Chapter 2

Energy Efficiency Policy in Viet Nam

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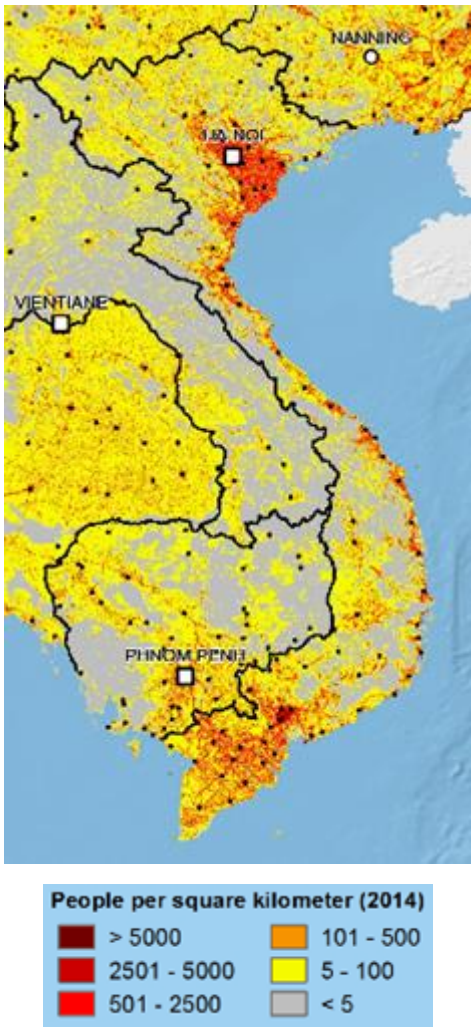
Chapter 2

Energy Efficiency Policy in Viet Nam

Before proceeding to policy analysis, the report will present an overview of the existing transport system in Viet Nam. As well recognized, Viet Nam is long from north to south. Population and industry are concentrated in Ha Noi City in the north and Ho Chi Minh City in the south. This geographical and demographical characteristic made Viet Nam to develop dense road network around two major cities, while interconnection of transport system between them is rather weak.

Figure 1.1: Population Density



Source: ADB website, Overview Map of GMS Population Distribution 2014

Figure 1.2: Existing and Planned Railways

Source: ADB website, Overview Map of GMS Railways 2012

Figure 1.3: Existing Road Network

Source: ADB website, Overview Map of Vietnam 2012

Figure 1.4: Planned Expressway

Source: Viet Nam Expressway Operation and Maintenance Limited Liability Company, Report on Viet Nam Expressway Development Plan, September 2013 (Bui Dinh Tuan).

2.1. The Current Energy Efficiency and Conservation (EE&C) Policy in Viet Nam

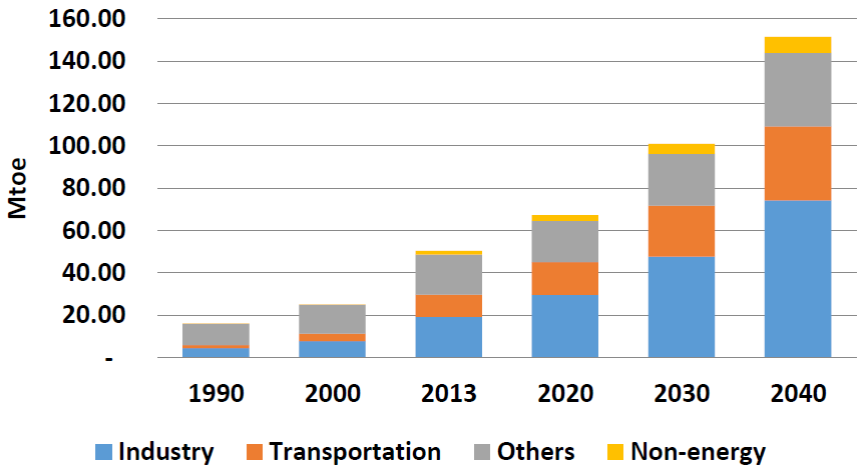
2.1.1. Introduction

(1) Final energy consumption, business as usual (BAU)

Viet Nam's final energy consumption increased at an average annual rate of 5.1% from 1990 to 2013, from 16.1 million tonnes of oil equivalent (Mtoe) to 50.5 Mtoe. The fastest growth occurred in the transport sector (9.2%), followed by the industrial sector (6.5%), and the residential or commercial ('others') sector (2.8%). Non-energy use increased at an average rate of 19.6% per year.

From 2013 to 2040, final energy consumption is projected to increase at an average rate of 4.2% per year under the BAU scenario, driven by strong economic growth, assumed to average 6.0% per year, and population growth of 0.7% per year. The strongest growth in consumption is projected to occur in the industry sector, increasing by 5.1% per year, followed by the transportation sector (4.6%), and the residential or commercial ('others') sector (2.3%). Non-energy use is expected to increase by 5.7% per year.

Figure 2.1: Final Energy Consumption by Sector, BAU Scenario



BAU = business-as-usual; Mtoe = million tonnes of oil equivalent

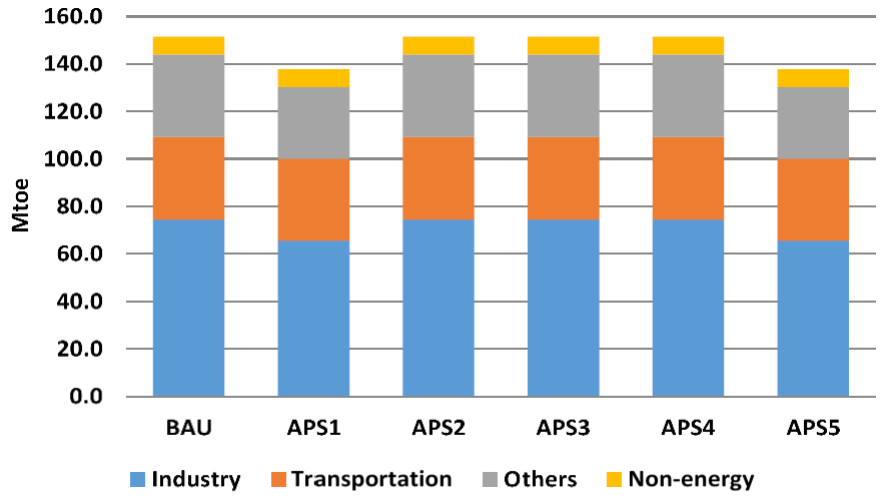
Source: ERIA (2016), *Energy Outlook and Energy Saving Potential in East Asia 2016*.

(2) Energy saving potential

In the Alternative Policy Scenario (APS 5), final energy consumption is projected to increase at a slower rate of 3.8% per year (compared with 4.2% in the BAU), from 50.5 Mtoe in 2013 to 137.8 Mtoe in 2040, mainly because of energy efficiency and conservation measures (APS 1) in the industrial, transport, and residential and commercial ('other') sectors.

APS implies different scenarios which are: (i) energy efficiency and conservation scenario (APS 1); improvement of energy efficiencies in power generation (APS 2); development of renewable energy (APS 3); further development of nuclear power plants (APS 4); and APS 5, a combination of all APSs, from APS 1 to APS 4.

Figure 2.2: Final Energy Consumption by Sector, BAU and APS

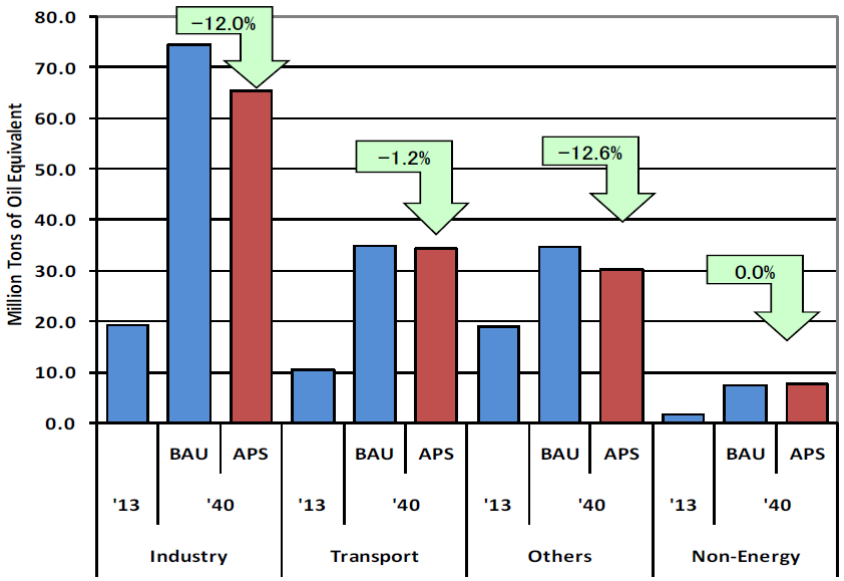


BAU = business-as-usual; APS = alternative policy scenario;Mtoe = million tonnes of oil equivalent.
Source: ERIA (2016).

The bulk of the savings are expected in the residential or commercial ('others') sector, at 4.4 Mtoe, equivalent to a 12.6% reduction, followed by the industry sector with 8.9 Mtoe, equivalent to a 12.0% reduction, and the transportation sector with 0.4 Mtoe, equivalent to a 1.2% reduction.

An improvement in end-use technologies and the introduction of energy management systems are expected to contribute to a slow consumption growth, particularly in the industry, residential and commercial ('others'), and transport sectors.

Figure 2.3: Final Energy Consumption, BAU vs APS



BAU = business-as-usual; APS = alternative policy scenario

Source: ERIA (2016), Energy Outlook and Energy Saving Potential in East Asia 2016.

2.1.2. The current energy efficiency and conservation policies in transport sector in Viet Nam

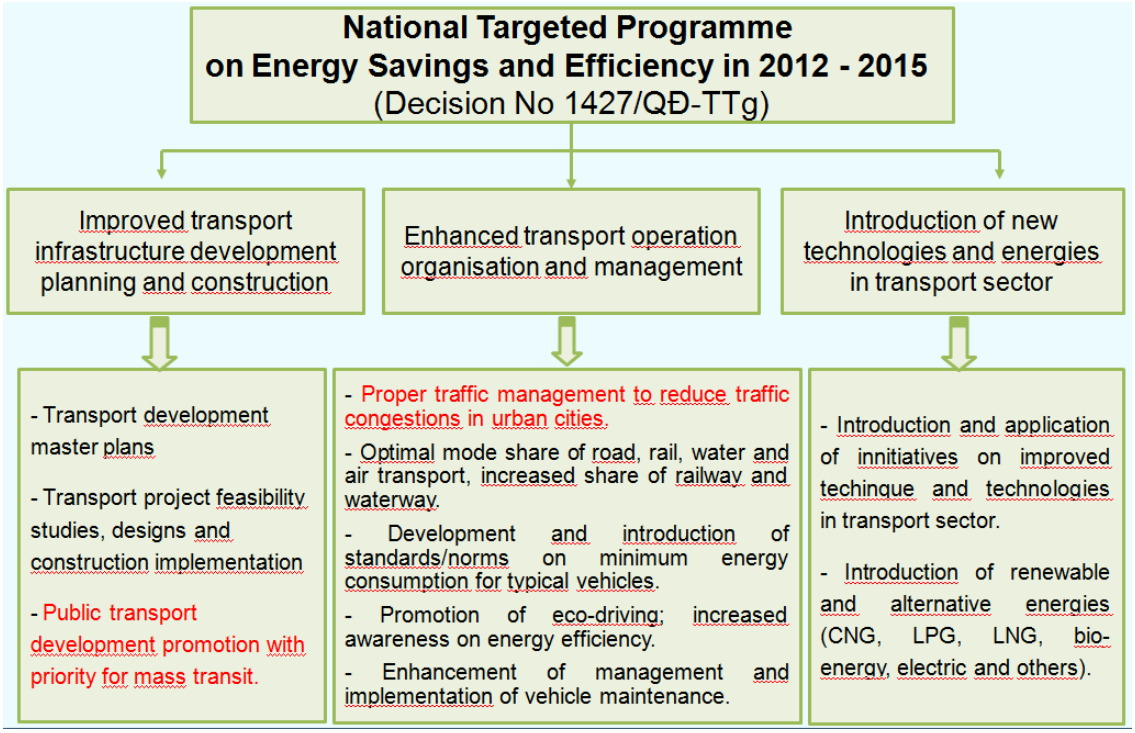
Viet Nam has made initial approaches for energy efficiency and conservation (EE&C) and environmental protection since the 1990s. The comprehensive law on EE&C with 12 Chapters, 48 articles was officially approved on 18 June 2010 and has been in effect since 1 January 2011. Thereafter, various decisions and circulars have been issued.

For example, Prime Minister's Decision No. 355/QD-TTg shows the transport development strategy up to 2020 with a vision to 2030. In this strategy through 2020, specific objectives are enumerated. For urban transport development, it stipulates rational development of urban transport and public transport infrastructure, allocating 16%–26% of land area for urban transport, and rapidly developing bus systems in major cities; quickly investing in bulk public routes, such as elevated railway and subway to accommodate 25%–30% of passenger transport demand, along with controlling the increase of private motorbikes and cars, especially in Hanoi City and Ho Chi Minh City.

Prime Minister's Decision No. 1427/QD-TTg indicates the National Targeted Programme on Energy Savings and Efficiency in 2012–2015. It consists of three pillars: (i) improved transport infrastructure

development and construction; (ii) enhanced transport operation organization and management; (iii) introduction of new technologies and energies in transport sector (Figure 2.4).

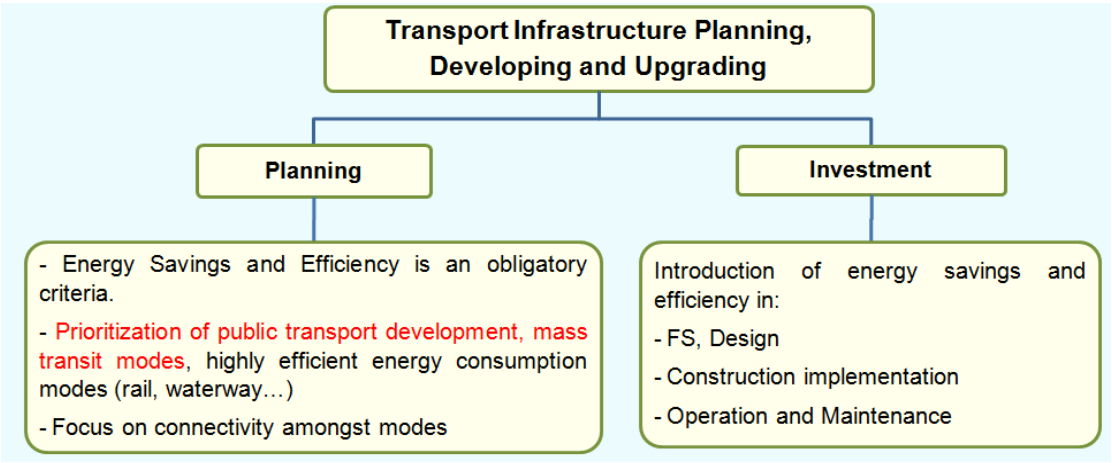
Figure 2.4: National Targeted Programme on Energy Savings and Efficiency in 2012–2015



CNG = compressed natural gas, LNG = liquefied natural gas, LPG = liquefied petroleum gas.
Source: Energy Efficiency and Conservation Office, Viet Nam.

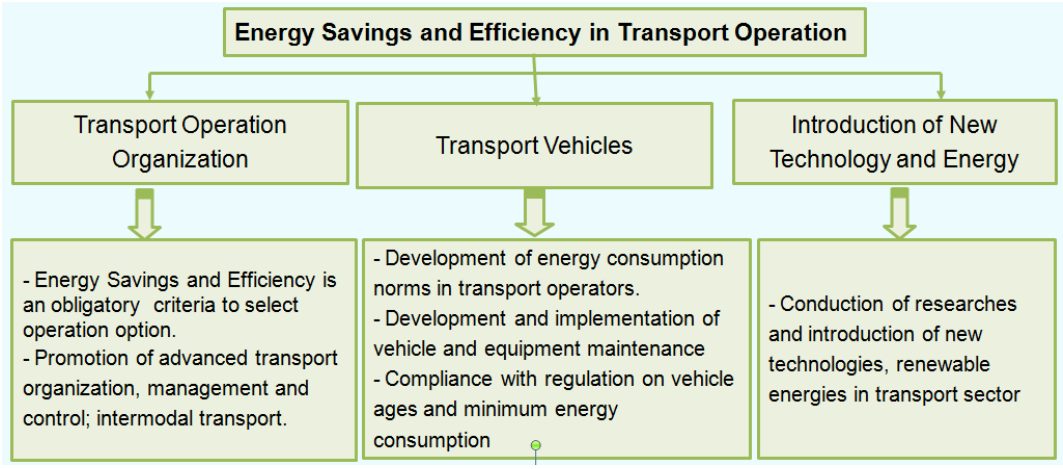
On measures for EE&C, Circular No. 64/2011/TT-BGTVT covers a wide range from infrastructure planning and investment to operation and management. Details are shown in Figures 2.5, 2.6, and 2.7.

Figure 2.5: Measures for Transport Infrastructure Planning, Developing, and Upgrading



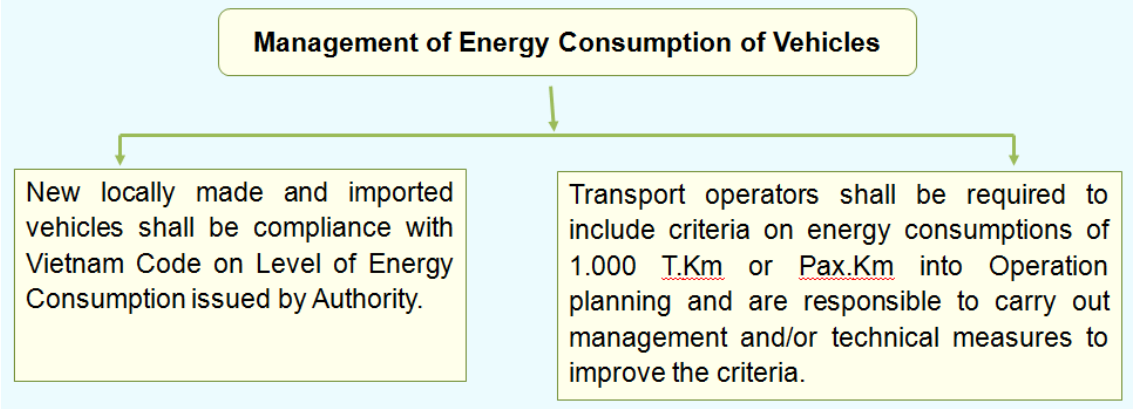
FS = feasibility study.
Source: Energy Efficiency and Conservation Office, Viet Nam.

Figure 2.6: Measures for Transport Operation



Source: Energy Efficiency and Conservation Office, Viet Nam.

Figure 2.7: Measures for Management of Energy Consumption of Vehicles



T.Km = total kilometre, Pax.Km = travel distance of passengers kilometre.
Source: Energy Efficiency and Conservation Office, Viet Nam.

2.2. Comparison of EE&C Policy in Viet Nam, Thailand, and Japan

Energy efficiency and conservation policies in the transport sector in three countries have been introduced at each time according to the development and growth stages of the country. For example, Japan will experience decline in population and low economic growth, while Viet Nam will have a steady population and economy growth. Thailand's situation is at the midpoint of that of the two countries. Thus, the priority of transportation policies a country should take may change from time to time, depending on the economic and social situation of the country.

Thailand especially puts emphasis on eco-labelling and expects a large amount of energy saving effects. On the other hand, Japan is keen on effective logistics to address labour shortages, especially truck drivers. The Japanese government is working on drawing up the next strategic logistics plan. It will incorporate in the next plan commercializing of self-driving technology, which is expected to greatly pare down economic loss of ¥10 trillion due to traffic jam.

In planning future policies, Viet Nam should not only follow other countries' precedents but also introduce policies tailored to its circumstances while referring to advanced examples of the world since urban mobility is transforming faster than ever, with revolutionary transport services altering how people move in cities daily.

The current status of EE&C policy in each country is described in Table 2.1.

Table 2.1: Overview of Major EE&C Policies in Three Countries

Category	Viet Nam	Thailand	Japan
Labelling and tax break for eco-vehicle	• Energy labelling for up to 7-seat cars -New locally made and imported cars: from Jan 2015. -For manufacturers who self-announce their energy consumption: from 1 Jan 2015 to 31 Dec 2016 • Energy labelling for 8-, 9- seat cars -mandatory from Jan 2018	• Eco-sticker for the rate of CO_2 and oil consumption (Starts on 1 Jan 2016) • Approved 97 companies of 2,249 versions of eco-stickers	• Tax reduction for eco-cars and eco-sticker have already been introduced.
Logistics and transportation management	• Adjustment of Transport Development Strategy of Viet Nam up to 2020, Vision to 2030	• Transportation management system demonstration for an efficient logistics management -Train 110 logistics companies • Tracking and initiatives to reduce energy consumption in transport sector -Traffic modelling -Create a data base to collect each car mileage	• Energy Conservation Law covers not only carriers but also shippers (encourages shipper to choose more energy-efficient carrier). • The next comprehensive logistics policy is under formulation.
Eco-driving	• Application of eco-drive program: environment-friendly driving -Taxi in Hanoi (Taxi group) -Trucks in Hanoi & Binh Duong -Training for pupils, students	• Eco-driving training - 4 regions with a total of 400 drivers (2-day training) - Create a network for training centers	• Eco-driving management system (EMS) has been introduced for trucks.

Public transport	• Approval of the scheme on development of public transport by bus, Stage 2012–2020	• DEDE has worked closely with OTP. • Fundamental information on energy saving evaluation - Airport rail link - BTS, MRT	• Low Carbon City Act (Dec 2012) -Promotion of public transport -Opening of new LRT/railway lines and bus routes and improvement of station
Railway improvement	• Railway Development Strategy until 2020 and vision to 2050 • The strategy focuses on upgrading the existing network.	【Double-track】 • DEDE with OTP follows the progress of double-track program • Change of 20 locomotive diesel heads (e.g. electric)	• 'Eco Rail Line Project is in progress, including installation of regenerative power absorbing device.

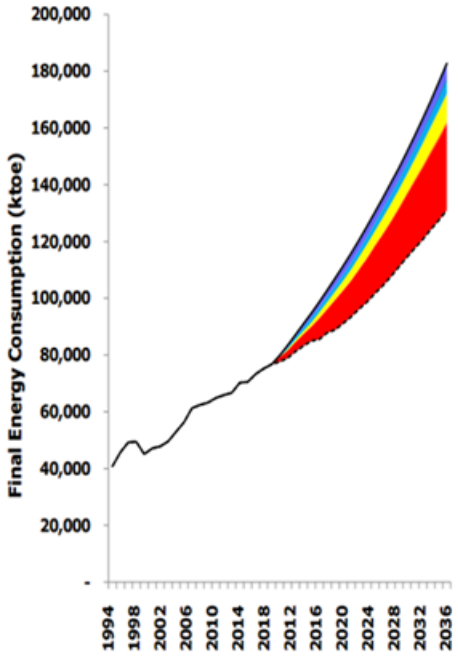
CO_2 = carbon dioxide, DEDE = Department of Alternative Energy Development and Efficiency, BTS = Bangkok Mass Transit System, LRT = light rail transit, MRT = mass rail transit, OTP = Office of Transport and Traffic Policy and Planning.
Source: Study Team.

2.2.1. Features of EE&C policy in Thailand

Thailand has formulated the Energy Efficiency Development Plan (EEDP) 2015–2036. According to the plan, an energy saving of 51,700 kilotonnes of oil equivalent (ktoe) will be realized in 2015–2036, 30,213 ktoe or 58% of which comes from the transport sector. In addition, specific energy saving target values are set for individual policies of the transport sector (Figure 2.8). Tax structure for vehicle and eco- sticker, which is the largest energy-saving contributor, accounts for 45% of the total energy reduction target. The eco-sticker (labelling) system based on carbon dioxide ($CO_{2)}$ emissions and fuel economy was introduced in January 2016, and CO_2 emissions have been reduced since then. The second largest saving is expected to come from railway improvement (double-track) and public transport, which account for approximately 16% of the total energy reduction target.

In promoting policies, Thailand established the EE7 Committee, which consists of government ministries and agencies with crossover cooperation to implement policies and verify results.

Figure 2.8: Summary of Energy Efficiency Development Plan Target by Sector

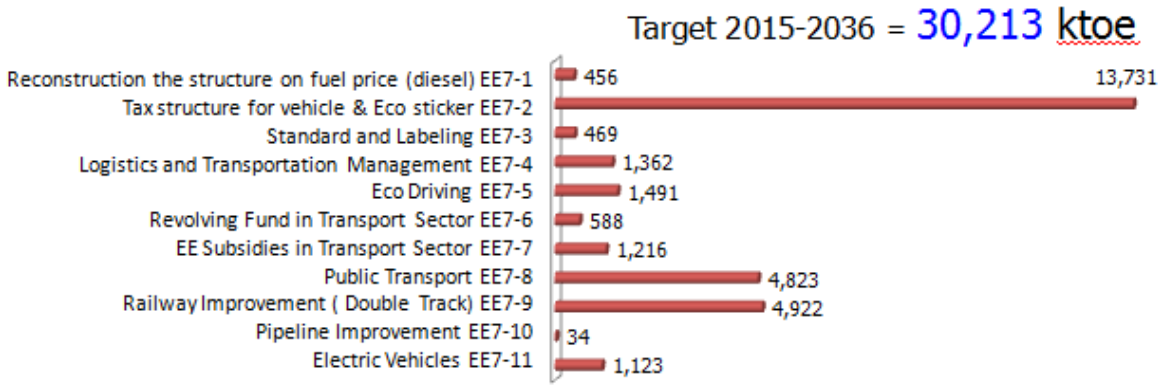


Expected Energy Saving by Economic Sector		Total (ktoe)	Total (%)
EE1	Enforcement of ENCON Act 1992 on energy conservation standards for designated factories and buildings	5,156	10%
EE2	Building Energy Code (BEC) on new buildings	1,166	2.2%
EE3	Energy Labeling on equipment/appliances (HEPs & MEPs)	4,150	8%
EE4	Enforcing Energy Efficiency Resource Standard (EERS) for large energy producers and distributors	500	1%
EE5	Financial Incentives and support for energy performance achievement	9,524	18.4%
EE6	Promoting and encourage to use LED	991	2%
EE7	Energy saving measures in transport sector	30,213	58.4%
EE8	Support the energy efficiency technology research & development	-	-
EE9	Support the human resource development on energy conservation	-	-
EE10	Support the public awareness and behavioral change on energy conservation	-	-
Total		51,700	100%

ktoe = kilotonne of oil equivalent.

Source: Department of Alternative Energy Development and Efficiency, Thailand Energy Efficiency Plan on Transport Sector (Mr. Pichalai)

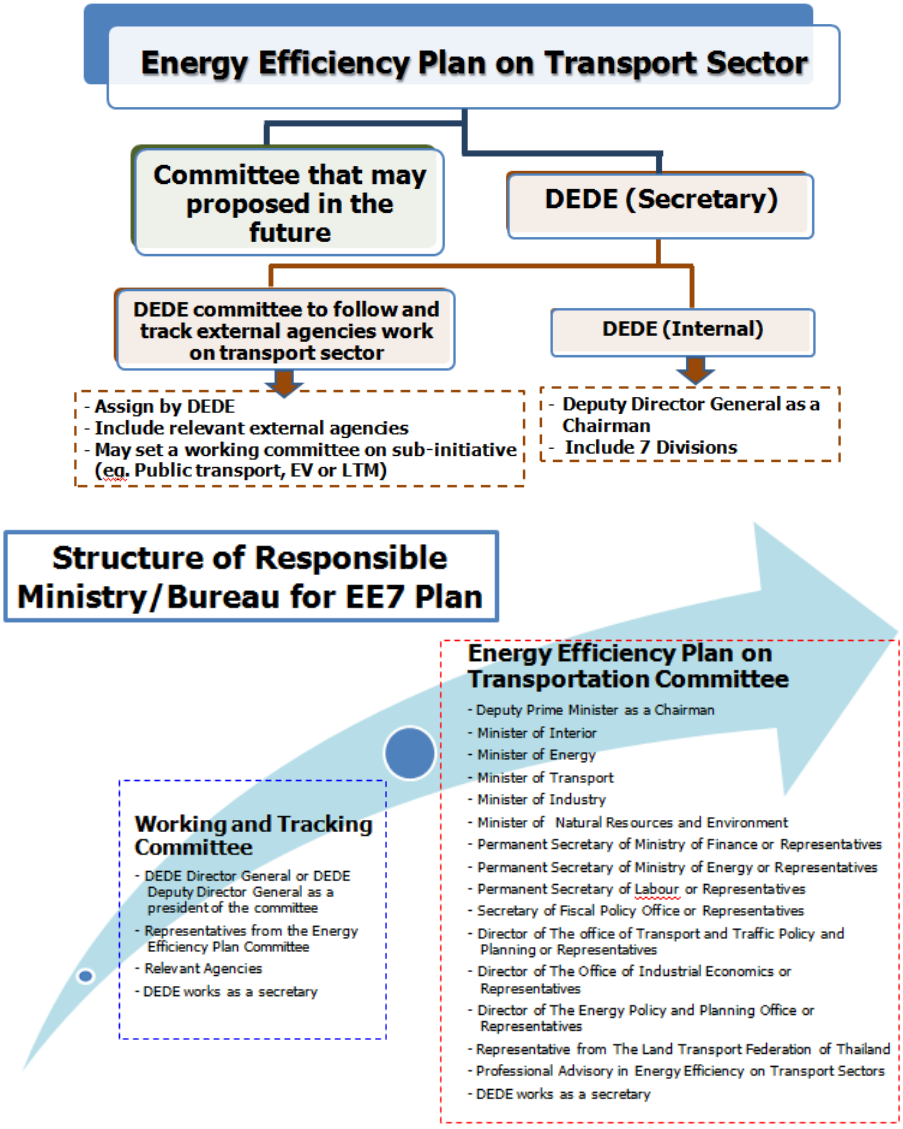
Figure 2.9: Energy Efficiency Plan on Transport Sector Saving Target (2015–2036)



ktoe = kilotonne of oil equivalent.

Source: Department of Alternative Energy Development and Efficiency (year), 'Thailand Energy Efficiency Plan on Transport Sector'.

Figure 2.10: Implementation Structure of EE&C Policy in Thailand



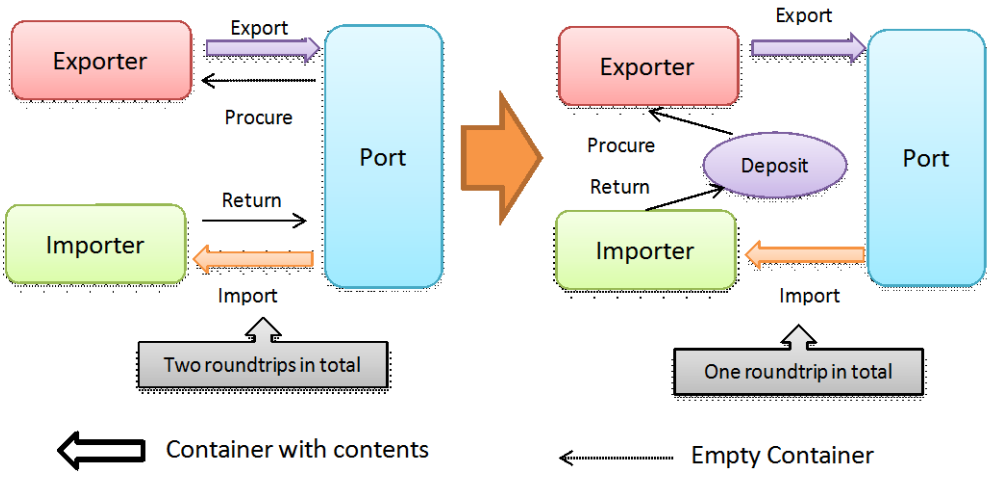
Source: Department of Alternative Energy Development and Efficiency, 'Thailand Energy Efficiency Plan on Transport Sector'.

2.2.2. Features of EE&C policy in Japan

One of the major energy efficiency features in Japan is that the Energy Conservation Law obligates business shippers, as well as transport operators, to make energy conservation efforts. The law is applied to shippers whose annual shipping amount is 30 million ton-kg and more which covers about 850 companies nationwide and about 19% of the total energy consumption of transportation sector. To build more efficient logistics for shippers, container round use (Table 2.2) and joint transportation and delivery (Table 2.3) have now been promoted. The Japanese government has also been formulating the next logistics plan with the cooperation of related ministries in the government. The government will incorporate technological innovation, i.e. ICT, in the policy, and address the problems of energy savings and labour shortages due to declining population.

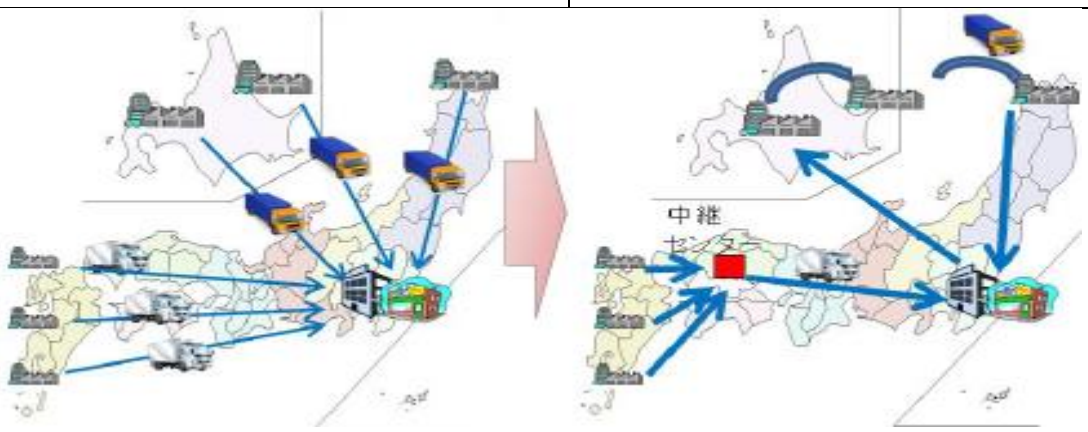
Table 2.2: Promotion of Container Round Use in Japan

Background	Countermeasures
• Inefficiency of maritime container transportation in imports and exports • During import, the container is picked up at the port, transported, and loads unpacked at the import company factory inland, and the empty container is returned to the port. During export, the empty container is picked up at the port, transported, and loads packed at the export company factory inland, and transported to the port and exported; all empty containers are returned to the port.	• Implement a pilot project where export operators can reuse containers used for import without returning them to the port (container round use) • Establish a council by stakeholders, shipping companies, distribution business operators, inland depots, government officials, and other stakeholders to grasp the current situation to solve problems



Source: Ministry of Economy, Trade and Industry, Japan.

Table 2.3: Promotion of Joint Transportation and Delivery in Japan

Background	Countermeasures
• Inefficient transport modes in rural areas • In rural areas, companies carry out shipping individually, so multiple duplicate transports occur with low loading efficiency.	• Construct a mechanism that loads and transports cargoes from small and medium regional enterprises with increased loading efficiency, sharing logistics bases and jointly shipping cargoes of multiple companies • Reduce logistics cost and lead time of regional companies by constructing a joint transportation and delivery model • Realize regional creation by promoting regional joint transportation and delivery model in other regions
	

Source: Ministry of Economy, Trade and Industry, Japan.

2.3. Proposals for Enhancing EE&C in Viet Nam

As an overview of the technology field in the world, artificial intelligence (AI) has been drawing much attention among governments, private enterprises, and research institutes. For the transportation sector, it can be applied in various fields, such as self-driving, traffic signals, and traffic congestion countermeasures.

AI has just come into the practical stage from the demonstration stage. For example, in Japan, 'Smart Bus' using AI is expected to be used in 2018. AI determines the optimum operating time and route based on the number of people desiring to use the bus, and the place and time. It is more efficient and convenient than running a determined route on time. As for AI traffic signals[1], in pilot tests in Pittsburgh, US, the smart traffic management system had impressive results. It reduced travel time by 25% and idle time by over 40%. The researchers also estimated that the system cut

[1] Radar sensors and cameras at each light detect traffic. Sophisticated AI algorithms use the data to build a timing plan that moves all the vehicles it knows about through the intersection in the most efficient way. The computer also sends the data to traffic intersections downstream for planning.

carbon dioxide emissions by 21%. The system could also save cities the cost of road widening or eliminating street parking by boosting traffic throughput[2].

In considering Viet Nam's transportation policy, it is desirable to incorporate the advancement of AI or other cutting-edge technologies. In particular, autonomous vehicles, AI traffic lights, and other devices or countermeasures to eliminate congestion have entered a full-scale introduction stage. Moreover, policy planning involving not only lawmakers but also citizens, businesses, and academia would translate into active participation and full commitment by each participant. Thus, this procedure would pave the way to solving various social problems, such as air pollution, traffic accidents, and high energy cost.

(i) Boosting efficiency in logistics; utilizing automated-driving technology

In Viet Nam, efficiency improvement of truck logistics is expected to have a large energy saving effect. For example, trucks consume more than 80% of total fuel in Da Nang City (Figure 3.6). To improve efficiency in logistics and to tackle traffic congestion, the government will set up a national express network, which consists of 21 routes with length of around 6,400 kilometres (kms). The investment will be focused on building two north–south expressway routes with priority to routes to Hanoi City, Ho Chi Minh City, Da Nang City, and big seaports. Moreover, the Economic Corridor extending to the east, west, north, and south has been promoting mainly through roads, which are responsible for regional logistics. It is essential to strengthen energy saving measures in the logistics field where Viet Nam is expected to deal with increased volume.

To address the challenge, Viet Nam could consider introducing advanced examples of automated-driving technology. In Japan, during the demonstration stage, automated-driving technology for truck platooning[3] has achieved a significant energy saving effect of 16% (Table 2.4). According to Japan's logistic strategy, an efficient distribution of logistics has been actively undertaken under the coordination of ministries and agencies with the government, and truck platooning will be utilized on highway by 2020 (Table 2.5).

Furthermore, autonomous driving system can be applied to BRT which will allow Viet Nam to easily expand BRT transportation volume.

[2] http://spectrum.ieee.org/cars-that-think/robotics/artificial-intelligence/pittsburgh-smart-traffic-signals-will-make-driving-less-boring

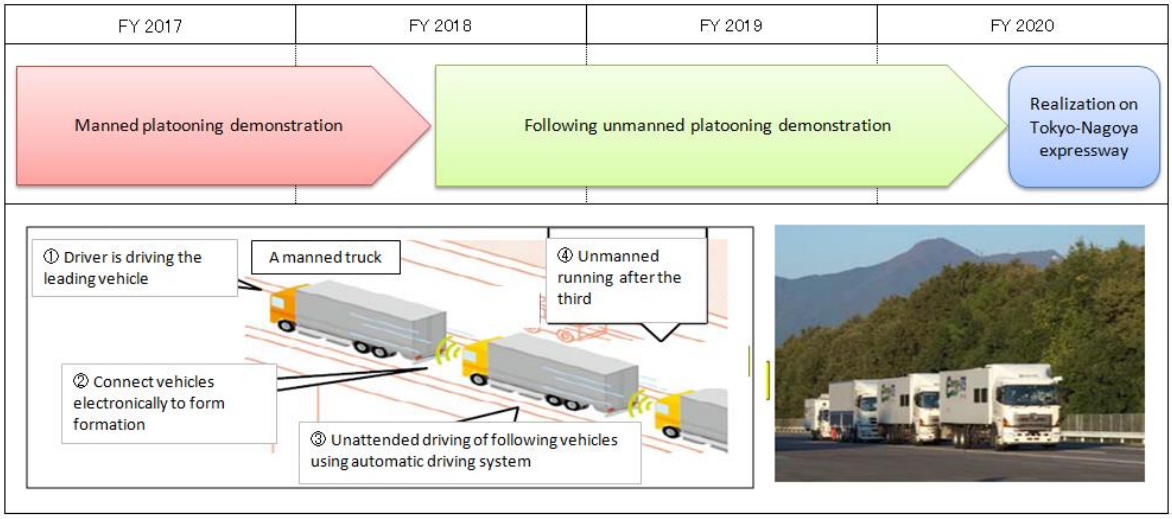
[3] Truck platooning is a driving method in which multiple trucks are driven in a platoon operation.

Table 2.4: R&D for Autonomous Truck Convoys in Japan

<table>
<tr><th>Period</th><th colspan="5">5 Years (2008–2012)</th></tr>
<tr><td>Targets</td><td colspan="5">• Improve fuel economy on highway by reducing running air resistance by proximity distance between vehicles and speed control without waste
• Realize a safe and reliable platooning that can travel even on existing highways</td></tr>
<tr><td>Experiments</td><td colspan="5">• Several driverless vehicles follow a human-driven truck to which they are wirelessly linked.
<table>
<tr><td colspan="2">Type</td><td>・4 heavy trucks
・CACC traveling</td><td>・3 heavy trucks
・Row traveling</td><td>・3 heavy trucks and a light truck
・Row traveling</td><td>・Alone unmanned driving</td></tr>
<tr><td rowspan="2">Spec.</td><td>Max.speed</td><td>80km/h</td><td>80km/h</td><td>80km/h</td><td>50km/h</td></tr>
<tr><td>Inter-vehicle Distance</td><td>30m</td><td>10m</td><td>4m</td><td>–</td></tr>
</table></td></tr>
<tr><td>Achievements</td><td colspan="5">• Realized platoon operations with a distance of 4 metres, achieving energy saving effect of 16.2%
• Platoon operations are applicable for expanding BRT transport volume.</td></tr>
</table>

R&D = research and development.
Source: NEDO Energy ITS Promotion Program, R&D for Autonomous Truck Convoys.

Table 2.5: Roadmap of Truck Platooning in Japan



Source: Prime Minister of Japan and His Cabinet (2017), A Government Council on Investments for the Future, February.

(ii) Traffic flow management; adopt an interactive, collaborative policy planning

Various policies incorporating the latest findings have been introduced to realize a sustainable society where traffic capacity can be increased while maintaining the current road width.

For example, the World Business Council for Sustainable Development (WBCSD) has launched 'Sustainable Mobility Project 2.0' with 15 mobility-related companies and other stakeholders to accelerate progress towards sustainable mobility. Six cities were selected as demonstration cities – Indore (India), Chengdu (China), Bangkok (Thailand), Campinas (Brazil), Lisbon (Portugal), and Hamburg (Germany).

A conventional policy planning, top–down approach, sometimes causes negative reactions from citizens or businesses, and even worse brings about harsh oppositions. To enhance the effectiveness of EE&C, it is crucial to gain an all-in support for the policy from all sectors.

As regards the project in Bangkok, the government developed and implemented the Sathorn Model for the most-heavily travelled Sathorn Street to mitigate traffic congestion and to make traffic flow smooth. Sathorn Model is initiated by WBCSD, Bangkok Metropolitan Administration (BMA), the Ministry of Transport (MOT), and Metropolitan Police Bureau. It has been scaled up by cooperating with Chulalongkorn University with around 110 million Thai baht granted from Toyota Mobility Foundation.

The model is composed of several dozens of policies. The government, private sector, academia, and citizens collaborated among themselves to promote the model effectively. As a result, it has brought noticeable achievements, thus these measures will be expanded across the city (Table 2.6).

Table 2.6: Overview of Sathorn Model Project in Bangkok, Thailand

Project Period	1 year and 9 months (April 2015–December 2016)
Purposes	• Mitigate the severe traffic congestion problem in Bangkok and achieve smooth and efficient movement of people through traffic and demand management, as well as through offer of diverse modes of transportation • Using the high-traffic flow concentration Sathorn district as a model, prepare a roadmap for traffic control for Bangkok as a whole that encompasses the public and private sectors, as well as ordinary citizens • Propose for the implementation of Sathorn Model in other districts.
Steps for collaboration among sectors	• Three steps taken to reach consensus from all sectors, namely government, citizens, businesses, academia; (1) Brainstorming for ideas from all sectors (2) Call for action to communicate with middle management to raise awareness and consider possible solutions (3) Leader forum
Main components	• Four pillars: Park and ride, shuttle bus, information system, traffic management • Evaluation of measures via six key performance indicators: greenhouse gas, energy efficiency, congestion and delay, commuting travel time, air polluting emissions, and comfort and pleasure
Achievements	• The amount of transportation in the peak time in the morning increased by 12.6%, 4691 vehicles per hour. • The average speed increased by 68%, which became 4.8 kms

	• Traffic jams caused by the stops at the traffic lights used to be more than 3 kms but are now within 2 kms

km = kilometre.
Source: Sathorn model website, TOYOTA Mobility Foundation, *Tokyo Shimbun*.

Technological advancement made the achievements possible. Now to address the raising concerns from the public for social challenges, including air pollution and greenhouse gas (GHG) emissions, Viet Nam has good opportunity to introduce innovative policies into the transport sectors in which various critical infrastructure projects are underway. For example, the country plans to construct 1,800 kms of highway connecting Hanoi City and Ho Chi Minh City, the country's largest-scale road yet at a maximum of 10 lanes. The route is expected to change logistics significantly for the entire Indochinese Peninsula.