China	1.25	1.10	0.95
Other Asia	1.25	1.10	0.95
India	1.25	1.10	0.95
Latin America	1.25	1.10	0.95
Africa	1.25	1.10	0.95

Source: World Bank, 2009

The importance of HDVs in road transport is also reflected in the volume of pollutant emissions. HGVs are in fact the second biggest transport source of CO_2 emissions, roughly equivalent to the sum of air and water transport CO_2 emissions (international and domestic transport).

In percentage terms, it is estimated that HDVs account for about 26% of CO_2 emissions from road transport in the EU, which is about 5% of total CO_2 emissions (CARS 21, 2012).

As stressed in the last report of the International Energy Agency (IEA, 2012), " The escalating number of trucks and lack of fuel-economy standards for commercial vehicles will have a major impact on CO_2 emissions and average fuel economy levels, particularly in non-OECD economies. Most member countries are working on commercial vehicle fuel-economy standards, and some have been implemented. Much more must be done in this area".

The relevance of the HGVs transport with respect to the economic activity, and in particular in the developing countries has paved the way to the definition of a wide range of HGVs policies and measures, whose impacts address the topics of energy efficiency and modal shift, as indicated in the following table.

Table 3: Overview of policies and measures addressing truck energy efficiency and modal shift

Policies and measures	Truck energy efficiency	Modal shift
Monitoring HDV CO2 emissions.	X	
Labelling of vehicles, components, bodies, trailers or transport services.	X	
Legislation to set performance requirements for vehicles, components, bodies and trailers.	X	
Direct stimulation of development and deployment of CO2 reducing technology by HDV manufacturers and their suppliers; voluntary agreements.	X	
Public procurement rules relating to HDV procurement.	X	

Policies and measures	Truck energy efficiency	Modal shift
Vehicle purchase taxes or incentives.	X	
Alternative fuels.	X	
Driver training, Speed reduction.	X	
Infrastructure provision, e.g. intermodal terminals, freight villages, rolling stock		X
Subsidies to intermodal (combined) transport.		X
Pricing measures (toll)	X	X
The development and diffusion of more efficient vehicles (including by means of changes to weights and dimensions legislation).	X	X
Improved logistics and fleet management.	X	X

The table shows that the measures addressing truck energy efficiency can be generally classified in:

- Measures primarily related to HDV CO_2 performance and/or purchase decisions by fleet operators.
- Measures affecting the operation of HDVs.
- Eco driving and use of alternative fuels.

Measures affecting modal shift can be classified in:

- Infrastructure provision of intermodal equipments and technologies
- Subsidies and incentives to intermodal transport

A different group of measures may act conjointly on improving truck energy efficiency and modal shift:

- Operational measures and intelligent transport systems, e.g. efficient routing, vehicle tracking, traffic management and control
- Pricing (toll) on trucks, tailored in function of energy efficiency targets
- Regulation on vehicle dimension and weighs

In such a case, disentangling the impacts (measure contribution) to energy efficiency and modal shift separately is not always easy. Besides, concerning modal shift measures, in some case the ultimate unintended impact of the above measures could be a modal shift from rail or more environmental friendly transport modes to road. For example, regulations on vehicle dimensions and weight, e.g. allowing longer and heavier vehicle, may have a beneficial role to play as they are more efficient in transporting freight than smaller vehicles. However, this improvement could be counteracted to an extent depending on the degree to which longer vehicles divert traffic from less greenhouse gas emitting modes of transport (modal shift from rail) and the size of rebound effects due to reduction in transport operating costs. The rebound effect, i.e. the growth of transport flows by trucks is also likely to be operative in case of improvement of truck traffic management and logistics.

Independently from the prevailing impacts on truck energy efficiency and modal shift, there are important factors influencing the efficient implementation of specific policies and measures, as demonstrated by the analysis of the national case studies carried out in this report, which can be classified in the following categories:

- **Industry and market structure**: the opposite poles are a fragmented industry, characterised by a large number of owner-drivers and small independent operators running 1-5 trucks, rigid 2- and 3-axle, on the one hand, and a larger, consolidated structure, with technologically advanced trucks, on the other. Concerning the rail industry, important when the potential of modal shift measures is considered, the opposite poles range between a weak railways industry, having problems with long delays, load damage and theft, on the one hand, and a modern rail industry, able to compete with the road freight sector.
- **Regulations and market competition**. The regulatory environment is a fundamental factor in industry efficiency. The opposite poles are characterised by a complex, over regulated market, lacking transparency and accessibility (competition), on the one hand, and a less regulated and efficient market, allowing competition between different operators and the presence of efficient logistics services.

In this report, market structure and the bundle of rules and regulations represent the framework for the interpretation of policies and measures, particularly relevant with reference to the differentiation between OECD and non OECD countries.

3. Experience from the Eight Individual Countries

The following table shows for each national case study: a) the reference country, b) the object, b) the typology of policy/measure, d) the prevailing topic addressed.

Table 4: Overview of the eight national case studies

Country	Object	Type of policy/measure	Topic addressed
1.Switzerland	Distance related fee for trucks (LSVA)	Pricing	Modal Shift/Energy efficiency
2. India	Facilities for Intermodal Transport	Infrastructure provision	Modal Shift
3. USA	System of incentives and technical assistance	Incentives	Modal Shift/Energy efficiency
4. Japan	Mandatory efficiency standards	Regulation	Energy efficiency
5. China	Technical assistance and technology testing	Technical measures	Energy efficiency
6. Colombia	Fleet renewal	Vehicle purchase, subsidies	Energy efficiency
7. France	CO_2 reduction	Voluntary agreements	Energy efficiency
8. Thailand	CNG fuel promotion	Alternative fuels	Energy efficiency

The criteria underlying the selection of the national case studies have been set up with the aim to ensure a) a wide geographical coverage, b) a comprehensive reference to the most important policies and measures.

From the geographical point of view, the case studies relate to four OECD countries and four non OECD countries. Concerning the OECD countries, there are two European countries: France and Switzerland and two countries located in the western and in the eastern part of the globe (respectively USA and Japan). The non OECD countries include the Latin-American continent (Colombia), two of the fast developing countries in Eastern Asia (China and India) and Thailand in South-East Asia.

The typology of policies and measures addressed provides a balanced mix of supply-side (technical measures, incentives to fleet renovation, etc.) and demand side measures (pricing and infrastructure measure[1]).

With reference to the truck energy efficiency and modal shift topics, it must be stressed that in some case the impacts of the national case studies' measures and policies are manifold, addressing both truck energy efficiency and modal shift policies.

In particular, this is the case for the following case studies:

- Pricing schemes in Switzerland, aiming at improving truck efficiency, through the differentiation of tolls according to the HGV emission classes, and modal shift, making the rail transport more convenient.
- Infrastructure provision in India, favouring modal shift through investment in intermodal transport, and improving at the same time the efficiency of the freight road transport segment of the chain.
- The SmartWay programme (USA), for which a programme aiming at supporting intermodal transport, i.e. using rail transport over big distances, is part of a more general national policy and measures addressing also truck efficiency.

For the most part, the case studies represent national policies, funded by government, as in USA, Japan, France, Switzerland, Bolivia and Thailand. In other cases, China and India, the measures must be intended as stand-alone example of good practices (India) or preliminary tests to the adoption of further national programmes (China).

[1] Infrastructure measures are usually classified among the supply side measures. However, in the context of the Indian national case study their impacts are mainly devoted to influence the transport demand (modal shift).

3.1 The context

The heterogenic geographic distribution of the case studies, e.g. different national GDP levels and cultural background, naturally can lead to different national contexts.

In 2011, in terms of national GDP per capita level, estimated at purchasing power parity in 2005 US constant $, the variability range among the national case studies is wide: between 42,486 $ in USA and 3,203 $ in India (see the next table).

Table 5: 2011 GDP per capita, PPP (constant 2005 international $)

Country		2011
United States	USA	42486
Switzerland	CHE	39412
Japan	JPN	30660
France	FRA	29819
Colombia	COL	8860
Thailand	THA	7635
China	CHN	7418
India	IND	3203

Source: World Bank, 2012

Data on GDP per capita show how the inclusion in the OECD country club makes the difference: the non OECD countries show on average smaller GDP per capita level by a factor of ten compared to the OECD countries.

The road freight market structure and competitiveness of the non OECD countries suffers of the following common problems.

- Road freight transport is the main mode of transport, with a low penetration of integrated logistic services. The industry's market structure is complex and fragmented, with owner-drivers and small independent operators accounting for more than 70 percent of the fleet. In general, there are only a handful of large, technologically oriented operators, serving the national and international segment of the market where they are permitted.

- In such markets, the role of intermediaries is important. Due to complex customs formalities, commercial procedures, and transit logistics, the role of intermediaries at ports of entry and destination offering service and liability for road cargo is essential. Intermediaries fall into three main groups: a) public sector intermediaries, b) private multinational transport groups, and c) privately owned transport enterprises. National public sector intermediaries largely survive at the margin of the transport chain, often with the help of local shippers' councils or subsidies. Private sector multinational transport groups control a large share of developing countries' freight-forwarding and clearing business and are ready to invest locally when the commercial, fiscal, and

financial prospects are favourable[2]. Transport enterprises privately owned by nationals are active in ship agency, clearing, forwarding, stevedoring, port handling, and road transport. Although some of these companies perform efficiently and profitably, their responsibility towards clients is poor, their financial situation weak and their international market coverage low.

- Freight vehicles tend to be smaller rigid vehicles with low fuel efficiency (two- and three-axle rigid trucks, 15-20 years old with 5-10 tons capacity load). These older trucks tend to consume more fuel. New, larger, and technologically advanced trucks are very costly in these countries, and capital is scarce and expensive. Fleet renovation proceeds at slower rates and governments incentives to promote change are necessary.

- Road freight transport fees are flexible and usually offer the best value in the market, compared to the other transport modes. But its product, as measured by ton/kilometer produced, can be expensive, as shown in the next table for a sample of countries related to the case studies.

Table 6: Truck performance (US cent per tkm)

Country		2011
Colombia	COL	16
France	FRA	7-9
China	CHN	4-6
Thailand	THA	3-8
United States of America	USA	2.5-5
India	IND	1.9-2.7

Source: World Bank, 2009

- Market regulation leads in general to non-efficient solutions: highly competitive for small operators (India, Thailand), producing low margins, with overloading and safety side-effects, to over-regulated structure not open to international operators (Colombia).

3.2 Objectives

The objectives of the national case studies are the following:

1. Swiss case study. Pricing: Distance related fee for trucks (LSVA). The LSVA is the Swiss-wide distance-related fee for Heavy Goods Vehicles (HGV). It started on January 1st 2001. The LSVA is applied to trucks more than 3.5 ton. on the whole road network of Switzerland. The main objectives are: a) shifting heavy vehicle traffic from road to rail and increasing the rail's competitiveness (modal shift) b) reducing the uprising trend in km travelled by trucks, c) fleet renovation; d) truck efficiency.

[2] This is what happened in Thailand, in the freight transport industry after the liberalisation of retail trade services in 1997. The modern trade businesses have dominated the domestic consumer goods freight by using efficient supply chain management and sub-contracting the transport function to a local haulage company. Being transport operators only, Thai freight firms gain a small profit margin and cannot develop their capacity to compete in the logistics and supply chain management market. (Narong , P. et al. 2011)

2. Indian case study. Infrastructure provision. The case study (investment in combined transport infrastructure) is rooted in the policy statements and Plan documents with which government has recommended that the Railways should be given the lead role in the transport sector because of their greater energy efficiency, eco-friendliness and relative safety. The main objectives are: a) to improve the institutional framework for efficient and competitive container transport to serve both foreign and domestic trade; b) to improve the service level and capacity in the main freight corridors by providing modem technology rolling stock to permit regular scheduled block train operations on gateway port corridors, c) to determine transport cost reduction.
3. American case study. The SmartWay programme of incentives and technical assistance. The United States Environmental Protection Agency (EPA) launched in 2004 a program that reduces transportation-related emissions by creating incentives to improve supply chain fuel efficiency. The main objectives are: a) for long distances, increase the share of freight carried by intermodal transport, that can cut fuel use and greenhouse gas emissions, compared to truck-only transport b) reduction in truck fuel consumption, c) reduction in truck pollutant emissions; d) transport efficiency.
4. Japanese case study. The "top runner" programme (Japan). In 2006, Japan developed the first fuel economy standard for HDVs with penalties that take effect in 2015. Japan chose 2015 as the target year and developed target values in each category (tractors and the other trucks) based on the top-runner approach. The main objectives are: a) reduction in truck pollutant emissions, b) reduction in truck fuel consumption, c) truck speed reduction.
5. Chinese case study. The Green Trucks Pilot Project. The pilot project started in 2009 with the aim to analyse the truck sector through research, survey (43 companies and 1038 drivers interviewed) and technological pilot; the main objectives are: a) reduction in truck fuel consumption, b) reduction in truck pollutant emissions; c) road transport cost reduction.
6. Colombian case study. The Colombia fleet renewal programme. On October 2007 the National Policy for Public Road Freight Transport Rationalization, launched a programme aimed at the renovation and the modernization of truck fleet. The main objectives are: a) accelerate the fleet renovation rate, b) reduction in truck fuel consumption, c) reduction in truck pollutant emissions.
7. French case study. The "Objective CO2"programme. In France, in 2008, industry representatives, under the auspices of the Ministry for the Environment, signed the "Hauliers commitment to CO2 reductions" charter. The programme is developed by the Ministry of Ecology and ADEME (French Environment and Energy Management Agency), in collaboration with the main professional organizations. The main objectives are: a) reduction in truck fuel consumption, b) reduction in truck CO2 emissions, c) improve the CO2 and energy performance of road carriers
8. Thai case study. CNG fuel promotion. Since 1984, cleaner fuels as CNG (Compressed Natural Gas) have been developing in Thailand mainly in order to reduce the high pollutant emissions from transport activities, particularly in the Bangkok area. The main objectives are: a) accelerate the fleet renovation rate, b) reduction in truck fuel consumption, c) reduction in truck pollutant emissions.

3.3 Management

The several approaches to manage the above mentioned national policies and measures can be classified in two main categories, according to their geographical scope.

1. Management at national level
2. Management involving the regional and local level

In the former case, the management of the policy (usually a national multi-annual programme) involves generally ministries and governmental agencies, with the occasional participation of transport stakeholders (operators, manufacturers).

In the latter case, the management involves regional agencies with an indirect support of national government.

More specifically, in the former group of case studies, the management of the Colombian, Japanese and Thai transport national policies has involved a complex network of ministries: Ministry of Transport, of Commerce, Industry and Tourism and of Finance (the Colombian fleet renovation programme), Ministry of Natural Resources and Environment (MNRE), the Department of Land Transport of the Ministry of Transport, Ministry of Finance in the Thai policy (CNG fuel promotion) and Ministry of Economy, Trade and Industry (METI) with the support of the Advisory Committee for Natural Resources and Energy, the subcommittee for Energy Efficiency Standard, in the Japanese "top runner" programme.

The reasons underlying the complex and high-level institutional involvement rely on the implications of the transport national programmes, well beyond the transportation domain, and enlarged to energy, finance, social and industrial policy areas. Namely:

- the Thai CNG fuel promotion concerns subsidies to energy sources, which in turn represent input to national industrial processes, with implications on national budget constraints.
- the Colombian fleet renovation programme involves subsidies (financial constraints), with relevant social and economic implications, i.e. providing incomes to truck owners and influencing their operational activity and the national freight distribution. The Japanese "top runner" programme affects the national industrial efficiency and competitiveness, through the mandatory efficiency standards regulation in the industrial sectors.

The same broad implications can be found in the Swiss truck pricing schemes, which is administered by the Swiss Federal Customs Administration and the Federal Office for Spatial Development, whose implications mainly address transport efficiency aspects (favouring a better vehicle utilization) and infrastructure planning (funding the construction of rail and road network).

The American SmartWay and the French "Objective CO2" programmes, which are supported by a strong involvement of truck operators companies and manufacturers, reduce in such a way the need of a complex institutional involvement. The institutions managing the programmes are the US Environmental Protection Agency (EPA) and the French Ministry of Ecology and Sustainable Development, supported by ADEME (the French Environment and Energy Management Agency).

Concerning the second group of management approaches, with a lower geographical scope (mainly local or regional), the management of the projects can be supported by international agencies (the World Bank), in association with local administrations and transport stakeholders, like the Guangdong province authorities in China (the Chinese Green Trucks Pilot Project) and the CONCOR, the Container Corporation of India in the Indian infrastructure provision case study.

3.4 Energy efficiency and modal shift results

The following table shows the key impacts by each type of national measure. In order to facilitate comparison, when data are available, two columns have been considered: the gains in absolute values and the impacts in % values. The table highlights the reduction in energy consumption, emissions of pollutants and CO_2 emissions, which can be reached either through measures and policies addressing the truck energy efficiency or through measures diverting transport flows from road to more environmental friendly transport modes (usually, rail transport).

Table 7: National case studies key impacts (ex-post evaluations)

Country	Object	Topics addressed	Gains	Impacts	Comments
1.Switzerland	Distance related fee for trucks (LSVA)	Modal Shift/Energy efficiency	-15,949 millions of tons/year of CO_2	Energy = - 4.3% NOx = -13.5% PM10 exhaust= -18.4% PM10 non exhaust= -4.7% CO2 = -3.7%	Aggregated data truck/40 t and rail over the period 2001-2008 (annual data)
2. India	Facilities for Intermodal Transport	Modal shift	-1,200 millions of tons/year of CO_2 -24 million/litre diesel -2.5 million ton CO_2		Only truck savings Annual data estimated on the freight corridor
3. USA	System of incentives and technical assistance	Modal Shift/Energy efficiency	-2,300 .5 million metric tons CO_2 -235,000 tons of nitrogen oxides (NOx) -9,000 tons of particulate matter (PM).		Only truck savings Data calculated along the 2004-2011 period (annual data)
4. Japan	Mandatory efficiency standards	Energy efficiency		-21.7% in l/km	Only truck savings Data calculated along the 1995-2005 period
5. China	Tire and aerodynamics equipment	Energy efficiency	- 10,500 millions of tons/year of CO_2 - 10.8 liters/day saved - 0.23 kg PM10/day	-6.7% litres saved	Test on long-haul HGVs per day data
6. Colombia	Fleet renewal	Energy efficiency	-276,000 tons/year of CO_2		Only truck savings Data related to the 2008-2011 period, Extrapolated to the 2013-2030 period

					(annual data)
7. France	CO_2 reduction	Energy efficiency	-660,000 tons of CO_2 and 160 million of litres of fuel		Potential gains calculated along the 2008-2013 period annual data-
8. Thailand	CNG fuel promotion	Energy efficiency	-1 million of CO_2		Only truck savings Data estimated along the 2006-2008 period – annual data -

The ex-post evaluations national case studies have been carried out according to different approaches and hypothesis.

In the Swiss case, for instance, the ex-post evaluation has concerned data in % values compared to a standard reference year[3], while in others absolute gains with reference usually to a short period (three/four years) have been reported (the American, Thai, Colombian, French and Japanese cases).

The assessment of the overall energy gains in the national case studies addressing modal shift is difficult to determine. A part from the Swiss case, which presented aggregate ex-post evaluations (including rail and road), the Indian case only reported the impacts from the reduction in the road freight transport.

The different sample of truck involved in the national case studies makes the comparison in terms of absolute gaining difficult.

In relative terms, assuming the calculation by an individual truck, the gaining from the implementation of energy efficiency measures ranges between 4.5-7 CO_2 ton per year and 1700-2100 litres of fuel.

3.5 Market transformation

Market transformation represents a different approach to evaluate the effectiveness of policy/measures; which is based on their capability to develop new market products, rather than to reduce fuel consumption, emissions, or diverting traffic from road towards more environmentally friendly transport modes.

Test trials at regional scale, as the Chinese case study, or suited to individual freight corridors, as the Indian case study, do not reach the critical mass to determine the development of new products.

In some case, as for national policies based on the commitments of stakeholders, the capability to shape the markets depends on the degree in which transport operators and industry support the policy.

In Colombia, the rate of renewal of the truck fleet depends on the efficiency and transparency of the procedures for reimbursement. In Thailand, only the long term sustainability of energy subsidies could support the growing number of trucks fuelled by CNG and the corresponding presence of new truck manufacturers willing to enter in the market.

[3] Absolute data estimated using the average CO_2 emissions per truck (direct and indirect) from the TREMOVE database

In the French and American national policies, the number of voluntary commitments of operators is the key factor to ensure the market transformation.

In case of the definition of mandatory standards (e.g. the Japanese top runner approach) as well as for the modification of the economics of freight transport services, as in the Swiss HGVs charging system, the effects in terms of market transformation could be significant, depending on the type of policy/measure.

For instances, in Japan, the top runner standard has contributed to shape the market; by setting a clear market direction, by removing private risks in investing in more efficient vehicles and thus accelerating the technological change. It should be stressed, however, that the objective of the "top runner approach" is to promote competition toward energy savings solutions rather than regulating the market. In fact, by imposing obligations to each manufacturer, competition occurs between manufacturers to introduce advanced technologies: all manufacturers except the ones that are above the standard have to make efforts to improve fuel efficiency, but, at the same time, even if the standard is not meet, there is not an immediate penalty to the manufacturer.

In the Swiss case, the market transformation caused by the new HGVs fee basically has concerned the truck fleet composition and the number of trips. The decrease in the number of transalpine road freight journeys observed until 2006 is due both to the HGVs new fee and the higher weight limit. Because of the change from a flat-rate charge to a distance-related charge, foreign vehicles could no longer cross Switzerland for a token sum of 40 Swiss francs, but had to pay an amount that is about 8 times higher. This significantly higher transit price is only worthwhile for efficient vehicles carrying full loads. This has been reflected in changes to the composition of vehicle fleets. In the first years of the new regime, there was an extraordinary increase in the number of semi trailers. This development was compensated by an even more pronounced drop in the number of lorries. The number of goods vehicles with trailers remained virtually constant. These shifts were clearly due to the higher weight limit. The traffic that was diverted out of Switzerland because of the lower weight limit, and which moved back when the weight limit was increased, is almost exclusively composed of semi-trailers. At the same time, journeys with lorries were replaced by journeys with semi-trailers, because the latter allow an optimum use of the higher weight limit. This second reason has also explained the significant decrease of the number of lorries. Due to the shift from light lorries to heavier semi-trailers, the weight loaded per vehicle has increased considerably. Summing up, the market transformation has advantaged the hauliers with big fleets, able to make a better use of logistics (fewer empty trips).

3.6 Problems and adaptation

The following table summarises the problems encountered in the implementation of the national case studies. The column "Comments" provides additional information, ancillary to the interpretation of the challenges.

Country	Object	Topics addressed	Problems	Comments
1.Switzerland	Distance related fee for trucks (LSVA)	Modal Shift/Energy efficiency	Low modal shift to rail	Modal share of rail in Switzerland is traditionally high: overall: 40%. In transalpine transport: 65% •Higher weight limit for trucks
2. India	Facilities for Intermodal Transport	Modal shift	Consolidation of the market position after the project completion	The project has provided technical know-how to the national container operator transport
3. USA	System of incentives and technical assistance	Modal Shift/Energy efficiency	Lack of direct verification of the impacts	In order to calculate the SmartWay program emission reductions, the programme management relies on self-reported industry data.
4. Japan	Mandatory efficiency standards	Energy efficiency	To include the life cycle assessment of the products in the standards.	The aim is to develop "the world best energy product". Therefore the methodology for the assessment must be comprehensive.
5. China	Tire and aerodynamics equipment	Energy efficiency	Procedural and technical problems in testing the results	In particular, concerning data harmonization and data collection issues.
6. Colombia	Fleet renewal	Energy efficiency	Programme management, transparency of	Truck owners complaint the lack in the allocation

Country	Object	Topics addressed	Problems	Comments
			reimbursement procedures	of funds after the "scrappage"
7. France	CO_2 reduction	Energy efficiency	Voluntary agreements, uncertainties on the future trends	The success depends on companies willingness to support the programme and the reliability of self reported results by carriers, as in the USA case
8. Thailand	CNG fuel promotion	Energy efficiency	Problems in supply adaptation to market CNG demand	Problems in conversion technologies and fuel quality

Adaptation plans to face the problems require:

a) the definition of a comprehensive strategy (infrastructure provision) to ensure the continuation of the project positive outcomes after the completion of the project (modal shift in the Indian case study) and broader reforms in the energy sector (the Thai case study)
b) the improvement of the procedural and administrative aspects of the programme, as in the Colombian case study (public administration accountability) and the American case study (methods of verification).
c) the enlargement of specific technical aspects of the programme, extended to life-cycle product analysis (the Japanese case), data collection and harmonization (the Chinese case study).
d) the continuation of the willingness to support the programme from transport operators and stakeholders (the French case study)
e) constraints to the further improvements from national legislation and/or natural barriers, as the attainment of additional modal shift to rail transport.

3.7 Accompanying measures

The accompanying measures to improve truck efficiency and modal shift policies fall under three categories, corresponding to three different levels of complexity (in decreasing order):

1. Accompanying measures involving socio-economic domains outside the direct measure/policy field of application, i.e. addressing broader transport, energy and social policies, departments, Ministries, etc.
2. Accompanying measures involving other programmes and actions in the same area of application of the policy/measure, e.g. the energy efficiency national plan.
3. Accompanying "stand alone" measures that do not necessitate the implementation of specific programmes.

The following case studies belong to the first category (high complexity accompanying measures)

- The Colombian national policy on fleet renewal, which is part of an overall strategy with which the Government of Colombia is trying to develop the necessary institutional capacities in the public sector to address the inefficiencies and suboptimal performance of the transportation sector in the country. This effort also includes policies to increase the efficiency of freight transport, such as the National Logistics Policy, which establishes an action plan to address institutional, data, infrastructure and operational weaknesses towards the development a more efficient national logistics system.
- The Indian project on improving the competitiveness of intermodal transport, part of an overall strategy consistent with the Government of India's long-term investment objectives in the transport and social sectors for a) removing bottlenecks, b) increasing capacity, c) conserving energy, d) completing ongoing work, e) maximizing asset utilization; f) paying special attention to development of rural areas.
- The Swiss HGVs charging policy, an important component of the strategy to funding the rail infrastructure provision as the new transalpine rail tunnels through the Gotthard and Lötschberg, aiming at promoting combined transport and introducing competitiveness in rail industry.

The following case studies belong to the second category (medium complexity accompanying measures):

- The American SmartWay supply chain programme, which is part of a four programme package including: 1) the SmartWay Technology Program: a testing, verification, and designation program to help freight companies identify equipment, technologies and strategies that save fuel and lower emissions. The program includes Heavy Duties testing, technology verification and the certification of technologies as 'smartway', 2) the SmartWay Finance Program: a competitive grant program that makes investing in fuel-saving equipment easier for freight carriers. The program includes innovative loan and financial mechanisms, 3) the SmartWay Vehicles: a program that ranks light-duty cars and small trucks and identifies superior environmental performers with the SmartWay logo. 4) the SmartWay Brand Marketing: a program producing multi media campaigns, educational materials, annual reward.
- The Japanese "top runner" accompanying measures are included in the METI programme, creating the Energy Saving Labelling Programme, which is based on the Japanese Industrial Standard (JIS). The label includes a symbol that shows the degree of energy-saving standards of a particular product, the energy-saving standard achievement rate, the energy consumption efficiency and the target per fiscal year.

The following case studies belong to the third category (low complexity accompanying measures):

- The Chinese case study, in which accompanying measures concern institutional communication of the project methodology and results. Dissemination results involved the participation to the Environmentally Sustainable Transport (EST) Forum in Bangkok in August 2010 and Better Air Quality Conference in Singapore (2010) with 600 policy makers and practitioners.

- The French case study accompanying measures concern the following topics: a) preparatory measures, e.g. to check the control and monitoring of several operational data, including what human, financial and organizational needs are required; b) evaluation measures, e.g. making the diagnosis CO_2, evaluate potential gains in fuel consumption, CO_2 emissions and return on investment by the implementation of actions; c) data validation measures, e.g. validating data and the commitments by ADEME; d) reporting measures; e) training schemes, e.g. providing in-company training (eco-driving), updating skills being able to adapt to changing tasks and new technologies.

3.8 Implementation costs and Benefits Arising from policy and energy efficiency measures

Implementation and financial costs are not available for most of the national case studies. When available, the classification is not homogeneous, as shown in the following table.

Table 8: Implementation costs and their breakdown

Country	Object	Topics addressed	Implementation costs breakdown	Comments
1.Switzerland	Distance related fee for trucks (LSVA)	Modal Shift/Energy efficiency	Implementation costs were within the credit limit of 100 Million EUR, plus another 50 Million EUR for the free distribution of the OBU. Operations costs are 4-6 % of revenues	Assuming average revenues of about € 1 billion/year, operation costs amount to about € 50 million
2. India	Facilities for Intermodal Transport	Modal shift	The total cost is about € 116 million, of which 10% training and capacity building	The project has been financed through bank grants up to 30%
3. USA	System of incentives and technical assistance	Modal Shift/Energy efficiency	Total grant amounts to about € 50 million	Funds allocated in 2011 by the Diesel Emission Reduction Act (DERA)

In terms of cost effectiveness, the following table shows the ratio € spent per ton of CO_2 saved in the two case studies for which data availability allows the comparison: the Indian and the American case study. In both cases, in fact, the ratio can be calculated due to the availability of the ex post evaluations of the annual saved ton/CO_2 (respectively from modal shift and from the implementation of incentives and technical measures) and the amount of resources spent.

Table 9: Comparisons of cost effectiveness for ton CO_2 saved.

Country	Object	Topics addressed	Cost/tCO_2 saved (€/tCO_2 annual)
1. India	Facilities for Intermodal Transport	Modal shift	44.9
2. USA	System of incentives and technical assistance	Modal Shift/Energy efficiency	21.2

The lower cost effectiveness of the Indian case study can be interpreted in the light of the higher costs needed for infrastructure provision.

4. Transferability of policies and measures

The analysis of the most important pre-requisites as conditions of application of the policies and measures leads to the following considerations:

Country	Object	Conditions of application
1.Switzerland	Distance related fee for trucks (LSVA) Focus on modal shift/energy efficiency	The project has benefited from the existence of an efficient organizational background, the Swiss Customs Authority, providing the administrative backbone for an efficient implementation, e.g. personnel, technologies.
2. India	Facilities for Intermodal Transport Focus on modal shift	Setting clear, focused and realistic objectives, taking into account of the operational and institutional constraints, e.g. fragmented market, inefficiencies of rail operators
3. USA	System of incentives and technical assistance Focus on modal shift/energy efficiency	The Program best suits to countries where the road freight market is not highly fragmented; in which is possible to target the most important companies (in terms of better technological endowment and market share).
4. Japan	Mandatory efficiency standards Focus on energy efficiency	In order to be effective, all products included in a programme similar to the "Top runner approach" should have technological potential for efficiency improvements. The programme works best in countries, as Japan, where following conditions apply: -The Market structure has quite limited number of domestic producer; -The manufacturers generally have high technological competence; -Standards can be accepted even without strict monitoring and sanctions (favourable cultural background).

Country	Object	Conditions of application
5. China	Technical assistance and technology testing Focus on energy efficiency	The identification and involvement of companies that are considered leaders in the sector.
6. Colombia	Fleet renewal Focus on energy efficiency	The pre-conditions of application are the following: -Transparency and efficiency in the institutional management of programme e.g. procedures for allocating compensations, required documentation to truck owners, etc. -Rules and regulations prone to facilitate market entry and competition. -A diversified road freight market structure, with the presence of a network of large, medium and small freight operators, in order to favour the uptake of new technologies and truck fleet upgrading.
7. France	CO_2 reduction Focus on energy efficiency	In general, it appears that the scheme could easily be replicated in similar contexts. An important factor is the presence of a public independent agency to monitor and implement the process.
8. Thailand	CNG fuel promotion Focus on energy efficiency	The conditions of application are the following: - Fiscal and budget equilibrium, the subsidies to alternative fuels must be consistent with a sustainable and long-term financial equilibrium and non-distorted energy prices -Technological development, which may favour the implementation of cost-effective equipments for conversion to CNG -Market structure, to the extent that the presence of an efficient freight industry, e.g. a network of competing freight operators with sound balance sheets, can favour investment and technological upgrade of vehicles.

The pre conditions shown in the above table can also be interpreted as pre-requisites for transferability of the measures, in the light of two important factors already stressed as relevant framework conditions for the adoption of measures for improving truck energy efficiency and favouring modal shifts.

Namely:

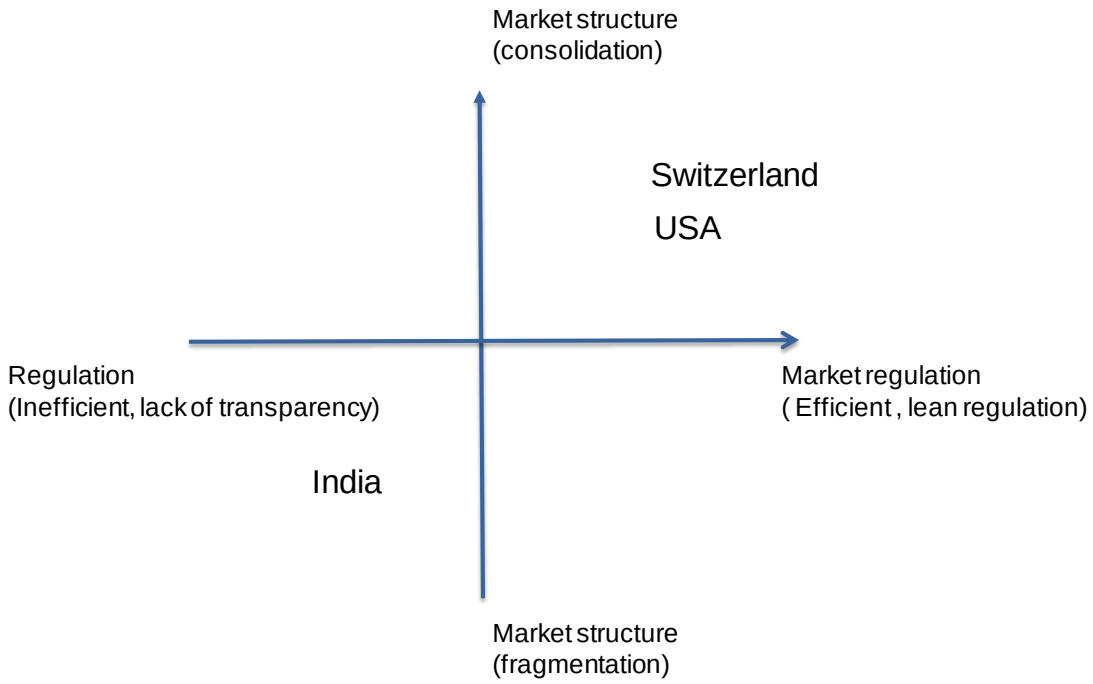
- the industry and market structure (fragmented and less developed industry, from a technological and financial point of view, opposed to a consolidated market structure, with efficient and diversified operators)
- the regulative framework (small, lean and efficient regulation and administration, opposite to over regulation, inefficiency and lack of transparency).

The following figures, drafted separately for the case studies addressing prevailingly modal shifts measures and truck energy efficiency measures, allow the classification of the national case studies according to their position with reference to two axes:

1. market structure (fragmentation vs consolidation), on the vertical axis;
2. regulation (efficient, lean regulation vs inefficient, opaque, regulation) on the horizontal axis.

The position of the national case studies in the quadrants emerging from the combination of the two axes of market structure and regulative framework provides the indications of the most important pre-conditions for the transferability of policies and measures, as specified in the following figures.

Figure 2: Modal shift policies: transferability framework

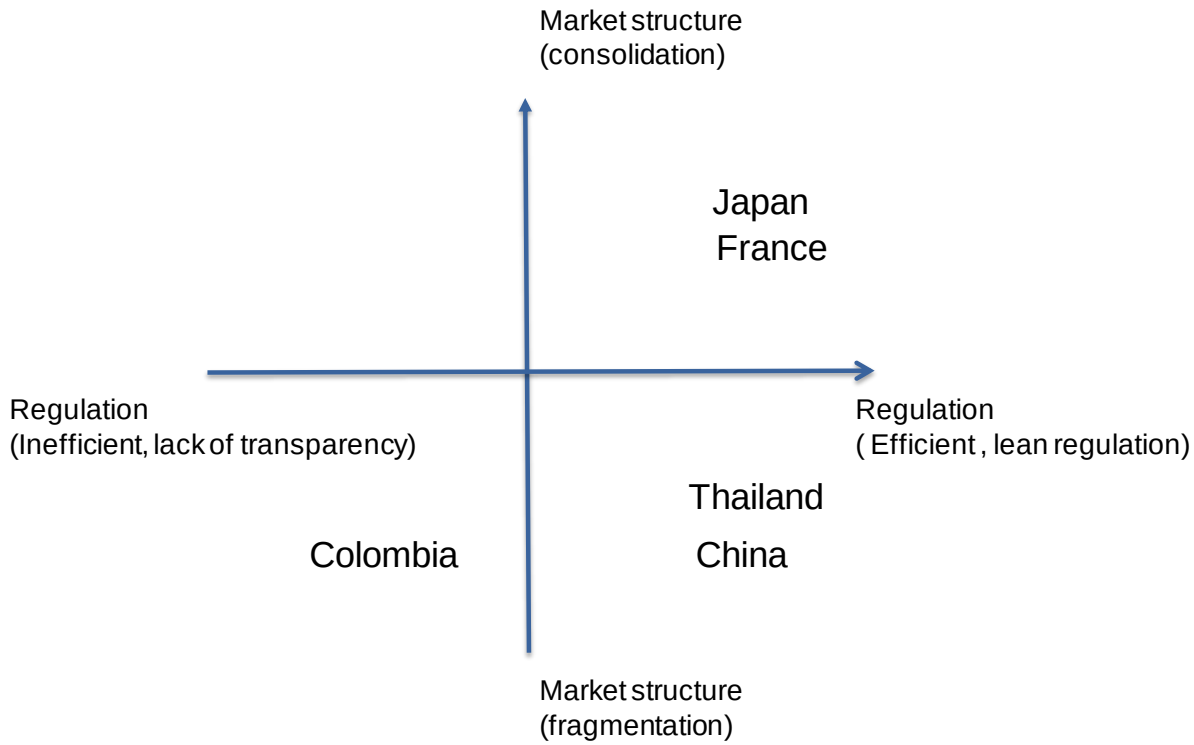


Policies favouring prevailingly modal shift policies, respectively characterised by the implementation of complex pricing schemes and systems of incentives, as in the Swiss and American case study[4], need a system of rules and regulation allowing competition among transport operators and transport modes, accommodating the decisions of transport operators in terms of resource allocation in the rail and road freight markets.

[4] It should be stressed, in fact, that the Swiss distance related LSVA and the american Smartways policies also address the improvement of truck energy efficiency

Infrastructure provision policies in contexts characterised by market fragmentation and lack of transparency, as in the Indian case study, need as pre condition of transferability the support of an institutional level (administrative, financial), which is able to overcome the barriers (e.g. insufficient development of rail services).

Figure 3: Truck energy efficiency policies: transferability framework



Concerning the measures addressing truck efficiency through programmes involving stakeholders (operators and manufacturers) as in the Japanese and French cases, either mandatory (Japanese case) or voluntary (French case), the preconditions for transferability are a consolidated market structure, with a limited number of leading industries and an efficient administrative and regulative context, both for enforcement and standard acceptability.

The development of alternative fuels, as in the Thai case, requires the presence of a network of competing operators in the context of an efficient market regulation (also addressing the energy market), in order to favour the technological upgrade of trucks and/or investment of new operators (truck manufacturers). Technical assistance and test trials, as in the Chinese case study, require the identification of companies and operators leader in the sector, whose technological performances take-up may be supported by the presence of consolidated and diversified market structure.

Truck fleet renewal through scrappage programmes, as in the Colombian case, require the set up of efficient regulation (monitoring of the programme, management of rebates and reimbursement).

5. Lessons learned

The analysis of the national case studies has shown that policies and measures addressing the improvement of truck efficiency and modal shift from road to rail are cost-effective. The gaining from the implementation of energy efficiency measures ranges between 4.5-7.5 CO_2 ton per year and 1700-2100 litres of fuel per truck. Where data are available, as in the case of the French and the American case studies, cost/effective ratio of the measures range between 0.4 and 0.8. Measures involving relevant infrastructure investment may raise the ratio, as in the Indian case study due to the significant capital investment.

The analysis has also shown the importance of the national market structure and regulative frameworks for the interpretation of policies and measures pre-conditions of transferability.

Different patterns can be observed in OECD and non OECD countries.

In OECD countries, a large proportion of freight is transported by small companies, but the trend is for increasing consolidation and a growing market share for large operators. Consolidation is driven by factors like the presence of large shippers and logistics service providers, creating market opportunities. Competition and integration between the road freight operators and a mature rail industry is another factor enabling modal shift policies.

In non-OECD countries, the combined effects exert by the pressure of several interest groups and associations, and in general the presence of a less developed transportation systems and logistics management can disrupt service and cause excessive handling, delays, and costs. The industry's market structure is complex and fragmented, with owner-drivers and small independent operators accounting for more than 70 percent of the fleet. The fragmented market structure also includes large, dominant firms in monopolistic market segments, having access to technologies and resources. The rail sector in general does not compete with trucking, except in some countries like China where the rail sector competes with roads in some regions

The regulatory framework is an important factor in determining the road freight efficiency. To set fairness access to markets, cost-effectiveness and balanced market regulations are in fact essential to ensure economic growth, safety standards and sustainable development in the industry.

In non-OECD countries, the presence of vested economic interests and institutional barriers impede economic efficiency and restrain competition. In OECD countries, the regulatory framework is set up at a level that in general ensures competition and a level playing field among operators.

The implications in terms of transferability of policies and measures are the following:

- Measures which require the presence of an efficient institutional sector are needed in context, like India and Colombia, characterised by lack of transparency (the efficient administration of the renovation truck fleet programme in Colombia) or market competition (modal shift policies in India). In particular when the development of the rail industry is scarce (India)

- Measures supporting market development, in terms of actors and competition, are required in presence of policies aiming at favouring the up-take of new fuels and technological upgrade (Thailand and China)
- Administrative accompanying measures, e.g. presence of independent agencies, are necessary in contexts (like France, USA and Japan) in which market competition and efficient regulation exist, together with a network of transport operators and truck manufacturers with a strong technological and financial basis.
- The presence of an efficient administrative sector is also important when extensive national pricing schemes are applied (Switzerland).

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Annex: Country Reports: China

China:
successful pilot project leads to green trucks program

Context	The Final Report on Guangzhou Pilot Project, elaborated by Clear Air Initiative for the Word Bank, highlights the high potential for energy efficiency measures in the freight sector in China underlining the following data: • The total number of diesel motor vehicles is expected to grow from around 10 million in 2005 to almost 60 million in 2035. Trucks, buses and vans (light and heavy commercial vehicles) will continue to be the dominant diesel vehicles; • Constantly from 1980 to 2006, approximately the 72% of freight is transported by highway; • Diesel costs represent the largest share of operational costs of trucks, thus there is a strong financial incentive to improve fuel efficiency. In this context, the successful implementation of Guangzhou Pilot Project has led to the elaboration and approval of a green truck programme for the whole Guangdong province.
Objective	The World Bank (WB) initiated a pilot project "Guangzhou Green Trucks Pilot Project" in support of the city's efforts to improve the air quality in preparation for the 2010 Asian Games. The ideas behind was to test a "proof of concept" able to be replicated in Guangdong Province, and possibly nation-wide. The aims of the project were to: • Enhance the fuel economy of the truck fleet; • Reduce black carbon and other air pollutants from trucks; • Obtain GHG emission savings.

Programme description

Management	The project has been implemented by the Clean Air Initiative for Asian Cities Center (CAI-Asia Center), in cooperation with Cascade Sierra Solutions, US EPA and World Bank, and with support from Guangzhou Environmental Protection Bureau (GEPB), Guangzhou Transport Committee (GTC), and Guangzhou Project Management Office (PMO) for the World Bank (WP).
Sponsors	World Bank
Beneficiaries/Target sector	Freights companies.
Mode of intervention	Built up on US Smartway experiences, the pilot project carried the four main activities: 1. Background analysis. The study analysed the freight sector numbers, growth, operations and fuel use in Guangzhou; reviewed the relevant institutions and policies in China and compared available fuel economy and emissions reduction strategies and technologies. 2. Survey of Guangzhou truck sector. The survey involved 1,040 truck drivers and 43 companies. The survey included details on the companies profiles, on the trucks used (ownership, type/size, age, brand, replacement), and the operations carried (km travelled, average speed, number of trips, route, maintenance, training, record keeping). 3. Driver training courses for fuel efficiency of trucks. The fleet managers participated in training courses on how to reduce trucks' fuel use. Objects of study were: truck specifications, technologies, route planning, maintenance and inspection and driving behaviours. 4. Technology pilot. Tyres and aerodynamics technologies were tested on ten long-haul, short-haul trucks and garbage trucks.

Follow-up	Following the good results of the pilot project, Guangdong authorities have started a three-year Green Trucks Demonstration Project in the whole province. The project, promoted by CAI-Asia and the WB, is co-financed by the Global Environmental Facility Fund and has budget of USD $14 million. Launched in 2011, the Demonstration Project will replicate and scale up the activities tested in Guangzhou city, focusing especially on ways to maximise new technologies use, favour the creation of a range of financing options and optimise the organisation of freight logistics. In addition, Clear Air Initiative-Asia has proposed nationwide Program "Green Freight China". The Program reflects the US SmartWay approach and is composed by five main activities named: Clean Technologies, Freight Logistics, Financing Mechanisms, Knowledge & Capacity, and Partnerships between government and the private sector.

Impact/evaluation

Ex-post evaluation	Ex post evaluation have been carried out in the three companies participating in the pilot: Star of the City Logistics (SOCL), Xinbang Logistics (XWBL), and Baiyun District Guangzhou. However, due mainly to the different data collection methods applied, the results of XWBL were not considered reliable, and therefore not disclosed. Most interesting, the pilot showed that Guangdong's 825,000 heavy duty trucks have the potential to reduce diesel use by 3.8 million hectolitre, CO2 emissions by 8 million tonnes and particulate matter (including black carbon) by 1.2 million tonnes each year.
Market transformation	As it was a pilot project, there was no market transformation.
Energy savings	• At Star of the City Logistics (SOCL), tyres and aerodynamics equipment were tested on 2 long-hauls HDTs. Investment costs were US$ 16,333, and annual savings are 3557 litres (6.64%), 9.18 tons CO2, 33.21 kg NOx, and 1.41 kg PM10. • For Baiyun District Guangzhou Company, tyres equipment was tested on 2 garbage trucks. Investment costs were $6320, and annual savings amount to 2520 litres of fuel (18.5%), 6.71 tons CO2, 23.53 kg NOx and 1 kg PM10. The payback period is 3.1 years, but is actually considered to be 1.5 years if the longer life of LRR tires compared to existing tires is considered.
Public costs	Are available the costs related to the technology part of the pilot project: • At Star of the City Logistics: investment costs were US$6,333, • Baiyun District Guangzhou company: Investment costs were US$6,320 • Xinbang Logistics (XWBL): not available
Problems / adaptations	The main problem encountered regarded the fragmentation of freight sector structure: the freight supply chain consists mainly by individual drivers and only 0.1% belongs to companies with more than one hundred trucks. Has represented a challenge for the pilot project also the identification of ways to compare and harmonise the data collected.
Accompanying measures	Accompanying measures regarded especially institutional communication of the project methodology and results. CAI Asia started the web-site: www.cleanairinitiative.org/greenfreight and participated at various meetings and conferences, among which the Environmentally Sustainable Transport (EST) Forum in Bangkok in August 2010 and Better Air Quality Conference in Singapore (2010) with 600 policy makers and practitioners.

Lessons and conditions of replication

The management team	The project results were achieved thanks to the collaboration of wide range of national and international institutions and private and public companies, namely Clean Air Initiative for Asian Cities Center (CAI-Asia Center), in cooperation with Cascade Sierra Solutions, US EPA and World Bank, and with support from Guangzhou Environmental Protection Bureau (GEPB), Guangzhou Transport

	Committee (GTC), and Guangzhou Project Management Office (PMO) for the World Bank
Develop a market for energy efficiency	The implementation of the project did not develop a market for energy products.
Conditions of applications	Final Report on Guangzhou Pilot Project identifies those aspects to be considered as crucial for successfully implement actions and initiatives related to the freight sector, especially in Asian countries: • Identify and involve companies that are consider leaders in the sector; • Elaborate effective and comprehensive eco-training for the drivers; • Establish clear and detailed pilot protocols for data collection.

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Country Reports: Colombia

Colombia: the fleet renovation programme

Context	The Colombia national policy case study focuses on the policy approved through the National Policy for Public Road Freight Transport (Política Nacional de Transporte Público Automotor de Carga, CONPES 3489), which has promoted, in the context of a more general package of policies (see the Accompanying measures section below), the rationalization, renovation and modernization of truck fleets. Most of the 217,000 trucks operating on Colombian roads are relatively small in size, with inefficient highly pollutant combustion engines, and an extended service age (average is about 18.4 years). 45% of the fleet is more than 20 years old and 71% of the fleet is over 10 years old. The average service age for the Colombian fleet is quite high when compared to international standards (i.e. USA average service age is 7.6 years). The high age of the fleet is partly explained by the informality of the trucking sector and the fragmentation of vehicle ownership. Less than 5% of the fleet is owned by the trucking companies. In practice, these companies become intermediaries between cargo generators (shippers) and transport service providers (carriers). Carriers are highly fragmented as 70% of the fleet is single-owned. Truck owners are hired by the transport companies through informal arrangements where the service and the pricing conditions are negotiated. In turn, the informality in labour arrangements has prevented transport companies and truck owners from internalizing the higher costs of an aging fleet. While the trucking sector generates more than 280,000 jobs, about 65% of these are informal labour relationships (inadequate access to health, insurance, pension, etc). This informality has allowed truck owners to maintain their service price competitive.
Objective	The objectives of national policy for truck fleet renovation address several topics: • Encourage business associations of transporters to improve technical standards and to offer cost efficient freight transport services • Favour the renewal of the old Colombian truck fleet (in 2008, 45% are +20 years old, 71% are + 10 years old) • Determine schemes to improve labour conditions, e.g. setting up transparent rules for hauliers employment. • Promote protection of the environment and the efficient use of fuels

Programme description

Management	The following institutional bodies are involved regarding the implementation of the truck fleet renovation programme: • The Ministry of Transport, responsible for formulating and adopting policies, plans, programs, projects and economic regulation • The Ministry of Commerce, Industry and Tourism, • The Ministry of Finance as far as the economic aspects are concerned • The Ministry of Social Protection, the Ministry of Foreign • Affairs, the Ministry of Interior and Justice, and the Department National Planning.
Sponsors	Shippers: Industrial National Association (ANDI) and Commercial National Federation (FENALCO): ANDI and FENALCO are amongst the guilds and organizations that represent the industrial and commercial sectors. These organizations could play a role for purposes of outreaching and mainstreaming the project scope to potentially interested shippers. Carriers and Truck Owners: Carriers Colombia Federation (Colfecar), National Carriers Association (Asecarga) and Carriers Association (Defencarga), Colombian Trucker Association (ACC), Colombian Transport Association (ATC),

	Colombian Trucker Federation (CCT). These organizations represent freight transportation companies and individual truck owners. These organizations have played an important role during project design to ensure a broad participation of carriers
Beneficiaries	Hauliers, carriers and truck owners
Mode of intervention	The truck fleet renewal programme has been basically implemented through a series of Transport Minister resolutions that have set rules and procedures for the truck registration and renewal. For example, the Resolution 7036, issued on July 31 2012 stated that trucks must load registered and scrapped "having a period equal or exceed 25 years from the date of registration". The requirements for registration and truck scrappage are: regular payment of taxes, no change of motor in the past four years, have no pending judicial or pledges in transit agencies, be in the range of 25 years life, have valid certificate tradition, and, most importantly, the vehicle to scrap is in good working condition. The Ministry of Transport determines the amount of the Vehicle Renovation Fund for Freight Vehicle scrappage. Compensation in 2012 were USD$ 35 million for straight trucks, $ 50 million for double trucks and $ 70 million for truck tractors.
Example of related projects	Examples of related projects are those administered under the Global Environment Facility (GEF) fund, in partnership with international institutions, non-governmental organizations, and the private sector to address global environmental issues. The GEF provides grants to developing countries and countries with economies in transition for projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants. The Low-carbon and Efficient National Freight Logistics Initiative (2012) will build on the implementation of the Vehicle Renovation Fund to support activities that result in additional GHG emission reductions, which would not happen otherwise. While the Vehicle Renovation Fund is aimed towards financing the uptake of new vehicles, funds could also support the retrofit of vehicles (trucks) in order to bring efficiencies in energy consumption and lower GHG emissions and air pollution. The proposed GEF project aims towards vehicles that are not yet at a scrapping (retirement) age, but which could be transformed to lower-carbon emitting units by installing mechanical and aero dynamical innovations to provide a more efficient operation. The proposed project will help address barriers that currently have impinged the retrofitting the aging fleet, thus lowering energy consumption and GHG emissions in road freight transport. These barriers include lack of understanding and trust (perception) of the new combustion technologies; limited financing options for covering upfront costs associated to the technological conversion; and lack of technical knowhow from the trucking owners and servicing companies that would ensure long-term maintenance of the installed technologies.
Follow-up	On 2011, at the United Nation Convention on Climate Change in Durban, the Ministry of Transport disclosed the follow-up of the Vehicle Renovation Fund for the years to come. For the period 2013-2022, about $ 130m/year are planned to be allocated to the Fund, in the context of the National Development Plan. The forecasts mention about 5,000 truck/year to be renewed, corresponding to several benefits: • Competitiveness (lower operation costs): -US$0,5b • Improved road safety: -13.000 road accidents, -600 deaths • Lower fuel consumption: -22 mill diesel barrels • Lower environmental impact: -4.7 mill tCO2, -35.000 Ton PM • Increased tax revenue (from labour (regular employed) and business development): +US$2.8b

Impact/evaluation

Ex-post evaluation	Methodology. Number of trucks scrapped after the implementation of the Vehicle Renovation Fund programme (2008-2011)

	Mode of evaluation. Country-wide ex-post assessment Source of impact analysis. Presentations from officials, e.g. Ministry of Transport, etc, and experts from international programmes.
Market transformation	Since the program began in 2008, 5,989 trucks have been scrapped, i.e. 3% of the stock. It is noted that only in the last quarter of 2012, the scrapping process achieved a record number of 599 vehicles, which demonstrates the success of the program and the interest of the Government in the implementation of the policy.
Energy savings	The modernization of the truck fleet has led to the reduction of an average of 46,800 tons/year of CO2 during the period 2008-2011, corresponding to 15 CO_2 toe. Under a business as usual (BAU) scenario, where no major policy changes are placed to formalize the industry and renew the transport fleet, road freight transport emissions would increase from 3.6 MtCO2eq in 2004 to 4.6 Mt CO2eq in 2030. In terms of future trends, the aging fleet of the ground carrier industry contributes to the sector's low energy efficiency performance and significant CO2 emissions. The transport sector represents 12% of the country's total CO2 emissions (180 Mt CO2eq per year) and 32% of the total CO2 emissions from national energy consumption. Of this, road transport accounts for about 90% of the sector's CO2 emissions. Given the current trend in the rate of renewal, the potential of mitigation amounts to 350,000 t CO2 per year.
Public costs	Administrative costs for running the programme are part of the general budget of the Ministry of Transport.
Problems / adaptations	The barriers to the implementation of the programme are the following: • Renovation fleet programs lacks of the institutional capacity at the managing agencies; compensations delay too much to reach the beneficiaries due to lack of transparency • Complex process, e.g. documentation, procedure, specifically difficult for individual owners (the majority) • Leakage due to loopholes in regulation and difficulties in controlling actual scrapping
Accompanying measures	The truck fleet modernization is part of an overall strategy with which the Government of Colombia (GOC) is trying to develop the necessary institutional capacities in the public sector to address the inefficiencies and suboptimal performance of the transportation sector in the country. This effort also includes policies to increase the efficiency of freight transport, such as the National Logistics Policy (Política Nacional Logística, CONPES Nº 3547), which establishes an action plan to address institutional, data, infrastructure and operational weaknesses towards the development a more efficient national logistics system.

Lessons and conditions of replication

Management team	The efficient implementation and management of the programme requires transparent procedures to disburse compensation in time and without misallocation. The implementation of the programme in fact raised the issue of the gap between the demand (owners willing to scrap the truck) and the supply of compensation (the owner actual receiving the resources).
Develop a market for energy efficiency	The extreme fragmentation of the freight market operators, 76% of which are physical persons, represents a barrier to the development and the modernization of the truck fleet. Only a handful of large firms with innovative technology and financial resources provide excellent services. The introduction of rules and regulations aiming at increase the number operators could lead to develop scale economies and truck efficiency.
Relevant size of the project	The relevance size of the policy is national. The implementation of the policy has involved ministries and governmental agencies at a broader level (country-wide policy setting).
A function of decision at the level of sponsors	Sponsors and stakeholders play a consultative role in the context of the general policy setting. The Ministry of Transport consults the key stakeholders (carriers, shippers and manufacturers), before demanding to the CONPES (Consejo Nacional de Política Económica y Social) the composition of the different positions.
Conditions of applications	The conditions of application are the following: • An appropriate institutional framework: transparency and efficiency in the

	management of the Vehicle Renovation Fund, e.g. procedures for allocating compensations, required documentation to truck owners, etc. • Rules and regulations prone to facilitate market entry and competition. • A diversified road freight market structure, with the presence of a network of large, medium and small freight operators, in order to favour the uptake of new technologies and truck fleet upgrading

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Country Reports: India

India: infrastructure provision

Context	Freight transport in India is dominated by the road sector with a share of 4.5 per cent in India's GDP in comparison to railways that has a mere 1 per cent share of GDP in 2004-2005. Interestingly, the increase in percentage share of transport in GDP since 1999/2000 has come from the road transport sector only. The average 10 percent annual growth of traffic volume in the road sector outpaced the overall GDP growth of 6 per cent, and it is expected to continue to do so, even with GDP being targeted to grow at 8-9 per cent in the future. It is estimated that investments in logistics infrastructure tripled from about USD 10 billion in 2003 to USD 30 billion in 2010 and is expected to grow at an accelerated rate to USD 500 billion in 2020. Increased GDP and investments in freight and logistics have translated into increased activity of trucks and light commercial vehicles on Indian roads, especially in the last two decades. Freight activity (billion tkm) in India is expected to be 9 times higher in 2050 compared with 2000 level (United Nations Centre for Regional Development, "Best practices in green freight for an environmentally sustainable road freight sector in Asia", 2011). In terms of total number of trucks, the growth expected is 15 times in 2050 when compared to 2000 levels. This growth is only matched by China. The road infrastructure improvements have resulted to a gradual shift of freight from rail to road. The share of road freight increased from around 12 per cent of total freight in the 1950s to more than 60 per cent by 2005. Experts have argued that unless a serious effort is made to reverse this trend, the share of road freight can increase to 85 per cent in the long run. This shift from rail to road has an enormous impact, because road freight transport is highly energy intensive and expensive compared to rail. The majority of India's freight (65 per cent) comprises bulk commodities and 75 per cent is transported over more than 400 km. Transporting bulk goods by rail over these distances would be more efficient and result in lower emissions and traffic accidents.
Objective	Taking into account the above context, the project (1995-2002) focuses on the provision of a suitable enabling environment for container transport to the Container Corporation of India (CONCOR) and increase the capacity and efficiency of long-haul transport of high-value general cargo, particularly related to foreign trade. The case study aims to increase container use in general cargo transport, and encourage and facilitate railway use for such transport wherever it is economically the best option. More specifically, the case study aims to: • improve the institutional framework for efficient and competitive container transport to serve both foreign and domestic trade; • strengthen the commercial and operational performance of the Container Corporation of India (CONCOR) in an increasingly competitive environment; and • improve the service level and capacity in the main corridors by providing modem technology rolling stock to permit regular scheduled block train operations on gateway port corridors.

Programme description

Management	The components of the project management were reasonably well designed and complementary to assisting the Project to achieve the development objectives. Efforts were made to improve the Project's design and implementation, including; (i) reaching agreement on key policy issues during preparation, such as the Multimodal Transport of Goods Act, customs procedures, and private sector participation; (ii) preparing the physical tender documents before loan negotiations; and (iii) including a comprehensive technical assistance program, funded by the Government of the Netherlands (GON).

Sponsors	The Project was consistent with the World Bank's Country Assistance Strategy (CAS) for India, which focused on supporting the Government of India 's efforts to provide an enabling environment for broad based, efficient, private sector-led growth while accelerating poverty alleviation and human resource development. Key CAS elements were assisting India to become a more trade-oriented economy, improving infrastructure services, increasing efficiency, promoting institutional capacity, and fostering competition in the transport sector.
Beneficiaries	Among the beneficiaries of the project can be included, at large: 1. Competition Commission of India 3. Ministry of Road Transport & Highways, Government of India 4. Ministry of Law and Justice 5. Planning Commission of India 6. The Working Group Report on Road Transport for the Eleventh Five Year Plan Government of India, Planning Commission 7. Transport operators (CONCOR, the Container Corporation of India)
Mode of intervention	The mode of intervention of the Project included the following components: • Improving the institutional framework for efficient and competitive container transport by removing some of the restrictive customs practices and policies restricting inland movement of containers, • Strengthening CONCOR's commercial approach and operational capacity in an increasingly competitive environment by: (i) formalizing service relations with Indian Railways (IR) through a memorandum of understanding (MOU) relating to container train service levels; (ii) divesting at least five percent of GOI's equity in CONCOR as a first step to diversifying the shareholder base and strengthening its commercial orientation; (iii) broadening the composition of CONCOR's Board of Directors to introduce non-official directors to improve the Board's skill base • Supporting scheduled high-quality container train services in the main corridors through: (i) acquiring and retrofitting 1,200 bogie container flatcars (BFKI) with air braking systems; (ii) acquiring 1,500 new container flatcars of new design prepared by the Research, Design and Standards Organization (RDSO) that are equipped with air brakes, automatic couplers and high-speed bogies (100 kph capability); (iii) acquiring five prototype 60-foot, platform, lightweight, flat wagon blocks capable of carrying three loaded 20-foot ISO containers, which utilize automatic couplers on end units and slackness drawbars for intermediate couplings, for testing purposes in preparation for the next generation of higher capacity flatcar; (iv) acquiring approximately 750 new flatcars of the same design as under (ii) or an equivalent capacity of the new designs under (iii) above if the design has been approved by the start of procurement
Follow-up	The follow-up of the project relies on several factors: a) the capability of the rail-container industry to cope with long-distance road fees; b) the evolution of international trade, with reference to international container flows.

Impact/evaluation

Ex-post evaluation	Methodology. Number of TEUs (containers) shifted to rail from road after the project (1997-2002), domestic and international market Mode of evaluation. Cost benefit for two components of the project, (i) acquisition of 2,250 flat cars funded through this loan, and (ii) retrofitting of 1,200 BFKI flat cars. Source of impact analysis. World Bank report.
Market transformation	After the implementation of the project, the container traffic at all Indian ports have increased at a rate of 13.95% during the period 2000-01 to 2010-11 including a rate of 11.81 % for major ports. During these periods containerised cargo has gone up from 2.47 million containers to 9.11 million TEUs. With the growth of external trade being faster than GDP, the similar trends are expected to continue in future

	as well. Similarly the possibilities of growth in container traffic in the domestic sector are significant with continued strong trends in growth of GDP and the need of the industry for value added services. Business trends are now changing towards more and more door-to-door clearances. This needs to provide single window clearance facilities the container sector customers. This will require close co-ordination and/or alliances with other relevant agencies and transport intermediaries for door-to-door movement of cargo in containers. The main strategy to capture domestic traffic will be to run regular scheduled point-to-point services by rail. However, despite the progresses, India needs to increase its use of rail, and realise the potential of its waterways. For example, in the normal course, India's rail share in freight would decline to 25 per cent from the current 36 per cent. This is relative to almost 50 per cent rail share in China and the US, similar continental sized nations.
Energy savings	The assessment of energy savings (litres of diesel) and emissions (CO2) starts from the volume of road trips saved (shifted to rail). Assuming one TEUs by truck (with a Euro 2 standard emissions), the results are about 25,000 trips by truck/year saved, which along an average distance of 1,600 km per trip (from northern India to the three gateway ports) determine a saving of 24 million of diesel/litre and 40,000 tonne of CO2.
Public costs	The Loan amount of the World Bank was USD 45 million. It includes technical assistance and equipments. The expenditure of the Indian operator CONCOR was USD 151 million, including equipment and training. In total the cost is about USD 196 million
Problems / adaptations	Poor Performance by the Manufacturer: Although the container flatcar procurement followed the regular procedures, all contracts were awarded to Indian manufacturers due to their low bid prices. This situation arose from the manufacturers' inexperience in managing contracts for design, manufacture, and supply of freight cars. Strong influence of Indian Railways; CONCOR's close links with Indian Railways have also contributed to procurement problems resulting from IR's strong influence in the selection of equipments and container flatcars. Government should have granted CONCOR full autonomy by reducing its shareholding to less than 50 percent.
Accompanying measures	The objectives were clear, realistic and consistent with the Government of India's (GOI) long-term investment objectives for the transport sector, which were/are: (i) removing bottlenecks; (ii) increasing capacity; (iii) conserving energy (iv) completing ongoing work; (v) maximizing asset utilization; paying special attention to rural areas.

Lessons and conditions of replication

Management team	In order to be carried out effectively, the project needs an accurate risks assessment, from consultancy and bank officer, that must address the relevant risks with greater attention, like the procurement issues and rail stakeholder's interference, which the Project actually experienced during implementation.
Develop a market for energy efficiency and modal split	The development of efficient transport servicers improving modal shift depends on several factors; mainly relying on infrastructure development and removing the bottlenecks in the development of efficient logistics system in the country.
Relevant size of the project	The project addressed the Indian region between Mumbai and Northern India.
A function of decision at the level of sponsors	The sponsor (World Bank) acted as a catalyst for the project implementation
Conditions of applications	• Setting clear and focused objectives relatively focused and realistic operational and institutional objectives • Beware of managing procurement issues. The Project in fact revealed several weaknesses in the procurement process adopted for awarding contracts for the

	supply of equipments and rolling stock. Furthermore, there was no real devolution of procurement powers to the implementing agency (CONCOR). The Indian Railways never gave it the real autonomy to make some of the critical procurement decisions.

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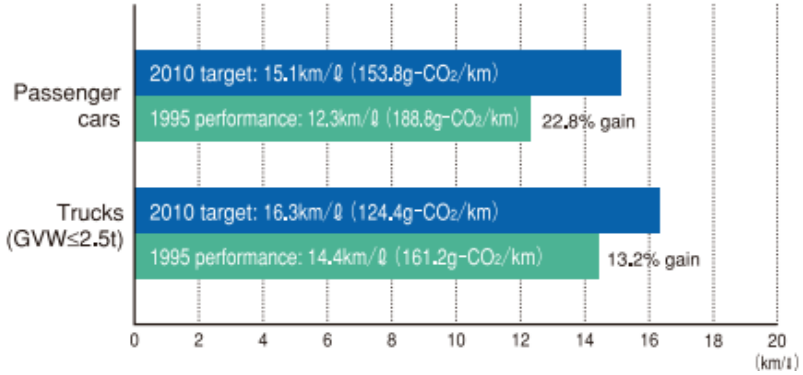
Country Reports: Japan

Japan: the "top runner" programme

Context	Japan has a solid experience of mandatory efficiency standards for appliances and vehicles. The first applications, dated 1980, brought little results due lack of a clear method for standard-setting and revision. Following the adoption of the Kyoto Protocol (1998), Japan elaborated the Top Runner Approach in order to set clear efficiency standards and targets, thereby reducing energy consumption and GHG emissions. In 1998, the Top Runner Approach was adopted in the revision of the Energy Conservation Law as new method for setting targets for selected products. The program started with 9 products, among which freight vehicles, and now concerns 21 products and is one of the major assets for Japanese climate policy.
Objective	Top runner approach aims to develop "the world best energy product"; the objective is to increase energy efficiency, and consequently: • Reducing energy consumption • Reducing CO2 emissions

Programme description

Management	The programme is managed by the Ministry of Economy, Trade and Industry (METI) with the support of the Advisory Committee for Natural Resources and Energy, the subcommittee for Energy Efficiency Standard and the different evaluation standard subcommittees (one for each product). The Committees and subcommittees include representatives from the academia, industry, local government and mass media.
Sponsors	The programme is funded by the Ministry of Economy, Trade and Industry.
Beneficiaries/Target sector	Manufacturers of 21 products, of which freight vehicles.
Mode of intervention	The METI, after consultation with the committee e subcommittees, approves a standard with which producers have to comply for a set year. Then, is responsibility of the manufacturers and importers the choice and the timing of actions to be taken in order to comply with the standards. When the target year comes, compliance is controlled. The main characteristics of the Top Runner approach are the following: • The Top Runners set "market based standards" produced by reviewing the products available in the market. However, technological analysis-potential of energy efficiency in the future are also taken into account. • The standards are differentiated based on different parameters such as size, weight and technological type. E.g. hybrid vehicles are excluded from the analysis because normal vehicles cannot meet their high efficiency level without adopting the same technology. • The compliance of the producers with the standard is evaluated if the weighted average energy efficiency of the products sold in the target year achieves the requisite standards. Thus, not all the manufacturer's products have to meet the target, but they must achieve the standard on average. This method enables producers to provide a wide range of models to meet the market demand. • For penalties, the Top Runner adopts a 'name and shame' approach. In the target year, the METI requires the producers to submit a report on their sales and the energy efficiency of their products, then evaluates their performance. In case of non-compliance four steps are followed: recommendation to the producers by the METI; publication on the press of the name of the company, order by the Ministry and amend, usually, under one million yen penalty.
Example of	In 1999, freight vehicles were included in the first list of products of the

projects	TopRunner Program, 2010 targets were adopted for diesel and gasoline trucks weighing ≤ 2.5t. Standards were based on fuel consumption values as shown in the figure below. **Average fuel efficiency targets for trucks: 2010 target**  Source: Japan Automobile Manufacturers Association Inc., Annual Environment Report (2010) Dec.2010. Source of figures: Ministry of Economy, Trade and Industry and Ministry of Land, Infrastructure, Transport and Tourism. Note: fuel efficiency here is 10*15 test cycle measured and targets were established assuming the same respective shipment volume ratios by vehicle weight category for 2010 as those recorded in 1995. Full report available at. http://www.jama-english.jp/release/release/2010/101224.html
Follow-up	In July 2007, the fuel efficiency target for diesel and gasoline trucks weighing ≤2.5t was updated to 2015. It was set an average improvement of fuel efficiency from 13.5 km/litre in the base year 2004 to 15.2 km/litre in 2015. Target values correspond on average to over 12.6% improvements in fuel efficiency. In 2006, first in the world, Japan has also introduced heavy- duty vehicles target with improvement from the average fuel efficiency of 6.32 km/litre in the base year 2002 to 7.09 km/litre in 2015. Target values correspond to an average of over 12% improvements in fuel efficiency. In both cases, target values are set by category of gross vehicle weight. For some categories, there are sub-categories divided based on pay loads.

Impact/evaluation

Ex-post evaluation	For all products included in the programme, energy efficiency results have been achieved and often exceeded. The programme requires to all manufactures of importers to comply in the target year with the set weighed average energy system for each vehicles' category. To confirm achievement of standards, questionnaires are distributed to the manufacturers after the target fiscal year and information are obtained on numbers of units shipped, energy consumption efficiency, and the like in the target fiscal year. The surveys are conducted by the Agency for Natural Resources and Energy that is responsible for enforcing the Energy Conservation Law.
Market transformation	Fuel efficiency standard have heavily changed the market, influenced also by other factors such as the increased use of freight services instead of privately-owned trucks, a decrease of total distance travelled, the adoption of eco-driving by truck fleet operators. However, no detailed information on this aspect is available for the freight sector.
Energy savings	According to Agency for Natural Resources and Energy, the energy consumption for diesel freight vehicles in the period 1995-2005, improved of 21.7% compared with the expected result of 6.5% (13.8km/l → 16.8km/l). *Reference*: Japan's Top Runner Program: The Race for the Top, Atsushi Kodaka, Energy Efficiency and Conservation Division Agency for Natural Resources and Energy Ministry of Economy, Trade and Industry
Public costs	The Law Concerning the Rational Use of Energy has established the Top Runner Programme with the aims of reducing energy consumption and GHG emissions. The government's budget for the Top Runner programme is not known.
Problems / adaptations	Remark for improvements regards the opportunity to include in setting the standard the life cycle assessment of the products.

<table>
<tr><td>Accompanying measures</td><td>The following measures are strictly connected with the Top Runner Programme:
In 2004, the METI created an environmental performance certification system directed to promote public awareness of highly efficient vehicles through the affixation of certification stickers. In the first years of application, the label identified vehicles that met fuel efficiency target or surpassed them.
Green Tax: for the time 2009-2012 a green tax scheme have been implemented to promote the purchase of those vehicles that met stipulated performance level.
The table below summarises the measures application for truck sector.
Labels and incentives for trucks<table><tr><th></th><th>Fuel Efficiency</th><th>Emissions Performance</th><th colspan="2">Incentives</th></tr><tr><th></th><th></th><th></th><th>Acquisition tax</th><th>Tonnage tax</th></tr><tr><td rowspan="2">Trucks ≤2.5t GVW ≤ 3.5t</td><td>Compliant with 2015 fuel efficiency standards:</td><td>Diesel vehicles: compliant with 2009 emission standards.</td><td>75% reduction</td><td>75% reduction</td></tr><tr><td></td><td>Gasoline vehicles: emissions fown by 50% from 2005 standards.</td><td>50% reduction</td><td>50% reduction</td></tr><tr><td rowspan="2">Heavy duty vehicles GVW≥3.5</td><td>Compliant with 2015 fuel efficiency standards:</td><td>Compliant with 2009 emission standards.</td><td>75% reduction</td><td>75% reduction</td></tr><tr><td></td><td>Compliant with 2005 emissions standards with NOx and PM emissions down by 10%from those standards</td><td>50% reduction</td><td>50% reduction</td></tr></table>Source: Japan Automobile Manufacturers Association Inc., Extract from Annual Environment Report (2010) Dec.2010.</td></tr>
</table>

Lessons and conditions of replication

The management team	The Government is highly involved in promoting and enforcing the program and a network of institutions has been established to oversee the correct implementation and the continuous update.
Develop a market for energy efficiency	The approach aims to create different “Segmentalized for fairness” promoting the introduction of advanced technologies in each segment by classifying vehicles into different weight-based categories. By imposing obligation to each manufacturer, the system favour competition to introduce advanced technologies. All manufacturers except the ones that are above the standard have to make efforts to improve fuel efficiency. At the same time, even if the standard is not meet, there is not an immediate penalty, as the objective is more to promote competition toward energy savings solutions than regulating the market.
Relevant size of the project	The size is one the project’s strength: it is nation-wide and covers a wide range of products.
Conditions of applications	In order to be effective, all products included in a program similar to the “Top runner approach” should have technological potential for efficiency improvements. The program works best in countries, as Japan, where following conditions apply: - The market structure has quite limited number of domestic producer; - The manufacturers generally have high technological competence; - Standards can be accepted even without strict monitoring and sanctions.

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Country Reports: France

France: the Objectif CO_2

Context	The road freight transport in France consists of about 37 000 enterprises, with 557,000 heavy duty vehicles (road vehicles with a gross vehicle mass ≥ 3.5 tons) and 5,9 million light commercial vehicles. In terms of employment, the industry accounts for about 349,000 jobs. Road freight transport operators are present throughout the country and they contribute significantly to economic dynamics of all the regions and their challenges. The sector is subject to a very strong competition operating in a highly liberalized market. Nowadays, the road freight sector is the dominant mode in French domestic trade. In 2011, it accounted for 88% land transport of goods (excluding oil – pipeline transport -). The relevance of the road freight transport is mirrored In terms of environmental indicators: concerning air pollutants, for example, the responsibility of transport sector emissions national air is far from negligible, accounting for, in 2010, by 59% of NOx (nitrogen oxides) and 22% CO (carbon monoxide) emissions. The share of diesel represents 38.8% of NOx and 4.6% CO transport sector emissions. In such a context, a "Charter of voluntary commitments to reducing CO2 emissions" was officially launched on December 16, 2008 in association with the whole carriers representatives' organisations and 15 carriers. The initiative is identified by the logo "Objectif CO2 - Les transporteurs s'engagent". The Objectif CO2 charter is part of an overall scheme to combat climate change and more specifically to reduce CO2 emissions in line with the findings of the Grenelle de l'Environnement multi-party roundtable on the environment
Objective	The objectives of the "Objectif CO2" programme are to improve the energy performance of the transport sector, in particular road freight (and limiting CO2 emissions) and provide companies with a reliable, coherent methodological framework, recognised at national level.

Programme description

Management	The scheme was launched in 2008 by the French Ministry of Ecology, Sustainable Development, Transport and Housing, and ADEME (the French Environment and Energy Management Agency), in cooperation with road freight industry bodies. It is a response to the policy commitments in terms of CO2 reductions.
Stakeholders	The stakeholders, professional bodies of the sector, involved in the design of the scheme are: FNTR, FNTV (Fédération Nationale des Transports de voyageurs), OTRE (Organisation des Transporteurs Routiers Européens), TLF (Fédération des entreprises de transport et de logistique de France), UNOSTRA (Union Nationale des Organisations Syndicales des Transporteurs Routiers Automobiles), UTP (L'Union des Transports Publics et Ferroviaires). Professional representatives were also involved in the design of the methodological tools and guidance documents. The scheme of involvement is based on the voluntary commitment of companies in the sector. Initially 15 companies signed a pilot Charter during the experimentation phase (2007-2008). These companies then took part in the elaboration of tools and methods that contributed to strengthening the scheme. The scheme was initially elaborated at national level, but then rolled out at regional level to ensure that all companies on the territory could be reached. In 2012 ADEME and the Ministry of Ecology presented new tools and modalities for the implementation of the scheme at regional level and especially the new web tool hosted on the dedicated website www.objectifco2.fr.
Beneficiaies	Transport haulers and truck manufacturers are among the key beneficiaries of the programme. In joining the "Objectif CO2" the company may benefit, among others,

	of: • Improvement of the company environmental brand; • Know how for costs reduction (control of fuel costs); • Responding better to customer demand (but also learn to offer new solutions to customers)
Mode of intervention	The scheme targets all common carriage companies and companies with their own fleet, whatever their size or business, as well as road haulage vehicles (light duty and heavy goods vehicles). . The participating companies commit to a three-year action plan of concrete, tailored measures to reduce their fuel consumption and hence their CO2 emissions. Globally companies commit for a reduction target of their CO2 performance expressed in terms of gCO2/km and gCO2/t.km. The initiative gives companies a coherent, reliable, nationally-recognized set of methods, as part of the activities of the Observatoire Energie Environnement des Transports. Companies are provided with tools and methodological guides to help them implement the scheme (such as "fiches actions"), through the regional Directorate for environment (DREAL) or ADEME regional branches. Participating companies make a commitment in four areas: vehicles (adapting vehicles, the maintenance, the choice of technology etc.); fuel (better use and choice of alternative fuels); drivers (promoting eco-driving and other good practices); flow management (itinerary, loading etc.). They must design and implement at least one action per area.
Follow-up	At the end of the three years (duration of the charter), participating companies must hand in an evaluation report to ADEME (monitoring board showing the benefits accrued, difficulties encountered, progress made etc.). Companies are invited to provide their overall feedback on the scheme directly to ADEME. They are also invited to sign a second charter for the next 3 year period. Recently (June 2012), some transport and logistics operators, e.g. STEF or Norbert Dentressangle, have renewed the charter to reduce CO2 emissions from its road transport activities in France for another three-year period (2012-2014).

Impact/evaluation

Ex-post evaluation	Methodology. Number of trips reduced, increased efficiency, environmental impacts and modal shift. Mode of evaluation. Country-wide ex-post assessment Source of impact analysis. Presentations from officials, e.g. ADEME and reports and presentations
Market transformation	Despite the implementation of the "Objectif CO2" will improve truck energy efficiency, no particular market transformation is expected.
Energy savings	On the 1st of October 2012, 672 companies had signed the charter, representing 79,000 drivers and 71,000 vehicles (15% of the French fleet) involved in the scheme The potential CO2 savings represented 489,000 tons of Co2 / year (at the end of the three year actions plan) or an average reduction of 9.5% (for a volume of activity staying the same). For companies, the gain in terms of energy saving turned out to be important. For instance the group Dupessey, with 260- heavy trucks, the scheme represents a saving of 4,500 tons of CO2 and 1.7 million litre of fuel over three years.
Public costs	Not available
Problems / adaptations	The scheme has been running since 2008 and has shown good progression in terms of companies adhering to the charter (300 at the end of 2011, more than 700 today). It seems sustainable as long as companies are willing to pay and see the benefits in terms of energy consumption (and therefore costs). The fact that the scheme is being extended to new types of vehicles is a good sign regarding the increasing institutionalisation of the scheme which is now increasingly accepted by professionals. Since September 2011 the scheme has

	been extended to passenger road transport (Transport routier de voyageurs, TRV) and at the end of 2012 to light duty vehicles.
Accompanying measures	The company can benefit from financial support (from ADEME) to get advice from consultants in designing the evaluation, action plan and monitoring tool (maximum 70% of the consulting fees, ceiling 50,000 Euros). ADEME also contributes to the creation of new job-profiles (Chargés de mission) dedicated to the implementation of the scheme (30% maximum of the total costs related to salary and other charges, ceiling 230,000 Euros, FTE over 3 years). Accompanying measures include training schemes. Eco-driving is at the heart of the training delivered as part of the plans. It is usually delivered in the form of in-company training. The training focuses on updating skills to adjust to changing tasks and new technologies. Several training providers propose training module in eco-driving. In-company training, using the company's vehicles as pedagogical tools, is also common. The format is usually between 1 and 1.5 day, costing between 300 and 500 Euros per day per trainee.

Lessons and conditions of replication

Management team	A medium-low skill level is required to carry out the programme.
Develop a market for energy efficiency	The implementation of the "Objectif CO2" various measures and actions is expected to support the development of a market for energy efficiency, as for the stimulus towards the adoption of solutions available in the market to reduce fuel consumption.
Relevant size of the project	The implementation of the project is extended at national level.
A function of decision at the level of sponsors	The training programme and the relationships with the sponsors (transport operators, associations) are monitored throughout the life of the programme, and are subject to company evaluation after three years. In terms of the relevance of the training delivered, there are clear benefits in terms low carbon objectives, as shown by studies carried out by ADEME and other organisations (provided that training is not a one-off event but followed by regular updates and proper management).
Conditions of applications	In general, it appears that the scheme could easily be replicated in a similar context. An important factor is the presence of a public independent agency. ADEME, in fact, has been providing a consistent support, being able to lead the program with the whole transport industry actors and develop tools and methodologies which can act as important enablers. It is also important that the independent agency gets the resources to finance companies which use consultants for doing diagnosis and running the tests. Furthermore, throughout the project, it is essential to regularly communicate internally with employees on the progress and challenges of the charter of voluntary commitments. Therefore, communication should promote awareness and involvement, convincing employees to have an active role to play. It is recommended to favour direct communication for contact with employees, so that a dialogue can be engaged and that everyone understands how it can effectively contribute to the success.

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Country Reports: Switzerland

Switzerland: the LSVA truck fee

Context	The Swiss transport context is broadly characterised on the one hand by a traditionally high share of rail transport compared to neighbour countries and, on the other hand, by a large extension of road network and practically no extension of rail network. This has resulted in a more attractive road network, with a constantly modal shift from rail (public transport) to road. The side effects of such a context are: a) congestion, especially in agglomerations, b) waste of resources, c) environmental damage The introduction of the LSVA (Leistungsabhängige Schwerverkehrsabgabe), the Swiss-wide distance-related fee for Heavy Goods Vehicles (HGV) on January 1st 2001 was designed to address several objectives (see the section below). It replaces the fixed HGV fee established in 1984. The LSVA is applied to trucks of more than 3.5 tons on the whole road network of Switzerland. The amount of this fee is the same for domestic and foreign vehicles. The LSVA is calculated based on: · the number of kilometres driven on all public roads in Switzerland (km) · the gross weight of the vehicle (over the past years, the weighting limit of trucks has been raised from 28 tons to 34 tons (in 2001) and to 40 tons in 2005). · the emissions of the vehicle (according to the emission classifications of the EU) .
Objective	The main reasons for the introduction of the LSVA were: • Internalisation of external cost of heavy vehicle traffic (polluter pays principle or approximation to real costs) • Shifting heavy vehicle traffic from road to rail and increasing the rail's competitiveness (modal shift) • Preventing the forecasted increase in heavy vehicles traffic • Compensating for the increase in productivity due to the admission of 40-tons goods vehicles (higher weight limit) that became legal after the bilateral treaties with the European Union. • Generating revenues for financing large-scale public transport projects, e.g. the New Alpine Rail Transversal (NEAT), according to the earmarking of revenues • Bringing the Swiss transit fee for crossing the Alps in line with the corresponding fees in France and Austria, thus avoiding distortion of competition and ecologically • Influencing the choice of vehicles towards environmentally friendlier solutions. • Reducing undesirable detours

Programme description

Management	The management of the LSVA (the legal basis and enforcement) relies on the Federal Heavy Vehicle Fee Act (Schwerverkehrsabgabegesetz) and the Federal Heavy Vehicle Fee Ordinance (Schwerverkehrsabgabeverordnung). In particular, the Article 85 of the Swiss Constitution provides the constitutional basis. The LSVA was introduced without any notable problems. Its enforcement is delegated to the Swiss Federal Customs Administration. The impact of the LSVA is continuously

	monitored and analysed by the ARE (the Federal Office for Spatial Development, created on 1 June 2000). ARE brought together the activities of the Federal Office for Spatial Planning, the Federal Transport Studies Service, Sustainable Development and the Alpine Convention under a single new roof.
Sponsors	Sponsors of the programmes are the Department of the Environment, Transport, Energy and Communications.
Beneficiaries	Main beneficiary of the LSVA (2/3 of the collected revenues) is the Public Transport Fund, whose main activity is to fund rail infrastructure projects, e.g. new rail links through the Alps, High Speed Network Links and other main rail projects. One third of the net revenues are passed on to the cantons (regions), earmarked for (internal and external) costs related to road transport.
Mode of intervention	Almost all Swiss heavy weight vehicles are equipped with an on board unit (OBU). This OBU collects data of the trip (km and tons), Later this data are forwarded to the authority the vehicle data are known. The procedure for foreign vehicles without an OBU is realised via an ID card with all vehicle data on it and the manual input of needed information (km and tons) into a terminal. The payment happens immediately.
Example of projects	Examples of related projects in the field of truck pricing, is the introduction of an Alpine Crossing Exchange (ACE). A central element of this exchange is the trading of crossing rights. The use of a transalpine road link would be coupled to the prior purchase of such a crossing right. The number of transalpine heavy goods vehicles could be controlled by means of a cap on the number of crossing rights. This ensures that transfer targets could be achieved. In order to prevent traffic diverting via other routes, the ACE would have to be introduced in coordination with neighbouring states.
Follow-up	The follow-up of the programme is basically related to two aspects: a) technological advancements and b) extension to all vehicles (passenger). Technological advancements concern the use of GSM options for the hauliers, (via Bluetooth) and enhanced interoperability. It must be stressed, however, that a part the technological update, the functionality remains the same. Concerning the extension to the passenger vehicles, the pros and cons have been pondered. On the pros side, it is envisaged the possibility to internalise external costs, to manage demand and raising funds for making public and private use of transport modes more balanced. On the cons side, must be considered collection costs and political acceptability.

Impact/evaluation

Ex-post evaluation	Methodology: Number of trips reduced, increased efficiency, environmental impacts, modal share of rail in Switzerland Mode of evaluation: Country-wide ex-post assessment Source of impact analysis. Presentations from officials, e.g. ARE and reports
Market transformation	The market transformation caused by the LSVA basically concerns the truck fleet composition and the number of trips. In Switzerland, the railways carry a far higher share of goods across the Alps than in Austria and France. Besides the HVF, the most important reasons for this differing trend are a ban on driving on Sundays and at night. Up to 2001, there was also a significantly lower maximum weight limit of 28 tonnes (compared to 40 tonnes in the European Union), which favoured rail. The decrease in the number of transalpine road freight journeys observed until 2006 is due both to the LSVA and the higher weight limit. Because of the change from a flat-rate charge to a distance-related charge, foreign vehicles could no longer cross Switzerland for a token sum of 40 Swiss francs, but had to pay an amount that is about 8 times higher. This significantly higher transit price is only worthwhile for efficient vehicles carrying full loads. This is reflected in changes to the composition of vehicle fleets. In the first years of the new regime, there was an extraordinary increase in the number of semi trailers. This development was compensated by an even more pronounced drop in the number of lorries. The number of goods vehicles with trailers remained virtually constant. These shifts were clearly due to the higher weight limit. The traffic that was diverted out of Switzerland because of the lower weight limit, and which moved back when the

	weight limit was increased, is almost exclusively composed of semi-trailers. At the same time, journeys with lorries were replaced by journeys with semi-trailers, because the latter allow an optimum use of the higher weight limit. This second reason also explains the significant decrease of the number of lorries. Due to the shift from light lorries to heavier semi-trailers, the weight loaded per vehicle has increased considerably. Summing up, the market transformation advantages the hauliers with big fleets, able to make a better use of logistics (fewer empty trips).
Energy savings	After the implementation of the LSVA, the vehicle tonne kilometres travelled by trucks were at about 124 and the corresponding vehicle kilometres at 95. (number index 2000 = 100). Combining fewer trips with more goods has meant to gain in efficiency (fuel consumption by ton, reduced by 4.3%). This has also determined better performances under the environmental point of view, with an average drop by 3.7% in CO2 emissions, by 10.3% of PM emissions and by 15.9 in NOx.
Public costs	Implementation costs are about of 100 Million EUR, plus another 50 Million EUR for the free distribution of the OBU. Operations costs are only 4-6 % of revenues (about 60 Million) which is very low compared to the usual figures of around 20%.
Problems / adaptations	In terms of modal shift, it has been noted that no significant modal shift has been observed after the introduction of LSVA. The impacts in fact were rather on the change of type of vehicles (trucks). This is due to several reasons: • Modal share of rail in Switzerland traditionally high: Overall: 40%, and in transalpine transport: 65% • Higher weight limit for trucks On the other hand, it should be considered that pricing is one element among others: • Reliability • Administrative procedures • Modern infrastructure
Accompanying measures	The accompanying measures to ensure the modal shift from road to rail (freight traffic) are the following: • Infrastructure provision: New transalpine rail tunnels through the Gotthard and Lötschberg • Legislative and financial measures: Transfer Law Foundations for accompanying measures such as promoting combined transport. Makes the necessary funding available (1,830 million Swiss francs). Contains the basis for introducing an Alpine Crossing Exchange • Rail reform. The rail reform introduces intra-modal competition into rail transport. There is free access to the European network for goods transport.

Lessons and conditions of replication

Management team	The implementation of the measure needs an efficient administrative and enforcement apparatus (The Swiss Customs Authority)
Develop a market for energy efficiency	No particular impacts are expected on the market for energy efficiency
Relevant size of the project	The size of the project is across the whole country area of application (all the Swiss road network).
A function of decision at the level of sponsors	The involvement of stakeholders, i.e. transport operators, has been important. The Swiss association of road transport operators ASTAG opposed the project initially, then, after the public vote the LSVA is accepted. After the introduction, the Swiss Association of road transport operators ASTAG seized the occasion to adapt their price recommendations.
Conditions of applications	The following pre-conditions should be taken into account for an efficient replication of the project: • The project has benefited from a previous organisation, the Swiss Customs Authority, providing the administrative backbone for an efficient implementation, e.g. personnel, technologies. • A lot could be learned and improved in tests and field trials.

	• For public acceptance, it was important that the project had been legitimated by the public vote (i.e. heavily attacked before, but democratically accepted afterwards).

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Country Reports: Thailand

Thailand: the CNG fuel promotion programme

Context

The Thailand Case Study concerns with the Compressed Natural Gas (CNG) fuel promotion for truck and other vehicles, a national policy carried out during the period 2006-2007 and continuing afterward. The background of this Case Study is rooted in the national energy policy. Thailand is in fact structurally dependent on oil import. The International Monetary Fund recent country review (2012) stresses that in the medium period the international boycott of Iranian oil could put upward pressures on oil prices, and this could lead to substantial and prolonged increase in oil prices that would have a significant fiscal cost for Thailand.

The energy consumption is about 1.8 million oil-barrels per day and is expected to be around 3 million barrels per day by 2015. Oil is the main source of energy in Thailand (47% of the total energy consumption), and about 67% of which is consumed by the transportation sector (2005 data). As a result, the oil-crisis in early 80's, with the related upward trend of derivatives (e.g. diesel prices) triggered the need for alternatives in fuelling the transportation system.

In such a context, it is estimated that there are about 38.2 trillion of cubic feet of natural gas reserves in Thailand (including the reserves in the Thailand-Malaysia Joint Development Area; JDA). Natural gas has been increasing steadily its share of energy supply from 14% in 1992 to 24% in 2010, which amounts to 3,000 MMSCFD (million cubic feet per day) or the equivalent of 515 thousand barrels per day of petroleum oil. Therefore, like many countries around the world which have indigenous natural gas reserves, the Thai government has strongly promoted alternative fuels since 2002. Gasohol, bio-diesel as well as natural gas have been selected to be major alternative vehicle fuels to reduce the impact of the high oil price. Among these, natural gas (CNG) is the most favourable fuel because it can replace 100 % of oil usage. Furthermore, it generates better tail-pipe emission than diesel and gasoline.

Objective

The objectives of the CNG fuel promotion are part of the following transport policy strategy:

1. To improve fuel quality
2. To set vehicle emission standards as to define target and measures to reduce CO2 and air pollution (particularly in the Bangkok urban area)
3. To devise traffic and transportation measures in the era of energy crisis

Programme description

Management

The Petroleum Authority of Thailand (PTT), in its capacity as the country's national oil and gas enterprise, has been assigned by the Thai Government for the management of the promotion of sustainable CNG business in Thailand.

Sponsors

The Pollution Control Department (PCD) of the Ministry of Natural Resources and Environment (MNRE), the Department of Land Transport of the Ministry of Transport, the Ministry of Finance.

Beneficiaries

Consumers, truck manufacturers

Mode of intervention

The history of the development of CNG for use in heavy-duty vehicles can be summarized in the following steps:

Duty exemption for:

- CNG tank and conversion kit
- New and used CNG engine

Duty reduction for equipment in gas station

Excise tax reduction for CNG truck and Retrofit engine

Annual vehicle registration or road tax reduction

- 50% for dedicated CNG, 25% for Bi Fuel or Dual Fuel

Example of projects	Subsidize for changing to CNG engine Marketing strategies. The Petroleum Authority of Thailand (PTT) Public Company Limited has arranged financial package to support vehicles owners in upgrading vehicles to shift to CNG. In particular, PTT has arranged NGV (Natural Gas vehicle) stations card systems to facilitate the collection of loans by the financing institutions as follows; • Gold Card: For those who do not have any loan liability, they will pay only CNG price. • Orange Card: For governmental organization's vehicles, PTT pays all the conversion costs for them which are then re-paid at 5 Baht per kilogram of CNG every time the converted vehicles refill with CNG. In addition to the above, PTT is studying the possibility of joining with more bankers and financiers to arrange financial packages for trucking service companies and bus / other vehicle fleet owners for their fleet conversion.
Follow-up	Infrastructure provision (more CNG stations). Thailand's Treasury Department has signed (September 2012) a Memorandum of Understanding with the Petroleum Authority of Thailand PTT Public Company Limited, allowing the state-owned oil and gas company and one of the country's biggest corporations, to use 13 rai (2.08 hectares) of public land to establish more natural gas vehicle (NGV) service stations Infrastructure upgrade and consumer information campaign. The Petroleum Authority of Thailand (PTT) has undertaken (2011) public education and measures to assist vehicle operators, including the publication of guidebooks that give information about NGV/CNG stations in the service areas. NGV users, especially fleet owners, were advised to receive services from nearby NGV conventional stations, in which the gas improvement system has already been installed. PTT has also maximized the production capacity of NGV mother stations to increase volume transported to the daughter stations network.

Impact/evaluation

Ex-post evaluation	Methodology. Number of trucks shifted to CNG after the implementation of the CNG-supporting programme. Mode of evaluation. Country-wide ex-post assessment Source of impact analysis. Presentations from officials, e.g. Ministry of Natural Resources and Environment (MONRE), Ministry of Transport, etc, and papers
Market transformation	In 2010 the truck transport dominates the freight transport industry in Thailand. More than 80% of freight is transported by trucks, with 2% of cargo moved by rail (427.5 and 11.5 million tonnes out of the total freight quantity of 507.7 million tonnes respectively). The rest is split among inland waterway, coastal and air transport. At present Thailand's freight transport services and market exhibit some inefficiency, including aged fleets of trucks with low load limits and low fuel efficiency, low penetration of multi-modal logistics providers, limited capital for new investment by small firms and limited use of Electronic Data Interchange for facilitating shipment and delivery and supply chain management. Despite some problems (see the Problems/adaptation section below), the truck market, about nine million units per year, of which about 10 per cent is for replacement, shows signs of recovery, growing at faster rate. The Thailand's national energy company, (PTT) Public Company Limited, reports that by end of 2011 the total number of natural gas vehicles (NGVs) has increased to 300,581 units from 162,023 units back in 2009 (85.5% growth). Trucks account by about 30% of market share, compared to just 10% versus conversion models just two years previous. The country has 10 major vehicle manufacturers (Chevrolet, Hino, Hyundai, Isuzu, Kia Motors, Mercedes Benz, Mitsubishi, Proton, Tata Motors, Toyota) producing CNG vehicles with additional models and manufacturers expected to enter the market through 2012 in order to meet the fast expanding local and regional demands for NGVs.
Energy savings	Energy savings come from the substitution of fuel diesel with alternative fuels (CNG). 73 millions of diesel by year could be saved through the provision of CNG refuelling stations and natural gas pipeline. In terms of CO2 emissions, non-renewable CNG and LNG could provide significant CO2 reduction (5-16 % savings

	in HGV well-to-wheel). Significant reduction of particulate emissions is also expected.
Public costs	The United Overseas Bank estimates that the costs of fuel subsidies in Thailand in 2008 equates to 1.2% of its GDP.
Problems / adaptations	The Thai Government has been promoting the use of gasohol and bio-diesel nationwide, and in 2006 it introduced compressed natural gas (CNG) vehicles. However, the share of alternative fuels, such as natural gas and ethanol, was not growing substantially in the short-term. In fact, while oil price were skyrocketing in early 80's, consumers and transport operators needed to change to CNG engines immediately and that lead to: • Shortage of mechanics in CNG engine re-powering/retrofit • Shortage of CNG supply • The Petroleum Authority of Thailand (PTT) was requested to invest in service station provision for the whole country. The following technical problems arose during the implementation of the CNG promotion policy. • Conversion technology has turned out to be a crucial factor. Simple gas mixer conversion technology is prone to pre-ignition in the intake manifold. Since a vacuum-control gas mixer was used for pre-mixing of gas and the intake air of the engine, the intake manifold was therefore filled with combustible gas, which was believed to be the cause of detrimental misfiring. The engines had been converted from diesel to spark ignition, with a resulting increase in the combustion temperature. The increased combustion heat was not removed by additional cooling provision, such as increasing radiator capacity; therefore the engine would naturally operate at a higher temperature and be prone to pre-ignition. The converted engine power obviously dropped to about 25-30%. • Problems with diesel and CNG. Both diesel and NGV were used at the same time in different proportions depending on the load and speed conditions of the engine. The converted engine can be tuned to have higher power than the original diesel engine by injecting natural gas into the diesel fuel system; however this has to be done very carefully to prevent the piston burn-out. Its tail-pipe emission contains lower PM10 than the original diesel engine. • CNG quality: natural gas that contains a high percentage of methane will inhibit pre-ignition whereas the percentage of inert gas will affect engine performance.
Accompanying measures	The accompanying measures are the following: 1. Development of Infrastructure (both natural gas pipeline network and NGV refuelling station) 2. Supporting NGVs vehicles expansion 3. Pricing Strategy, i.e. reducing the user costs of shifting to CNG fuels

Lessons and conditions of replication

Management team	An efficient governance at national level is required. National agencies, Ministries and stakeholders, e.g. manufacturers, must co-operate to ensure the smooth implementation of the policy.
Develop a market for energy efficiency	The subsidies to the alternative fuels can provide distorted signs to the energy market. The Energy Ministry last year planned to raise the price of CNG, from 8.50 baht per kg to 14.50 baht. However, the plan has been delayed amid calls for a review by transport operators. After a few incremental increases, the CNG is now at 10.50 baht. According to the Energy Research Institute (ERI) at Chulalongkorn University, the appropriate price for the gas would be at 13.28 baht per kg (VAT included). As also recognised by the International Monetary Fund report (2012), while some energy prices are now gradually allowed to adjust to market prices, the subsidies and tax cuts have been extended repeatedly, most recently to end- April 2012. Such tax incentives should be allowed to expire as they are neither fiscally sustainable, nor efficient to cope with elevated global fuel prices. Because higher-income households consume a disproportionate share of energy, such untargeted measures are not efficient in terms of income distribution objectives either.
Relevant size of the	The implementation of the policy has involved ministries and governmental

project	agencies at a broader level (country-wide policy setting). No specific implementation costs are reported.
A function of decision at the level of sponsors	In general, the policy implementation has been vertically managed by central government agencies. However, stakeholder's involvement (transport operators) in case of fuel price changes has also been considered.
Conditions of applications	The conditions of application are the following: • Fiscal and budget equilibrium, the subsidies to alternative fuels must be consistent with a sustainable and long-term financial equilibrium and non-distorted energy prices • Technological development, which may favour the implementation of cost-effective equipments for conversion to CNG • Market structure, to the extent that the presence of an efficient freight industry, e.g. a network of competing freight operators with sound balance sheets, can favour investment and technological upgrade of vehicles • Cheap natural endowment of resources (natural gas), which can provide the cost-efficient supply of CNG, lowering the final price to consumers

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Country Reports: United States

United States: the SmartWay programme

Context	Voluntary collaborative programme between US Environmental Protection Agency (EPA) and the industry.
Objective	SmartWay long term goals are: - Improve energy efficiency and lower greenhouse gas emissions and air pollution from transport activities; - Create a strong market-based incentive that challenge companies shipping products, and transportation companies delivering these products. SmartWay objectives are: • Providing the freight industry with information so that companies can make informed emission optimization choices; • Providing standardized system of data collection and calculation; • Creating a market based system to incentivize good performers; • Providing calculation tools, a data management system, and informational materials.

Programme description

Management	Environmental Protection Agency (EPA) and so called 'Charter Partners' 15 companies and organizations that helped EPA to develop and evaluate the core principles, tools, and recommendations that make up the SmartWay program.
Sponsors	Environmental Protection Agency (EPA)
Beneficiaries	Freights companies, both carriers and shippers.
Mode of intervention	The Smartway Partnership is composed by six key program components: 1) **SmartWay Supply Chain Partnership**: A partnership in which freight carriers and shippers commit to benchmark operations, track fuel consumption and improve performance annually. 2) **SmartWay Technology Program**: A testing, verification, and designation program to help freight companies identify equipment, technologies and strategies that save fuel and lower emissions. The program includes Heavy Duties testing, technology verification and the certification of technologies as 'smartway'. 3) **SmartWay Finance Program**: A competitive grant program that makes investing in fuel-saving equipment easier for freight carriers. The program includes innovative loan and financial mechanisms. 4) **SmartWay Vehicles**: A program that ranks light-duty cars and small trucks and identifies superior environmental performers with the SmartWay logo. 5) **SmartWay Brand Marketing:** a program producing multi media campaigns, educational materials, annual reward.
Example of projects	SmartWay Supply Chain Partnership collects and publishes, annually, data by partner's organisations in order to define their three-year improvements target. Smartways provides technical assistance for quantification of the emissions, and recommends strategies to reduce fuel consumption. In addition, the database collect industry data in order to calculate 8 basic metrics that shippers and carriers need to optimize their performance. Among the benefits, the high visibility granted to the best partners. Depending on the type of partners, different database are available to collect data: Carrier Data Collection tools, shippers Tool, Truck Tool, Logistics Tool, Multimodal

	Suite. For the Carrier Data, the type of information requested are: • Fleet characteristics (operation, FTL, LTL, PUD), truck types (weight classes), fuels type used (%); • Activity information: total fuel used last year (by fuel type), total km driven last year (specifying empty km), average utilisation (by payload, volume); The Smartway Carrier Data provides outputs regarding: • Co2 performance (e.g.Co2/mile, Co2/ton-mile, Co2/volume-mile); • Nox, PM performance; • Benchmarks versus the rest of the industry.
Follow-up	Started in 2004, the Supply Chain Partnership has now more than 2700 partners (carriers and shippers).Among the directions advanced to follow-up and extend the Partnership: • Increase the number of participants (targeting specific sectors such as oil and gas transporters, local and regional delivery companies, private fleets, local construction transporters); • Obtain greater support and commitment from the state government; • Seek funding to support technologies that best fit new sectors; • Promote corporate image with events and awards.

Impact/evaluation

Ex-post evaluation	According to EPA's March 2011 SmartWay Program Highlights, SmartWay's clean air achievements include emission reductions of: • 16.5 million metric tons of CO2, • 235,000 tons of nitrogen oxides (NOx), • 9,000 tons of particulate matter (PM).
Market transformation	Representatives from environmental, retail, and trucking associations consider EPA's SmartWay program an effective program for reducing fuel costs and reducing the environmental impact of freight movement. According to a survey conducted by American Shipper, SmartWay ranked first among all the choices of supply chain sustainability programs. The results are confirmed by the high increase of participation to the programs since 2008.
Energy savings	According to SmartWay Program (2011), between 2004 and 2011, SmartWay partners saved 50 million barrels of oil. These savings are equivalent to taking over 3 million cars off the road for an entire year. SmartWay has also helped U.S. businesses reduce their fuel costs, saving $6.1 billion dollars to date, according to EPA.
Public costs	EPA's SmartWay program received $2.42 million in 2011 and $2.7 million 2012. The programme has 11 full-time employees and has contracted 10 Partner Account Managers. In 2008-2010, SmartWay also received $16.9 million in Diesel Emission Reduction Act (DERA) and in 2009 $30 million in American Reinvestment and Recovery Act. With these supplementary funds, EPA awarded 12 grants to 9 grantees. The grants were for loan guarantees, loans, subsidies, and leases to retrofit, repower, or replace equipment to reduce emissions.
Problems / adaptations	In order to calculate SmartWay program emission reductions, EPA relies on self-reported industry data. OTAQ performs some checks of data provided by industry. EPA also has 10 Partner Account Managers who review data provided by the partners, along with any explanations, and who can question data that appears incorrect. However, there is no direct verification by EPA of data submitted by SmartWay participants. The lack of direct verification is a potential design weakness in the program, which affects the Agency's ability to ensure the overall validity of claimed SmartWay Transport Partnership results
Accompanying measures	The strength of Smartway Supply Chain Partnership program is partly due to a four accompanying initiatives that have been developed and extended with the Partnership Program: the Smartway Technology Program, the Finance Program

	and the Vehicles and Brand Program. In particular, the Finance Program started in 2008, awarding $3.4 million to three loan programs that help small trucking companies reduce fuel costs and emissions. In 2009, the initiative awarded $30 million to support the development of five financing programs for trucks, school buses and non-road vehicles/equipment. In 2009-2010, the SmartWay Finance Program awarded $13.5 million to support four truck financing programs.

Lessons and conditions of replication

Management team	The report "Designing and Implementing a Freight Sustainability Program: Tools, Best Practices, and Lessons Learned" indicates that, for the first years, the program can be designed and developed by a small group of experts with strong technical and communication skills. For running the programme, the report suggests a team composed on the basis of the active members, with an indication of 1 staff per 100 - 150 active members, and technical as well as marketing skills.
Develop a market for energy efficiency	Thanks to the large participation and to the diversification of instruments provided, Smartway had impact on greening the freight supply chain; however, there are not data for quantifying the impact on energy efficiency market.
Relevant size of the project	The strength of the programme is the number of partner's organisations and the share of market covered. The Partnership now covers over 650,000 trucks and 60 billion miles per years (approximately 30% of US Road freight). Among the participants: US corporations use Smartway accounting tools and methods; small businesses rely upon SmartWay for the Technical and Finance program, the US government, through GSA, uses Smartway to implement EO 13514, which directs the federal government to green its supply chain
Conditions of applications	To start-up similar program, the active involvement of main companies should be looked after since the elaboration phase (e.g. "Charter Partners"). Consequently, the Program program best suits to countries where the freight market is not highly fragmented. The report "Designing and Implementing a Freight Sustainability Program: Tools, Best Practices, and Lessons Learned" indicates as lessons to consider: • Companies should be helped in understanding better the results/benefits and in marketing this to their shippers and general public; • The database should be with simple forms in order to reduce time and efforts to collect/report data to a minimum; • Workshop should be held for getting companies started, and period follow up organised;

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