GREATER MEKONG SUBREGION
CORE ENVIRONMENT PROGRAM

THE GREATER MEKONG SUBREGION GREEN FREIGHT INITIATIVE
Potential Pathways for Sustainable Transport

Background Paper for the 5th GMS Environment Ministers' Meeting

KEY MESSAGES:

(i) Big reductions in fuel consumption can be made from drag-reducing aerodynamic measures on truck cabs, efficient tires, and eco-driving techniques, as demonstrated by the Green Freight Initiative.

(ii) The benefits of retrofit technologies can be enhanced by other measures, including electric delivery trucks in urban areas to reduce air pollution, and allowing heavier trucks on the road.

(iii) Fuel efficiency measures are cost effective and offer positive returns on investment. But because of high upfront costs and other barriers, their benefits are not widely perceived in the trucking industry.

Worldwide, the transport sector emitted 7.5 billion tons of carbon dioxide (CO_2) in 2015—18% of the total global CO_2 emissions.[1] Transport emissions grew by a factor of 2.5 from 1990 to 2013, a higher growth rate than total emissions.[2] By 2050, transport emissions are expected to rise by 60% even if there is significant technological progress to reduce them.[3] Road freight accounts for half of the transport sector's total emissions.

By 2050, Asia is expected to account for two-thirds of global surface freight. Road transport dominates freight haulage in all Greater Mekong Subregion (GMS) countries. Vehicles registered in GMS countries have almost doubled in-between 2010 to 2015,[4] with transport accounting for approximately one fifth of energy-related CO_2 emissions in the subregion, excluding the People's Republic of China. Improving transport infrastructure will spur increased transport activity, fuel consumption, and emissions in the GMS.

This paper examines the interventions used by the GMS Core Environment Program's (CEP's) Green Freight Initiative to improve fuel efficiency, reduce fuel costs, and reduce CO_2 emissions of trucking companies in the Lao People's Democratic Republic (Lao PDR), Thailand, and Viet Nam. The paper also looks at policy and finance interventions to facilitate uptake of regional and international good practices.

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[1] International Energy Agency (IEA), 2015, *World Energy Outlook*.
[2] IEA, 2016, *World Energy Outlook.*
[3] OECD/ITF, *Transport Outlook,* 2017.
[4] http://portal.gms-eoc.org/charts/all/registered-motor-vehicles?gid=29&gideoc=6&regoreoc=1.

Measures to Improve Road Freight Fuel Efficiency

Roads carry most of the freight tonnage in the GMS. The share was 84% in Thailand in 2009, 79% in the Lao PDR, and 71% in Viet Nam. The use of road freight has increased in most GMS countries, while rail and shipping has decreased. This trend is likely to continue as road infrastructure investments continue to be a priority for the subregion. Since 1992, the GMS Economic Cooperation Program has invested more than $15 billion in transport infrastructure and a considerable portion of the $64 billion of planned investments under the GMS Regional Investment Framework, 2022, will also be in this sector.

Measures to improve fuel efficiency will help reduce greenhouse gas (GHG) emissions, and improve the profitability and overall competitiveness of road freight companies in the GMS. Fuel accounts for 40%–60% of these companies' operating costs.

Fuel efficiency and reducing emission in road freight can be achieved through the following measures:

(i) Avoid freight transport in the first place. For example, through industrial clustering to reduce transport trips, and better logistics to avoid empty backhauls.

(ii) Shift transport from road to rail, road to shipping, and road to pipelines. Roads have higher emissions per ton-kilometer by a factor of 3 to 10 times than rail or shipping. Increasing investments in waterways and railways, and making both more efficient, will be essential for shifting more road freight to these modes of transport.

(iii) Implement efficiency improvements to increase load factors, reduce fuel consumption and emissions per unit of distance driven, and switch to cleaner fuel.

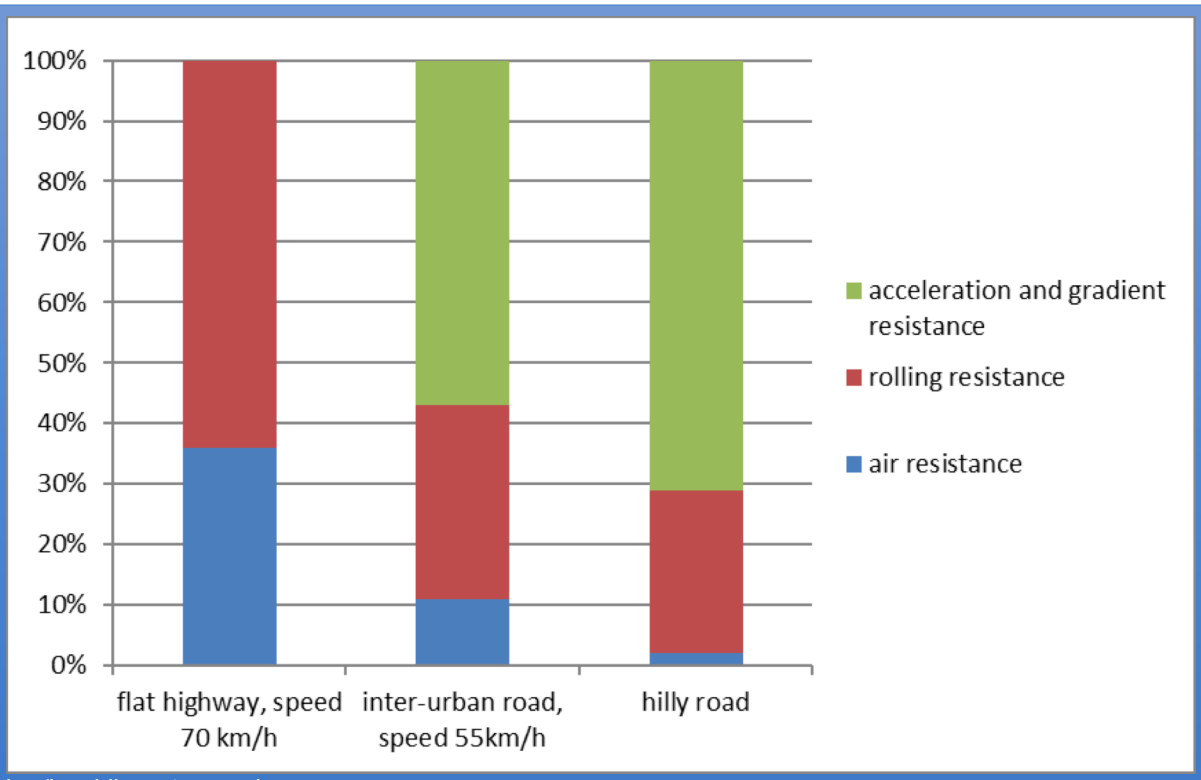
Green freight programs have emerged in the GMS in recent years to promote cleaner technologies and improve fleet management. From 2013 to 2016, the CEP's Green Freight Initiative, which focused on long-haul road freight, helped 60 small- and medium-sized freight companies in the Lao PDR, Thailand, and Viet Nam to test ways to make their businesses more fuel efficient. GIZ supports an additional 500 small- and medium-sized companies under its European Union-funded technical assistance project for Sustainable Freight and Logistics in the Mekong Region (2016–2019) in Cambodia, Lao PDR, Myanmar, Thailand, and Viet Nam.

Three types of fuel savings measures—aerodynamic devices, efficient tires, and eco-driving—were extensively tested during the pilot phase of the Green Freight Initiative in the Lao PDR, Thailand, and Viet Nam.

Aerodynamic Devices

Air resistance can significantly affect the fuel consumption of trucks, depending on the speed (*Figure 1*).

Figure 1: Efficiency Loss Factors for Trucks at Different Speeds



km/h = kilometre per hour
Source: Author.

In most GMS countries, trucking speeds are relatively low due to difficult road conditions, and the predominance of low-powered, heavily loaded trucks. Given these conditions, cab-roof deflectors are the most viable device to reduce drag, which reduces fuel consumption and emissions. Retrofitting trucks with cab-roof deflectors can result in savings of 3%–5% in total fuel costs. In these countries with high trucking average speeds (over 70 kilometers per hour), side deflectors and other aerodynamic devices can further reduce drag.

Efficient Tires

Low-rolling resistance tires—which work well at both low and high speeds—can achieve savings of 4%–6% of total fuel costs, and they last longer than conventional tires. The major tire makers sell them in GMS countries. Because efficient tires are quite expensive, they are not widely used by trucking companies, despite their sizable fuel cost savings. The European Union has successfully implemented a tire label and directive, which obliges tire makers to sell fuel-efficient tires.

Eco-Driving

Eco-efficient driving reduces fuel consumption and improves road safety. It is about smart driving techniques, changing rapidly to higher gears, and using the most efficient gears and braking techniques for uphill and downhill driving. Training on eco-driving for truckers usually lasts a day, and involves training on trucks or truck simulators). Eco-driving can bring cost savings of 3%–5% in total fuel costs. Many countries around the world have made eco-driving part of the skills required to get or renew a driving license for truck drivers.

The CEP Green Freight Initiative developed an eco-driving training course for driver instructors. Under this program, 40 instructors were trained in the three pilot countries, who then passed their eco-driving skills on to 300 truck drivers.

Retrofit Technologies

Field tests of retrofit technologies carried out in GMS countries under the CEP's Green Freight Initiative on aerodynamic devices, efficient tyres, and maintaining correct tire-inflation showed a 9% to 14% fuel savings during the trial period. When these technologies were supplemented by eco-driving, fuel savings rose by 11%–17%. Field testing of eco-driving by GIZ yielded an average of 13% in fuel savings after the training. However, since the effects of training wanes over time, regular refresher training is necessary. Financial analyses showed that fuel cost savings from many of these technologies will cover the investment costs within less than a year.

These technologies can be enhanced by additional measures to increase fuel savings in the GMS through the following:

Scrapping and Replacing Old Trucks

Scrapping and replacing older trucks can help reduce CO_2 emissions and improve road safety, as fuel efficient and cleaner technology becomes available. That said, this is not having much of an impact currently since the fuel-efficiency of trucks has not improved much in recent decades. Scrapping and replacing older trucks is also costly and can distort market structures. If GMS governments do decide to implement old truck scrapping and replacement programs, these should focus on urban trucks, as these have a significant impact on air quality and health.

Alternative Fuels

Gas-powered trucks can be cost-effective and help reduce overall emissions in road freight contributing significantly to reduce air pollution in urban areas. A downside is that the GHG emissions of gas-powered trucks are the same or even higher than diesel trucks because of methane slip.[5] Hybrid and electric trucks up to 18 tons have started to be used in some urban areas such as in Zurich, and of the two, electric trucks have a large potential for reducing air pollution in urban areas.

[5] Methane slip is when gas leaks unburned through the engine.

Increase Truck Sizes

Allowing larger trucks on the road greatly improves transport efficiency by better matching trucks with loads when a larger load is available. This reduces fuel consumption, transport costs, road congestion, and emissions. Larger trucks do not automatically increase damage to roads by being heavier. Given the potential to better optimize the load factor, increasing the maximum allowed truck weight can be an important measure to reduce emissions and improve freight efficiency.

Logistics Measures

Empty running makes up 25%–50% of trips made by freight companies in the GMS. Improving logistic measures could improve fleet optimization to better match load and reduce empty backhauling. The measures include electronic platforms for load consolidation, drop and hook,[6] and freight consolidation centers. Technologies that integrate telecommunications, global positioning, and informatics or "telematics" can help combat this issue. Global experience has shown that logistics measures such as these are best managed by the private sector. Cooperative alliances between companies can help address market inefficiencies i.e., fragmentation across freight companies and a lack of networking within the sector.

Green Freight Programs

Green freight programs are generally national-level initiatives that bring together key stakeholders to achieve a number of objectives. These objectives are increasing fuel efficiency of the freight sector, ensuring safety and sound working conditions, improving the economic efficiency of freight and the competitiveness of national economies, and reducing emissions and air pollution. Typical program components include the development of a green freight standard, data collection and management, as well as labeling and recognition of companies that meet the standard. Viet Nam is currently developing such a standard and label with GIZ support.

Investment Barriers and Policy Options to Promote Green Freight

The efficiency measures overviewed in this paper such as eco-driving, and larger trucks, are all cost effective, and offer positive returns on investment. But like many other efficiency investments, they face barriers to their widespread use. The following are the most common of these barriers:

(i) Efficiency equipment has fairly high upfront costs with insecure returns. Unfortunately, these costs are very visible, while the efficiency gains tend to be less well-appreciated because they occur over time.

(ii) Trucking companies tend to focus on their core business (haulage), and are reluctant to invest in efficiency-improving resources.

[6] Drop and hook is a common term used within the trucking industry that refers to a situation when a driver delivers a load at the final delivery location for a customer and all the driver has to do is drop the trailer and simply pick up a new trailer.

(iii) Split incentives, where truck drivers are paid a fixed fee, including fuel per trip, reduce the incentive for operators to invest in vehicle improvements.

(iv) Smaller fleet operators have limited access to finance needed for fleet or technology upgrades.

(v) There is a lack of an enabling policy framework for trucking companies to invest in technology and operational measures for fuel efficiency, as governments do not see or appreciate the public policy benefits of green freight and logistics.

The following two-phased approach is suggested to remove these barriers.

The first phase is based on voluntary participation, and involves financial incentives for first-movers paying partially for the incremental costs of aerodynamic equipment, efficient tyres, and other fuel efficiency measures. During this phase, a labelling scheme is introduced to create awareness in the industry of the types and benefits of fuel saving measures, such as the difference between efficient and normal tires. In this phase, an eco-driving course is developed, instructors trained, and truck driving schools equipped with simulators. Implementing this phase requires financial incentives and subsidies to prepare the ground for the second phase. Incentives can also be used in the first phase to encourage the greater use of cover hybrid and electric trucks.

The second phase introduces compulsory tire efficiency standards, which become progressively more stringent, and make eco-driving a compulsory part of truck driver training for new and renewal of licenses. This should result in large fuel savings nationally, as the performances of all vehicles improve. Low-carbon trucks can be made compulsory for heavily polluted urban areas, and financial incentives given to promote the switch to these trucks.

Climate Financing

Comprehensive and clearly staged green road freight plans have the potential to attract climate finance to subsidize the investments needed to implement the first phase. GMS countries can approach the Green Climate Fund for this, though they will need to present a concrete plan for how transformational impacts will be achieved. The steps for attracting climate finance include setting up green freight Nationally Appropriate Mitigation Actions (NAMAs).

CEP is supporting Viet Nam in developing such a NAMA. This will help the country identify the measures and policies that will need to be taken to attract climate financing and to assess the environmental and economic impacts of these measures and policies. Viet Nam's NAMA proposes to implement aerodynamic devices on trucks, compulsory eco-driving training, scrapping older trucks, and norms for minimum tire efficiency. These measures are expected to reduce transport emissions by 6%. The annual cost of implementing these measures is about $55 million. The measures can potentially bring yearly fuel savings of over $200 million, and yearly environmental savings of $50 million. *Table 1* presents the per measure and cumulative impact of the measures in the proposed NAMA.

Table 1: Estimated Impact of NAMA Green Freight Measures in Viet Nam, Cumulative, 2018–2030 (tons)

Parameter	Aerodynamics	LRRs	Eco Driving	Truck Replacement	Combined
$PM_{2.5}$ reduction	46	247	141	60.5	436
NO_2 reduction	2,246	17,801	9,739	1,071	29,495
SO_2 reduction	2	25	18	0.3	45
CO_2 reduction	**145,066**	**3,525,569**	**1,672,967**	**19,693**	**5,269,544**

CO_2 = carbon dioxide, NO_2 = nitrogen dioxide, $PM_{2.5}$ = particulate matter 2.5, SO_2 = sulfur dioxide.

Source: Grutter 2017, Green Freight Nationally Appropriate Mitigation Action Viet Nam.

Table 2 shows the expected capital expenditure, cumulative operational expenditure, cumulative financial and economic savings, and the resultant financial internal rate of return, and economic internal rate of return of the NAMA.

Table 2: Estimated Economic and Financial Impacts of Viet Nam's Green Freight NAMA, 2018–2030

Parameter	Aerodynamics	Efficient tyres	Eco Driving	Truck scrapping	Combined measure
CAPEX MUSD	34	189	18	16	242
OPEX MUSD	0	0	107	0	107
Financial savings MUSD	32	787	373	4	1,176
Economic savings MUSD	43	945	470	10	1,479
FIRR	-1%	420%	194%	-24%	87%
EIRR	6%	506%	474%	-11%	127%

CAPEX = capital expenditure, OPEX = operational expenditure, FIRR =financial internal rate of return, EIRR = economic internal rate of return.

Source: Grutter 2017, Green Freight Nationally Appropriate Mitigation Action Viet Nam.

Although these measures offer high financial internal rates of return, they have not yet attracted investors in Viet Nam or the other countries that have NAMAs. Initial subsidies are important to overcome the perception of risks and other similar impediments. This could be supplemented by regulations for compulsory eco-driving training and norms on fuel efficiency. To finance initial subsidies, and to manage NAMAs, Viet Nam will need $34 million in international climate finance.

GMS countries can also develop Green Climate Fund financial proposals. Thailand, with the support of the Asian Development Bank, has already prepared a Green Climate Fund concept note to source concessional funding for a green freight program, based on the two stages described in this brief.