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Advancing Free Trade
for Asia-Pacific Prosperity

Policy Dialogue on Fuel Economy Platform

APEC Policy Partnership on Science, Technology and Innovation

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Executive Summary

With rising concern on energy and environment worldwide, various economic sectors, especially transportation, have been subjected to energy efficiency improvement in order to utilize energy efficiently, as well as reduce greenhouse gas emission. With fast-growing vehicle population from emerging economies outside Organisation for Economic Cooperation and Development (non-OECD) economies, fuel economy policy has been considered as a low-hanging fruit solution to deliver tangible outcome with minimal budget due to existing technological innovation. Since 2009, Global Fuel Economy Initiative (GFEI) has been launched to tackle this issue to improve vehicle fuel economy worldwide with many of Asia-Pacific Economic Cooperation (APEC) economies actively participating. This project will carry on the momentum to highlight existing fuel economy policy, namely information, regulation and incentive, which have been implemented in many economies. Lesson learned from the economies that already implemented those measures will be investigated and shared with those economies that currently have interest or in the initial phase to implement through workshop series

Objectives

This project has four key objectives as follows:

1. Ensure trained participants will be able to conduct impact assessment on fuel economy policy in his/her own economies after the training.
2. Create framework or platform for fuel economy among APEC economies following Global Fuel Economy Initiative (GFEI).
3. Develop recommendations for economies with trained participants on how fuel economy initiative can be established.
4. Increase knowledge and build capacity in impact assessment of fuel economy as one of the energy efficiency measure in transportation sector.

Methodology

This project has four steps to conduct as follows:

1. Set up project team members composed of experts from various institutions selected from APEC member economies to review status of vehicle labeling scheme among APEC economies in order to find a few best practices suitable for developing APEC economies.
2. Hold first workshop with APEC experts and nominated participants to learn necessary fuel economy tool for impact assessment of fuel economy policy.

3. Participants to first workshop was followed up in order to gather necessary data in his/her own economies for assessment.
4. Hold second follow-up workshop with an aim to have as many participants from first workshop to continue discussion. Analysis results on certain economies were presented with discussion leading to recommendations and action plans to establish fuel economy policy in the region.

Project outcome

This project has expanded the previous APEC project Energy Working Group EWG 05 2014A, which focused on labelling of vehicle fuel consumption, to revisit the fuel economy issue with recent development. The experts are selected from fuel economy experts involved in Global Fuel Economy Initiative (GFEI) by International Energy Agency (IEA) and Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), known as German International Cooperation Agency, project "Energy Efficiency and Climate Change Mitigation in the Land Transport Sector in the ASEAN Region" or TCC (Transport & Climate Change) in short. The project held two workshops, the first workshop in Pathum Thani, Thailand during 26-27 April 2018 and the second workshop in Kuching, Malaysia on 22 November 2018. Both workshops were designed to achieve workshop goal via technical background presentation, discussion among experts and active participants, and moderation to address issues/concerns with a focus to push forward fuel economy policy in APEC region.

The first workshop laid out overview and current status of fuel economy policy around the world with focus on APEC economies, in particular the regional perspective in South East Asia, where some are APEC member economies. Discussion on common approach to bring together regional fuel economy was moderated with example from Thailand case study. Review of cost-benefit analysis tool on fuel economy policy was presented in details for participants to learn with step-by-step calculation with Thailand data. A follow up with participants from first workshop was carried out till second workshop.

The second workshop was designed to be coincide with international conference focusing on fuel economy named "10th Better Air Quality (BAQ)" in order to get larger exposure to experts in the fields. Update on fuel economy development in the APEC region was presented with highlight on recently endorsed ASEAN fuel economy roadmap, where some of the participants to this APEC project have been involved. In addition, update on fuel economy development in non-APEC region was added to attract further exchange of idea and discussion to advance regional collaboration for better fuel economy.

From both workshops and follow-up to selected participants from certain APEC economies, recommendations for fuel economy policy implementation are based on the principle of fuel economy policy.

1. Information approach should be initiated first for vehicle fuel economy labelling, as have been focused in APEC EWG 05 2014A, so that fuel consumption data can be publically and transparently accessible for car buyers to make decision.
2. Fiscal approach should be followed together with vehicle fuel economy labelling to incentivise fuel efficient vehicle through taxing mechanism, ranging from one-time excise tax to annual registration tax. As a function of fuel consumption in L/100km (or carbon dioxide, CO_2, emission in gCO_2/km), there are various taxing scheme, e.g. step-wise, linear function, or even feebate, where rebate could be awarded to very fuel efficient vehicle. Details of CO_2-step, slope of linear function or feebate criteria can be adjusted periodically to monitor government income. In addition, fiscal approach could be indirectly applied, such as fuel tax, so that market will favor fuel efficient vehicle automatically. Often, fiscal approach for fuel efficient vehicle could specifically target electric vehicle. With recent promotion of electric vehicle, average fuel economy has been shown to improve as well.
3. Standard approach could be utilized once auto industry is generally equipped with fuel efficient technology for fair competition. Although this approach is very attractive to government due to no subsidy involved, there should be many consultations with auto industry for cooperative and smooth implementation. Fuel economy standard could come in a form of Minimum Energy Performance Standard (MEPS), where individual vehicle must be more fuel efficient than the criteria before being sold in the market, or Corporate Average Fuel Economy (CAFÉ), where automotive company must have average fuel economy of all car models to be more fuel efficient than the criteria (i.e. car company is allowed to sell luxurious vehicle with poor fuel efficiency, as long as the company also sells fuel efficient vehicle to have company-average fuel economy better than the criteria)
4. It should be noted that all three approaches above should have dynamic criteria subjected to periodic revision to update criteria with emerging technologies and market situation.

Project Background

Transportation is a key infrastructure among all APEC economies, especially the emerging economies to support economic growth and prosperity. With sharp-rising vehicle population, energy efficient measure must be considered to address future energy and environment sustainability. Within existing technical innovation in vehicle technology, fuel economy policy can be easily implemented in any economy focusing on information (e.g. labeling of vehicle fuel consumption and CO_2 emission as in EWG 05 2014A), regulation (e.g. mandating individual or average fuel consumption) or incentive (e.g. subsidizing vehicle with better fuel consumption or penalizing vehicle with poor fuel consumption). Of course, there is no one size fit all so the project seeks to analyze lessons learned, both technology and policy aspects, from economies already have fuel economy policy to share with economies with interest or beginning to implement fuel economy policy. Practical hand-on training on fuel economy theory and impact assessment will enable selected representatives from interested economies to initiate policy dialogue on fuel economy for future implementation.

The project aims to involve several stakeholders related to vehicle consumption in APEC member economies, ranging from policy makers, research institutes and private sectors, especially technology-ready automotive industry. Discussion during workshops on technical aspects of vehicle fuel-efficient technology, as well as non-technical aspects of fuel economy policy implementation will be conducted with an attempt to reach some common understandings and recommendations how to further realize benefit from fuel economy policy among APEC economies. During such discussion, developing APEC member economies will benefit from capacity building on technical knowledge, as well as lesson learned, shared from developed APEC member economies with constraints and concerns specified by developing APEC member economies. Level of engagement by developing APEC member economies very well ranges from working group member, supporting member and participates to arranged workshops.

The main goal of this project is to formulate recommendations for fuel economy policy in the APEC region. Specifically, the project objectives are

1. Ensure trained participants will be able to conduct impact assessment on fuel economy policy in his/her own economies after the training.
2. Create framework or platform for fuel economy among APEC economies following Global Fuel Economy Initiative (GFEI).

3. Develop recommendations for economies with trained participants on how fuel economy initiative can be established.
4. Increase knowledge and build capacity in impact assessment of fuel economy as one of the energy efficiency measure in transportation sector.

Project Methodology

To achieve the main goal previously identified, the project implementation is divided into four steps as follows.

First, the project team members were established from a network of fuel economy experts from related group in APEC member economies, such as Global Fuel Economy Initiative (GFEI) by International Energy Agency (IEA) and Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), known as German International Cooperation Agency, project "Energy Efficiency and Climate Change Mitigation in the Land Transport Sector in the ASEAN Region" or TCC (Transport & Climate Change) in short. With the knowledge and experience in fuel economy policy and technology, the project team members can help speed up the discussion toward implementation of fuel economy policy for benefit of both vehicle manufacturers and vehicle users. Without political binding of project team members, they can freely discuss based on scientific evidence and policy recommendation. Status of vehicle labeling scheme among APEC economies was reviewed in order to find a few best practices suitable for developing APEC economies. The finding was presented at the 1st training workshop so the participants can understand the big picture and how might his/her economy adapt the best practice.

Second, the first workshop was held as a platform for project team members, experts and active participants from APEC member economies to share information regarding fuel economy policy initiative and implementation, especially lesson learned and best practices as a way forward for other APEC member economies of initial stage to implement fuel economy policy. Discussion will focus on ready vehicle technology from automotive industry with cost benefit analysis to illustrate win-win situation to implement fuel economy policy. During the first day, each participant was asked to present his/her knowledge and/or awareness of fuel economy related activity/policy in his/her own economy. Then, overview of fuel economy policy among APEC economies, as well as global initiatives, was presented to show lesson learned and best practice. On the second day, existing tool to assess impact from fuel economy policy, e.g. IEA FEPIT (Fuel Economy Policies Implementation Tool by International Energy Agency) was explained step-by-step with example so that participants could perform analysis back in his/her economies.

Third, concerns and issues identified by participants from the first workshop were consulted among project team members, and other experts if needed, as a follow up for further analysis and discussion at second workshop. Necessary data was

gathered in own economies for cost-benefit assessment of fuel economy policy implementation.

Fourth, the second workshop was held aiming to have as many participants from the first workshop to continue discussion. Analysis results on certain economies were presented with interactive discussion leading to recommendations and action plans to establish fuel economy policy in the region.

Project Team Members

Table 1 shows the list of project team leader, members and coordinators representing seven economies. Out of ten members, there are well balanced of five women and five men, four government and five university/research institute, and one private sector.

Table 1: Lists of APEC project PPSTI 03 2017A team members

No	Name	Affiliation	Economy	Gender	Position in project	Email
1	Dr Nuwong Chollacoop	National Metal and Materials Technology Center (MTEC)	Thailand	M	Head	nuwongc@mtec.or.th
2	Ms Gessarin Gunthawong	Transport and Climate Change Project, GIZ Thailand	Thailand	F	Deputy head	gessarin.gunthawong@giz.de
3	Mr Robert Earley	Sino-Canadian Commodities Consulting Co., Ltd.	Canada	M	Expert	rob@sinocanadian.net
3	Mr Puput Ahmad Safrudin	Komite Penghapusan Bensin Bertimbel (KPBB)	Indonesia	M	Expert	puput@kpbb.org
4	Ms Jeyashri Kisna	Transport and Climate Change Project, GIZ Malaysia	Malaysia	F	Coordinator	jeyashri.kisna@giz.de
5	Ms Kathleen Dematera	Clean Air Asia (CAA)	Philippines	F	Coordinator	kathleen.dematera@cleanairasia.org
6	Mr Bert Fabian	UN Environment	Philippines	M	Expert	bert.fabian@un.org
7	Dr Peerawat Saisirirat	National Metal and Materials Technology Center (MTEC)	Thailand	M	Expert	peerawas@mtec.or.th
8	Dr Manida Tongroon	National Metal and Materials Technology Center (MTEC)	Thailand	F	Expert	manidat@mtec.or.th
9	Ms Wanita Powsakul	National Metal and Materials Technology Center (MTEC)	Thailand	F	Coordinator	wanitap@mtec.or.th
10	Dr Le Anh Tuan	Hanoi University of Science and Technology (HUST)	Viet Nam	M	Expert	tuan.leanh@hust.edu.vn

Summary of first workshop

The first APEC Workshop on Policy Dialogue on Fuel Economy Platform was held during 26-27 April 2018 in Pathum Thani, Thailand, with the main objective to provide current status of fuel economy policy around the world with focus on selected APEC member economies, as well as to train participants cost-benefit analysis tool developed by International Energy Agency (IEA) called "Fuel Economy Policies Implementation Tool (FEPIT)" for further analysis in own economies. The agenda is shown in Table 2, where on the first day, the workshop was honored to have opening speech by Ms. Thamaporn Apison, as shown in Figure 1, Director of Office of International Cooperation, Ministry of Science and Technology (MOST), who is Thailand representative to APEC PPSTI (Policy Partnership on Science, Technology and Innovation). She was aware of this project and looked forward to the project output so that Thailand, among many other APEC member economies, can join hand to proceed toward full implementation of fuel economy policy in the near future.

Table 2: Agenda of the first APEC Workshop on Fuel Economy Platform

The First APEC Workshop on Fuel Economy Platform

26-27 April 2018

Convention Center 4th Flr Board Room

Thailand Science Park, Pathumthani, Thailand (https://goo.gl/maps/e9rEp72J4F12**)**

Thursday 26 April 2018

Agenda	
08.30	Registration
09.00	Opening Session and Workshop/Project Overview Welcoming Remark by Dr Aree Thanaboonsombut, Deputy Executive Director, National Metal and Materials Technology Center Project overview and Opening remark by Ms Thamaporn Apison, Director, Office of International Cooperation, Ministry of Science and Technology and PPSTI Representative from Thailand Group Photo
09.30	**Keynote – Overview of fuel economy development in the world** Mr Bert Fabian, UN Environment
10.00	Coffee Break
10.30	**Overview of fuel economy development around the world with focus on fiscal incentives (30 min each)** **USA**: Ms Zifei Yang, The International Council on Clean Transportation (ICCT) **via skype** **Australia**: Mr Mark Gjerek, MOV3MENT

	Canada: Mr Robert Earley, Sino-Canadian Commodities Consulting Co, Ltd
12.00	**Lunch**
13.00	**Overview of fuel economy development around the world with focus on fiscal incentive (cont'd, 30 min each)** **China:** Mr Robert Earley, Sino-Canadian Commodities Consulting Co, Ltd **Philippines**: Ms Kathleen Dematera, Clean Air Asia (CAA) **Thailand**: Ms Gessarin Gunthawong, GIZ TCC **Viet Nam**: Prof Le Anh Tuan, Hanoi University of Science and Technology (HUST)
15.00	Coffee Break
15.30	Regional perspective on fuel economy in South East Asia Mr Friedel Sehlleier, Acting Director of GIZ TCC
16.00	**Discussion on common approach to bring together regional fuel economy** Moderator will ask for opinion from participants on fuel economy initiatives toward regional collaboration aiming for recommendations on fuel economy policy. All the feedback will be compiled for further discussion.
18.00	Welcome Dinner (by invitation only)

Friday, 27 April 2018

Analysis on baseline fuel economy with case studies to establish common approach

Agenda	
08.30	Registration
09.00	**Overview of Thailand case study on fuel economy analysis** Dr Nuwong Chollacoop, National Metal and Materials Technology Center (MTEC)
09.30	**Technological advancement to improve vehicle fuel economy** Mr Siamnat Panassorn, Tripetch Isuzu Sales Co, Ltd (TIS)
10.00	**Technological advancement to improve vehicle fuel economy** Dr Atthawit Techawiboonwong, BMW (Thailand) Co, Ltd
10.30	Coffee Break
11.00	**Gasoline Powertrain Technology Trends for highest Efficiency and ultra-low Emission under real driving conditions** Dr Hubert Friedl, AVL List GmbH Mr Franz Kinzer, AVL SEA & AUSTRALIA Co., Ltd.
11.30	**Round table Discussion on private sector contribution to fuel economy improvement** Moderator will ask for opinion from participants on role of private sector to support fuel economy improvement
12.00	**Lunch**
13.00	**Review of cost-benefit analysis tool on fuel economy with case study: FEPIT** Dr Peerawat Saisirat, National Metal and Materials Technology Center (MTEC)

14.00	**Discussion on common approach for cost benefit analysis on fuel economy** Moderator will ask for opinion from participants on cost benefit analysis on fuel economy toward regional collaboration
15.00	Coffee Break
15.30	**Drafting of fuel economy framework in member economies** • Based on case studies, participants are encouraged to try to draft fuel economy framework in member economies, e.g. listing related stakeholders and authorities, identifying current and future fiscal incentive and formulating fuel economy framework.
16.30	**Wrap up** • The moderator will set up task to be completed by participants from member economies by second workshop in November 2018 during BAQ2018 in Malaysia.

Figure 1: Opening session of the first workshop

TOP: (left) Welcoming Remark by Dr Aree Thanaboonsombut, Deputy Executive Director, MTEC, and (right) Opening Remark by Ms Thamaporn Apison, Director of Office of International Cooperation, Ministry of Science and Technology (MOST) & PPSTI Representative

First workshop participants

As shown in Figure 2 and

Table 3, the workshop was attended by 50 participants from nine APEC member economies with a ratio of female ratio of 46% (23 women and 27 men).

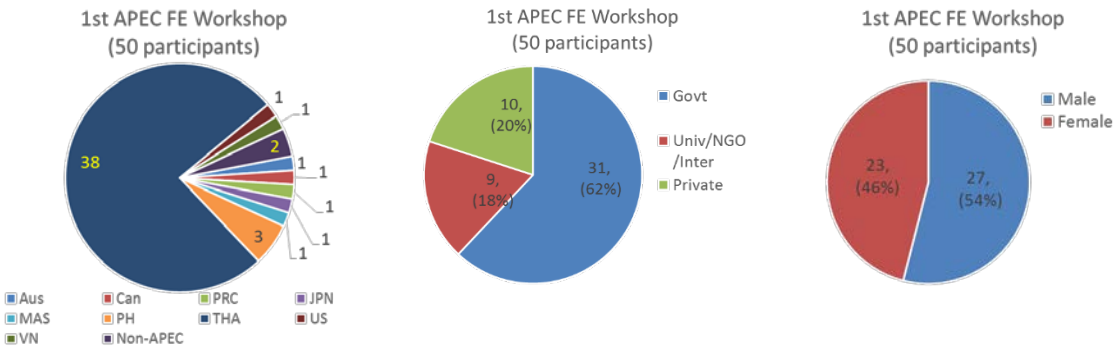

Figure 2: Group photo of the first workshop with breakdown statistics

Table 3: List of participants to first APEC Workshop

No	Name	Affiliation	Economy	Gender	Email*
1	Ms Thamaporn Apison	Director, Office of International Cooperation, Ministry of Science and Technology and PPSTI Representative from Thailand	Thailand	F	thamapor@most.go.th
2	Dr Aree Thanaboonsombut	Deputy Executive Director National Metal and Materials Technology Center (MTEC)	Thailand	F	areeh@mtec.or.th
3	Dr Sumittra Charojrochkul	Director Materials for Energy Research Unit (MTEC)	Thailand	F	sumittrc@mtec.or.th
4	Mr Mark Gjerek	Australia, MOV3MENT	Australia	M	mark@mov3ment.com.au
5	Mr Robert Earley	Canada, Sino-Canadian Commodities Consulting Co. Ltd.	Canada	M	rob@sinocanadian.net
6	Ms Xi Jin	China, China Society for Sustainable Development	People's Republic of China	F	jinxi@acca21.org.cn
7	Mr Atomo Yukimune	Japan Science and Technology Agency (JST)	Japan	M	atomo.yukimune@jstsg.org
8	Mr Mohd. Fauzi Ismail	Malaysia, SIRIM Industrial Research	Malaysia	M	mfauzi@sirim.my
9	Mr Bert Fabian	Philippines, UN Environment	Philippines	M	bert.fabian@un.org

No	Name	Affiliation	Economy	Gender	Email*
10	Ms Kathleen Dematera	Philippines, Clean Air Asia (CAA)	Philippines	F	kathleen.dematera@cleanairasia.org
11	Ms Alexandra Leonardo	Philippines, Department of Finance	Philippines	F	
12	Ms Zifei Yang	USA	USA	F	zifei.yang@theicct.org
13	Prof Le Anh Tuan	Viet Nam, Hanoi University of Science and Technology (HUST)	Viet Nam	M	tuan.leanh@hust.edu.vn
14	Mr Franz Kinzer	AVL SEA & AUSTRALIA Co., Ltd.	Austria	M	Franz.Kinzer@avl.com
15	Mr Friedel Sehlleier	Acting Director of GIZ TCC	Germany	M	friedel.sehlleier@giz.de
16	Ms Kalaya Jinliang	Office of International Cooperation, MOST	Thailand	F	kalaya67@gmail.com
17	Mr Vasuchar Thusaneeyapun	Office of International Cooperation, MOST	Thailand	M	
18	Ms Chanidabha Yuktadatta	Ministry of Foreign Affairs of Thailand	Thailand	F	
19	Mr Sunhanut Jenjesda	Ministry of Foreign Affairs of Thailand	Thailand	M	
20	Dr Nuwong Chollacoop	National Metal and Materials Technology Center (MTEC)	Thailand	M	nuwongc@mtec.or.th
21	Dr Peerawat Saisirat	National Metal and Materials Technology Center (MTEC)	Thailand	M	peerawas@mtec.or.th
22	Dr Manida Tongroon	National Metal and Materials Technology Center (MTEC)	Thailand	M	manidat@mtec.or.th
23	Ms Wanita Powsakul	National Metal and Materials Technology Center (MTEC)	Thailand	F	wanitap@mtec.or.th
24	Ms Gessarin Gunthawong	GIZ	Thailand	F	gessarin.gunthawong@giz.de
25	Dr Worajit Setthapun	Chiang Mai Rajabhat University	Thailand	F	worajit@cmru.ac.th
26	Ms Thanyathorn Sawatdiwong	Office of Transport and Traffic Policy and Planning	Thailand	F	

No	Name	Affiliation	Economy	Gender	Email*
27	Acting Capt Supawat Chaiprapan	Office of Transport and Traffic Policy and Planning	Thailand	M	
28	Mr Wanrudee Chansiri	Office of Transport and Traffic Policy and Planning	Thailand	M	
29	Ms Patporn Thongprachan	Office of Transport and Traffic Policy and Planning	Thailand	F	patpornat@gmail.com
30	Mr Kittipid Onika	Office of Transport and Traffic Policy and Planning	Thailand	M	
31	Ms Deungchai Wongrak	Office of Transport and Traffic Policy and Planning	Thailand	F	
32	Mr Sukapat Tiempathom	Office of Transport and Traffic Policy and Planning	Thailand	M	
33	Mr Monchai Chumintarajak	Office of Transport and Traffic Policy and Planning	Thailand	M	
34	Ms Rabiab Khongnantha	Office of Transport and Traffic Policy and Planning	Thailand	F	
35	Mr Nut Boonyubol	Office of Transport and Traffic Policy and Planning	Thailand	M	
36	Mr Jirawut Panprom	Office of Transport and Traffic Policy and Planning	Thailand	M	
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No	Name	Affiliation	Economy	Gender	Email*
42	Ms Kamolporn Pornroekwiangping	Office of Natural Resources and Environmental Policy and Planning	Thailand	F	pearryiiws@gmail.com
43	Mr Borwornpong Sunipasa	Department of Alternative Energy Development and Efficiency	Thailand	M	
44	Mr Siamnat Panassorn	Tripetch Isuzu Sales Co, Ltd (TIS)	Thailand	M	p_siamnat@tripetch-isuzu.co.th
45	Dr Atthawit Techawiboonwong	BMW (Thailand) Co, Ltd	Thailand	M	Atthawit.Techawiboonwong@bmw.co.th
46	Ms Juthathip Sinthao	The Thai Automotive Industry Association	Thailand	F	juthathip.sin@nissan.co.th
47	Mr Narun Suwanchotchoung	The Thai Automotive Industry Association	Thailand	M	naruns@tdem.toyota-asia.com
48	Ms Poonlaporn Suksai	Denso International Asia	Thailand	F	poonlaporn_s@denso.co.th
49	Ms Aussamaporn Banyam	Thai Autoparts Manufacturers Association (TAPMA)	Thailand	F	
50	Mr Tanakorn Charoenrueangwanich	Thai Yamaha Motor Co,Ltd	Thailand	M	

*For those who allows their emails to be listed.

First workshop presentation and discussion

The first workshop was structured for two days with the first day composed of various presentations from global overview and participating APEC member economies, followed by regional perspective effort in South East Asia prior to discussion on common approach to bring together regional fuel economy. The second day focused on the case study of Thailand with fuel economy analysis on the weight-average fuel consumption improvement of new vehicles after Thai government implemented CO_2-based excise tax on new vehicle. Presentations on available technologies to improve vehicle fuel consumption from private sectors further confirmed justification for fuel economy policy implementation. Then, cost-benefit analysis tool called “Fuel Economy Policies Implementation Tool (FEPIT)” developed by International Energy Agency (IEA) was explained step-by-step with example calculation with Thailand data. Lastly, the workshop was concluded with discussion on common approach for cost benefit analysis on fuel economy, as well as drafting of fuel economy framework in member economies. Figure 3 showed various presentations and discussion on 1st day; whereas, Figure 4 showed presentations by private sectors

with final discussion to wrap up the workshop. Presentation file is shared at https://www.transportandclimatechange.org/2018/05/09/the-1st-apec-workshop-on-policy-dialogue-on-fuel-economy-platform/.

Figure 3: Various presentations and discussion during the first workshop (day one)

Figure 4: Various presentations and discussion during the first workshop (day two)

The keynote speech on “Overview of fuel economy development in the world” was delivered by Mr Bert Fabian from UN Environment focusing Global Fuel Economy Initiative (GFEI) to double vehicle fuel efficiency worldwide. Given the fast rising of motor vehicles in the world (one billion today and over 2.5 billion by 2050) and increasing CO_2 emission from transport sector, sustainable and low-emissions transport has been a focus based on the principle of avoid-shift-improve by reducing the need to travel, changing to more energy efficient modes and using more energy efficient technologies, respectively. With many on-going initiatives and collaborations around the world, low-hanging fruit option is implementation of fuel economy policy, where GFEI has set a target to double light duty vehicle (LDV) fuel efficiency by 2050 focusing on non-OEDC improvement especially in Asian economies. Key options for fuel economy policy includes fuel economy labeling, fuel pricing, fuel economy standards and vehicle purchase tax. Best practices where fuel economy policies work were illustrated with link to Conference of the Parties (COP) to United Nations Framework Convention on Climate Change, as identified in IEA two-degree scenario.

Next was presentation by Ms Zifei Yang (via skype) from USA, on the overview of fuel economy development in USA from the work by The International Council on Clean Transportation (ICCT). US fuel economy/GHG standards showed that better performing and more efficient vehicles have been produced in the market, both from technological advancement and cost-effectiveness from consumers' point of view (three to five years). Among fiscal measures to improve vehicle fuel efficiency, vehicle tax, incentive for fuel-efficient vehicles and feebate scheme seem to encourage technology advancement; whereas, fuel tax and infrastructure support (e.g. charging station, discounted electricity) may not sustain in the long term. Example of electric vehicle (EV) in the US showed that EV could be cost-competitive to conventional vehicles given scale of production, battery technology improvement and fiscal/non-fiscal policies. In fact, Zero Emission Vehicle (ZEV) mandate would indirectly stimulate EV market, which in turn would further improve fuel economy policy like Corporate Average Fuel Economy (CAFÉ).

Next was presentation by Mr Mark Gjerek from Australian consulting company, MOV3MENT, on fuel economy update from Australia. Australian landscape is rather unique having 90% urbanized with more than 40% of total population living in two cities, Sydney and Melbourne. Fuel economy of passenger cars have been slowly improving about 2.6% annually, partly due to increasing sport utility vehicle (SUV) share, with potential room for improvement as transport fuel is the main household energy cost. Recently in 2015, ministerial forum on vehicle emissions was established to focus on three issues, namely vehicle pollution, vehicle efficiency and fuel quality, where discussion is still continued till today without official target yet. With only a few indirect incentives from both central and state government, major ownership costs are not affected that much leading to slow progress in fuel efficiency improvement.

Next were presentations by Mr Robert Earley from consulting company working in both Canada and People's Republic of China, on fuel economy policy in both economies. As the world's fourth largest automotive exporter in 2016, Canada has 27 auto factories with integrated US-Canada supply chain. From oil crisis in 1973, Canada started Corporate Average Fuel Consumption (CAFC) standard, which has tracked US standard, but on the voluntary basis with great effectiveness at the beginning but went stagnant for 25 years. Then, GHG emission reduction initiative has come in to stimulate the policy again with high excise tax on fuel-inefficient vehicle. Today, 2018 fuel consumption guide provides model-specific fuel consumption information.

Next was presentation by Ms Kathleen Dematera from The Philippines on fuel economy development. With increasing percentage of greenhouse gas (GHG) emission from transport sector due to increasing number of vehicles, energy efficiency

and conservation roadmap (2017-2040) has been launched with 25% energy saving target in transport sector. In the short term plan (2017-2020), fuel economy labeling has been in discussion under the development of the Implementing Rules and Regulations (IRR) of the Department Circular 2016-04-0005 with first workshop held in October 2017. For medium term (2021-2030), the focus will be on financial incentives for energy efficiency vehicle through taxes, promotion of key vehicle technologies and driver education/fleet management programs. Various taxation schemes from vehicle excise tax and fuel tax have been in discussion as part of recent tax reform.

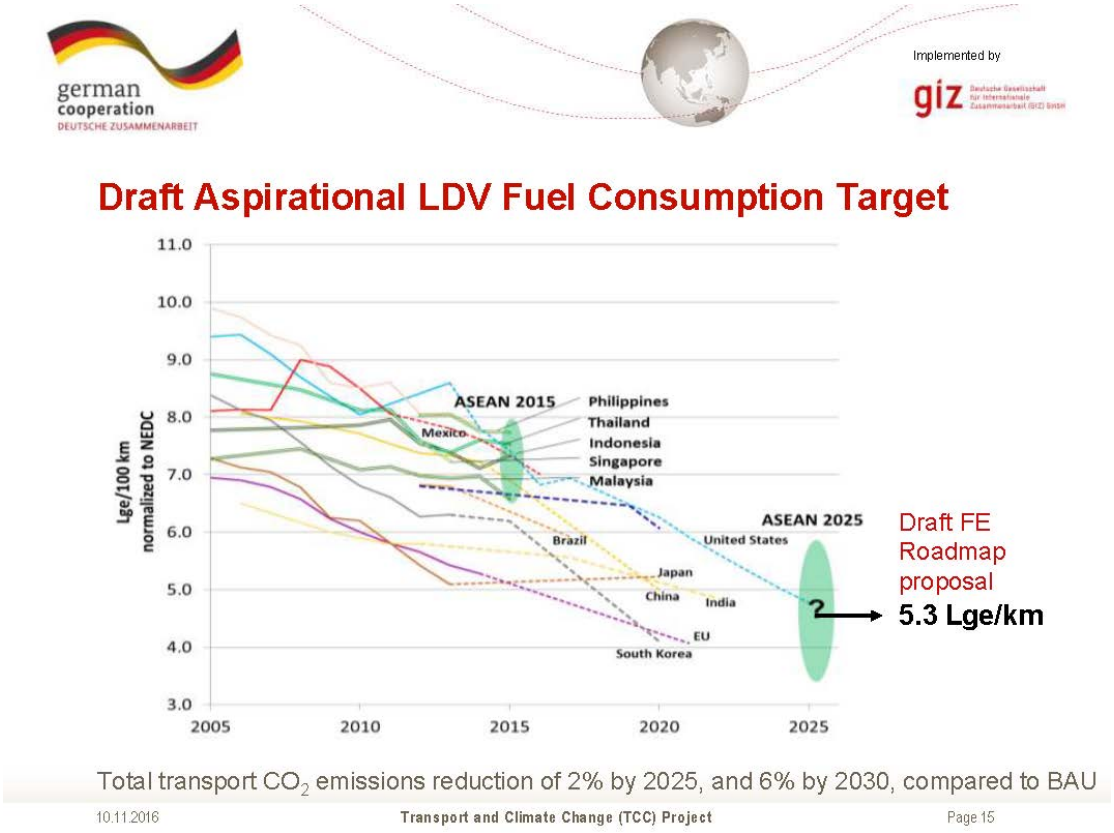
Next was presentation by Ms Gessarin Gunthawong from Thailand on overview of fuel economy development in Thailand as part of on-going regional initiative by GIZ. With increasing number of vehicles contributing to higher energy consumption and GHG emission, GIZ has helped Thailand Ministry of Transport to characterize stakeholder map on fuel efficiency policies into information, fiscal and standard. With current fuel efficiency policies in Thailand, namely twelfth 12^{th} Economic and Social Development Plan (2017-2021), National Determined Contribution (NDC: 2021-2030) and Energy Efficiency Plan (EEP: 2015-2036), vehicle energy efficiency has been of mutual interest. Recent CO_2-based vehicle excise tax implemented on 1 January 2016 has clearly shown 3% fuel consumption rate improvement with main improvement in passenger car but little in pick-up truck due to different schemes. Stakeholder consultation has suggested three proposals of fuel economy improvement, namely improving eco-sticker (Thai vehicle labeling program), revising excise tax scheme and revising fuel/circulation taxes.

Next was presentation by Prof Le Anh Tuan from Viet Nam on the overview of fuel economy development in Vietnam. With fast rising of vehicles, especially motorcycle, the government has set forth many policies to improve energy efficiency in transport sector. In 2015, fuel economy labelling program for locally assembled and imported cars with up to seven seats was mandated; whereas, all vehicles with nine seats or less will require new fuel efficiency labels before they can hit the market in 2018. Excise tax is also high for larger vehicle with lowest rate for electric car.

Next was presentation by Mr Friedel Sehlleier on South East Asia perspective as part of GIZ initiative. Wish emerging economies in ASEAN, vehicle sales have been rapidly increasing with also increasing car ownership but sale-weighted average of light duty vehicle (LDV) fuel consumption is still 3% less fuel efficient than other parts of the world with these characteristics, 30% less powerful, 10% lower energy displacement, 8% lighter and 5% smaller. With regional fuel efficient strategies among ASEAN Ministry of Transport (Kuala Lumpur Transport Strategic Plan: 2016-2025) and Ministry

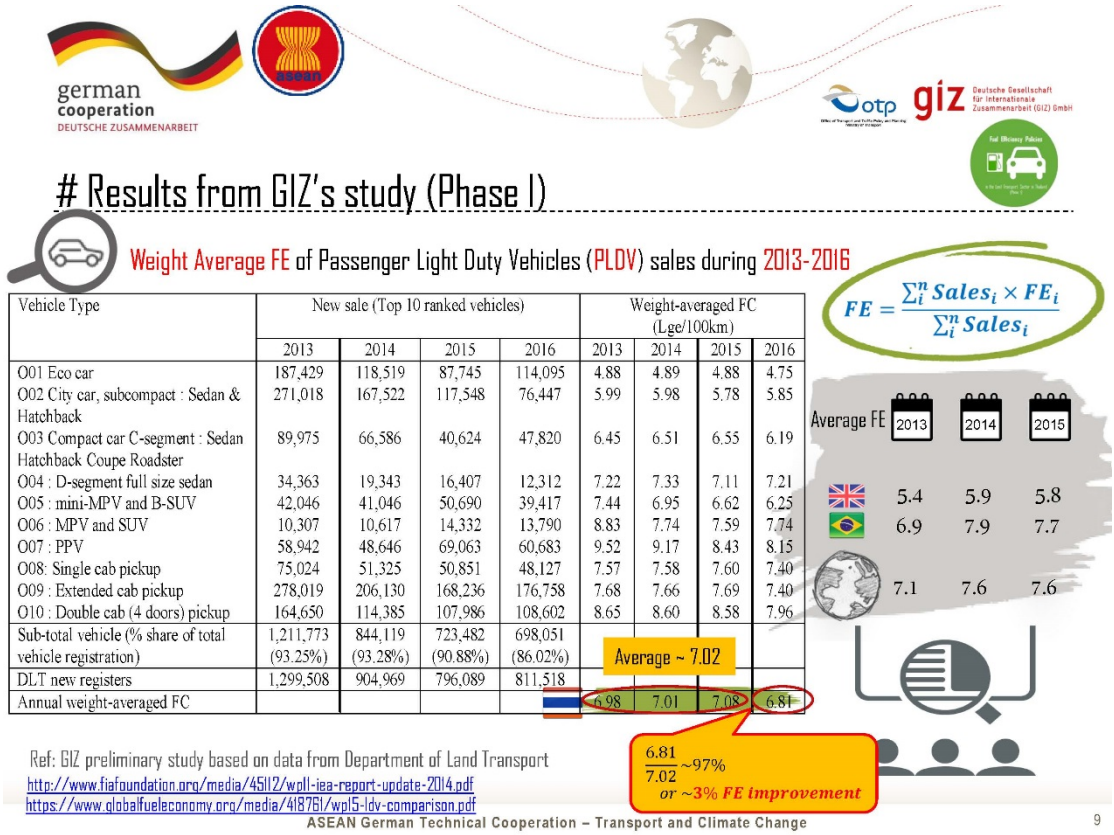
of Energy (ASEAN Plan of Action for Energy Cooperation: 2016-2025), GIZ has established ASEAN Fuel Economy Platform to support development of fuel economy roadmap through expert inputs, joint brainstorming and exchange of experiences/information. ASEAN fuel economy roadmap has been drafted with vision and aspirational goals for 2025. Drafted vision of this roadmap is to transform the ASEAN light duty vehicle market into one of the world's most fuel efficient by 2025, helping to meet regional and domestic goals for sustainable transport, energy efficiency and climate change mitigation, while supporting the vision of the ASEAN Economic Community 2025, and ensuring health and quality of life of people across the region". Drafted aspirational fuel consumption target for light duty vehicle (LDV) is 5.3 Lge/100km. (liters of gasoline equivalent per 100 kilometers), as shown in Table 4. This draft roadmap is also served as a good starting point for discussion on common approach to bring together regional fuel economy.

Table 4: Draft vision and aspirational goal for ASEAN Fuel Economy Roadmap



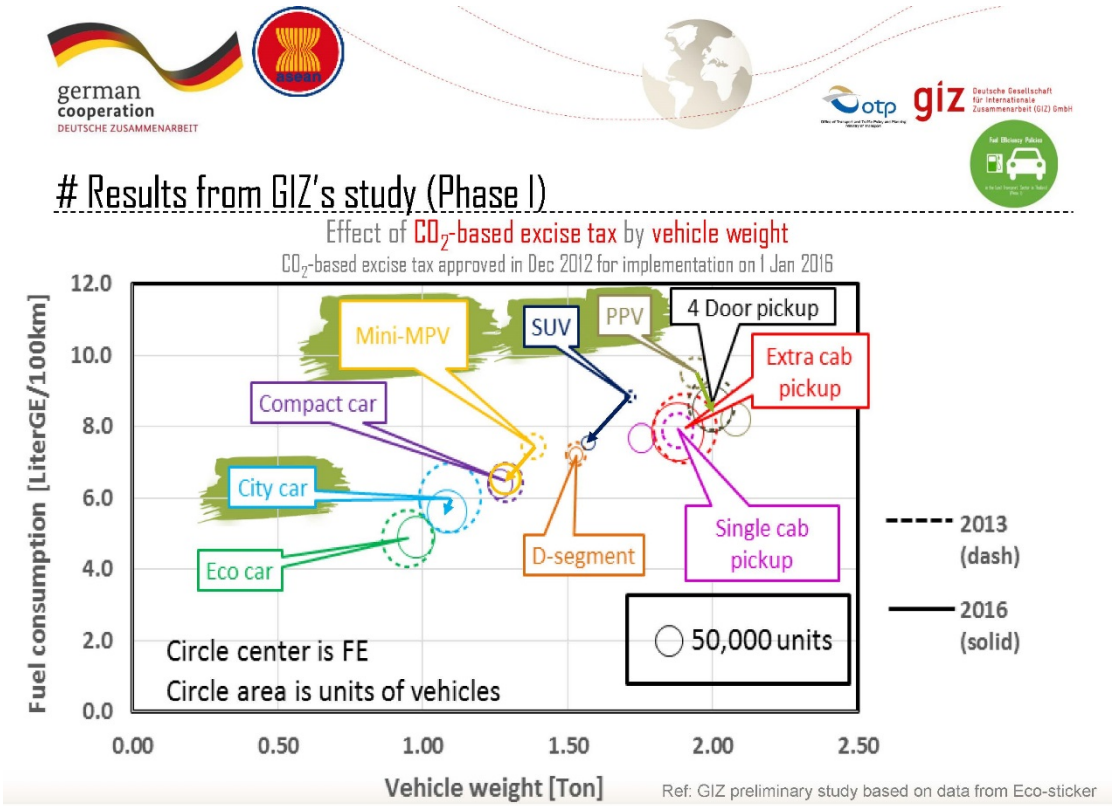
On the second day focusing on Thailand case study for analysis on baseline fuel economy, the first presentation by Dr Nuwong Chollacoop from Thailand showed

how weight-average fuel consumption of passenger light duty vehicle (PLDV) was calculated during 2013-2015 versus 2016, where CO_2-based vehicle excise tax was effective on 1 January 2016. Figure 5(a) clearly showed 3% fuel efficiency improvement upon CO_2-based excise tax implementation; whereas, Figure 5(b) showed details of how each PLDV segment has improved. With stricter scheme for passenger car than pick-up truck, the improvement in passenger car, especially Eco car, City car, Mini Multi-Purposed Vehicle (MPV) and SUV, is better than pick-up truck. After various consultations with stakeholders, stakeholders' diagram was developed, as shown in Figure 5(c), where three recommendations on further improvement in fuel economy policy were extracted, as shown in Figure 5(d)-(f).

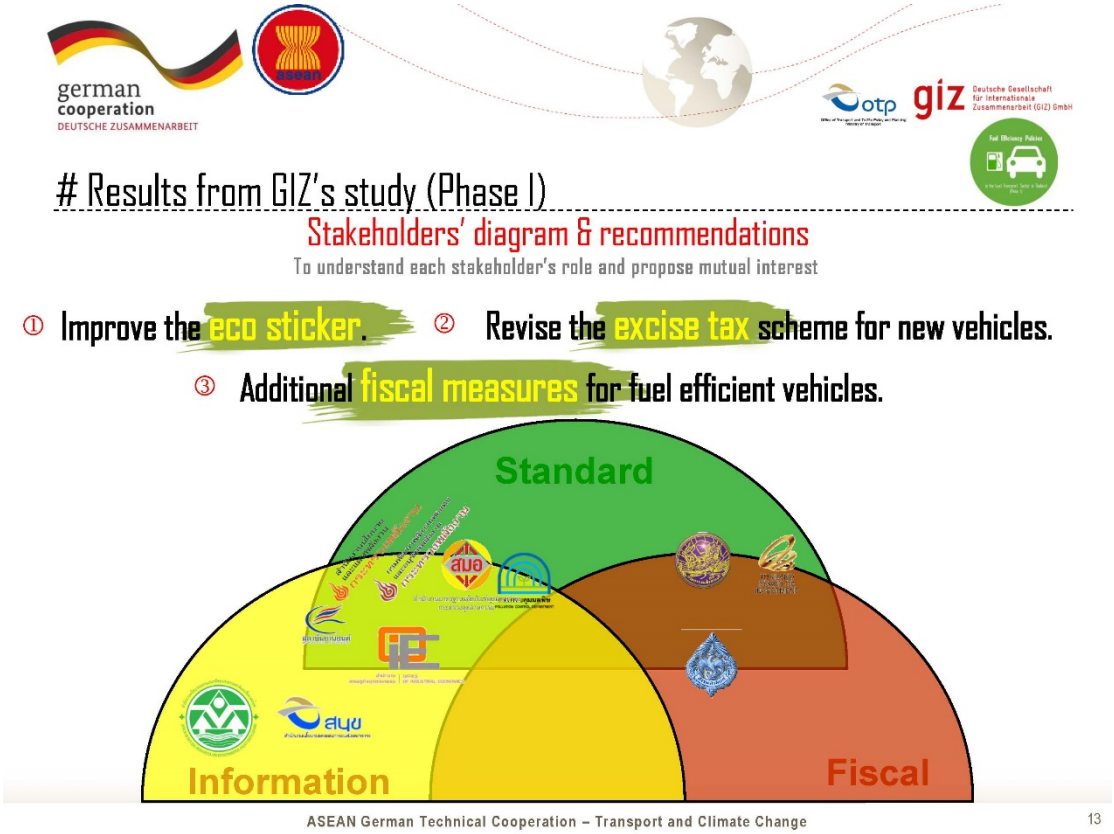


Vehicle Type	New sale (Top 10 ranked vehicles)				Weight-averaged FC (Lge/100km)			
	2013	2014	2015	2016	2013	2014	2015	2016
O01 Eco car	187,429	118,519	87,745	114,095	4.88	4.89	4.88	4.75
O02 City car, subcompact : Sedan & Hatchback	271,018	167,522	117,548	76,447	5.99	5.98	5.78	5.85
O03 Compact car C-segment : Sedan Hatchback Coupe Roadster	89,975	66,586	40,624	47,820	6.45	6.51	6.55	6.19
O04 : D-segment full size sedan	34,363	19,343	16,407	12,312	7.22	7.33	7.11	7.21
O05 : mini-MPV and B-SUV	42,046	41,046	50,690	39,417	7.44	6.95	6.62	6.25
O06 : MPV and SUV	10,307	10,617	14,332	13,790	8.83	7.74	7.59	7.74
O07 : PPV	58,942	48,646	69,063	60,683	9.52	9.17	8.43	8.15
O08: Single cab pickup	75,024	51,325	50,851	48,127	7.57	7.58	7.60	7.40
O09 : Extended cab pickup	278,019	206,130	168,236	176,758	7.68	7.66	7.69	7.40
O10 : Double cab (4 doors) pickup	164,650	114,385	107,986	108,602	8.65	8.60	8.58	7.96
Sub-total vehicle (% share of total vehicle registration)	1,211,773 (93.25%)	844,119 (93.28%)	723,482 (90.88%)	698,051 (86.02%)				
DLT new registers	1,299,508	904,969	796,089	811,518				
Annual weight-averaged FC					6.98	7.01	7.08	6.81

(a)


Results from GIZ's study (Phase I)
Effect of CO_2-based excise tax by vehicle weight
CO_2-based excise tax approved in Dec 2012 for implementation on 1 Jan 2016
Fuel consumption [LiterGE/100km]
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0.00
0.50
1.00
1.50
2.00
2.50
Vehicle weight [Ton]
Mini-MPV
SUV
PPV
4 Door pickup
Extra cab pickup
Compact car
City car
Eco car
D-segment
Single cab pickup
2013 (dash)
2016 (solid)
50,000 units
Circle center is FE
Circle area is units of vehicles
Ref: GIZ preliminary study based on data from Eco-sticker
ASEAN German Technical Cooperation – Transport and Climate Change
10

(b)


Results from GIZ's study (Phase I)
Stakeholders' diagram & recommendations
To understand each stakeholder's role and propose mutual interest
① Improve the eco sticker.
② Revise the excise tax scheme for new vehicles.
③ Additional fiscal measures for fuel efficient vehicles.
Standard
Information
Fiscal
ASEAN German Technical Cooperation – Transport and Climate Change
13

(c)

Recommendation 1: Improve the eco sticker (I)

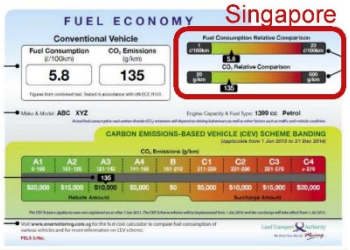
- Show relative fuel economy performance in the same vehicle class

DLT → Vehicle classification → OIE

Calculate model-average FE from Eco-sticker

- Show average fuel cost saving

DLT, EPPO → NV/VKT, Fuel price → DTP → FE from Eco-sticker → OIE

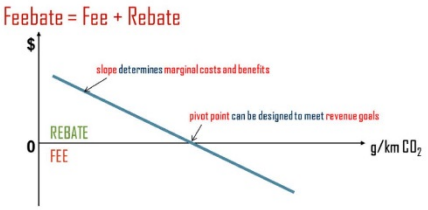


Calculate average fuel cost saving

(d)

Recommendation 2: Revise the excise tax scheme for new vehicle

- Introduce a continuous linear function

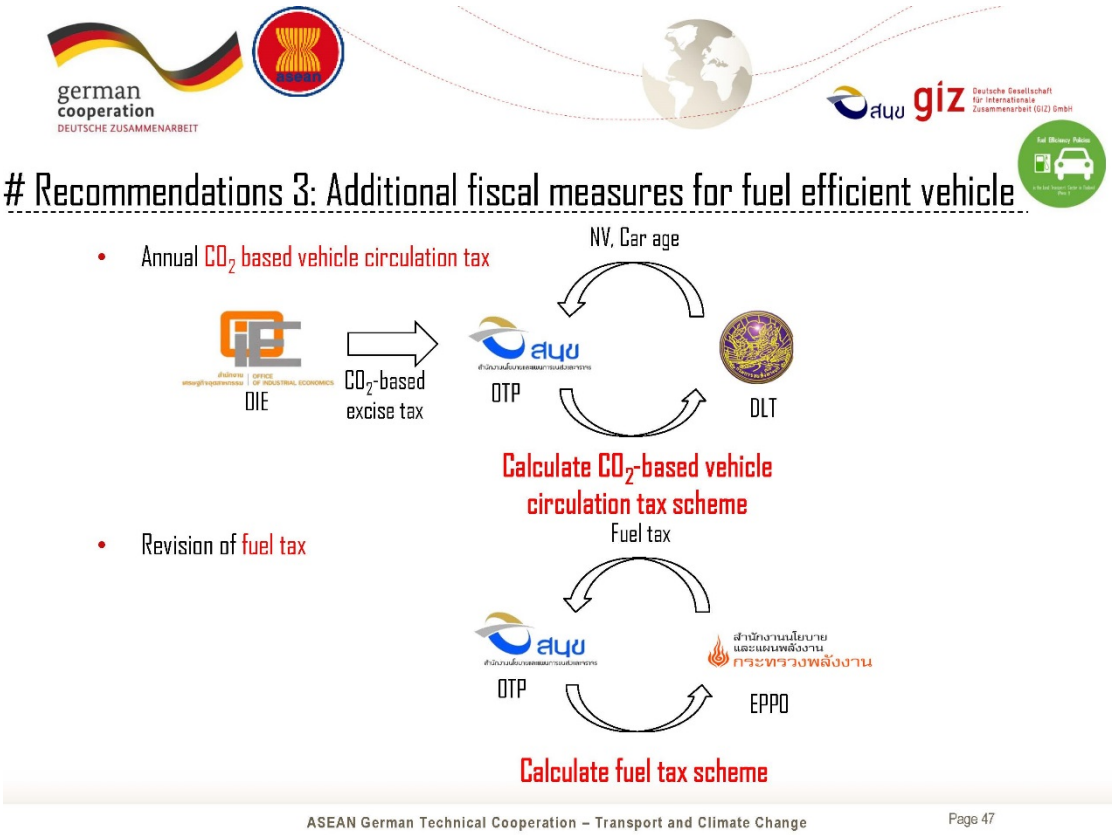


DLT → NV (new) → DTP → FE from Eco-sticker → OIE

Propose continuous linear function for CO_2 based excise tax
(revenue from excise tax should be maintained or increased)

Excise

(e)



(f)

Figure 5: Thailand case study on fuel economy policy: (a) Table and (b) Bubble plot of weighted-average fuel economy of passenger light duty vehicle during 2013-2017, (c) Stakeholders' diagram and (d)-(f) three recommendations

Next three presentations were from private sectors, namely Isuzu, BMW and AVL, on private sectors contribution to vehicle fuel efficient technologies. Isuzu focused on down-sizing of engine in pick-up truck (from above 2L to below 2L engine displacement) to be qualified for CO_2-based excise tax, as well as more fuel efficient pick-up truck, which would attract more customers. Hence, Isuzu has invested in engine down-sizing technology for co-benefits of lower CO_2-base excise tax and greater customers' attraction. On the other hand, BMW focused on hybridization to improve vehicle fuel economy, which is qualified for lower CO_2-based excise tax. With recent investment privilege offered by Thailand Board of Investment (BOI) on Hybrid Vehicle (HV), Plug-in Hybrid Vehicle (PHEV) and Battery Electric Vehicle (BEV), BMW realize more affordable HV-PHEV-BEV market in Thailand. Apart from automakers, engineering company like AVL can contribute to better fuel efficient vehicle by various conventional engine technologies.

Next was presentation from Dr Peerawat Saisirirat on a review of cost-benefit analysis tool on fuel economy (FEPIT) with case study on Thailand to show that fuel economy policy can be properly designed to achieve net benefit for the economy. Of course, better fuel efficient technology for vehicle comes with higher cost but government could use proper taxing scheme to make vehicle price cost-competitive by balancing subsidy between fuel-efficient vehicles and fuel-inefficient vehicles. Of course, FEPIT can be use with specific economy data to tailor for scenario of excise tax, annual registration tax and fuel tax for various vehicle mixes.

Final discussion on common approach for cost benefit analysis on fuel economy to draft fuel economy framework in member economies mainly focused on ASEAN fuel economy roadmap as schematic to be adapted in other APEC member economies. Principles, methodologies and lesson learned were shared from experts from GFEI, GIZ and Thailand to other APEC member economies.

Summary of second workshop

The second APEC Workshop on Policy Dialogue on Fuel Economy Platform was held on 13 November 2018 in Kuching, Malaysia, with the main objective to follow up discussion from first workshop and finalize recommendation for fuel economy policy implementation. The agenda is shown in Table 5, where Chief Executive Officer of Malaysia Automotive Institute (MAI) and representative from PPSTI joined the opening session, as shown in Figure 6.

Table 5: Agenda of the second APEC Workshop on Policy Dialogue on Fuel Economy Platform

The Second Workshop on Policy Dialogue on Fuel Economy Platform

13 November 2018

Borneo Convention Centre Kuching, Malaysia (https://goo.gl/maps/pnkcXrDZs912)

Moderators: Dr Nuwong Chollacoop (MTEC Thailand) & Ms Kathleen Dematera (Clean Air Asia)

Program Schedule	
08.30	**Registration**
09.00	**Opening Session and Overview** **Welcome Remarks:** Dato' Madani Sahari, CEO, Malaysia Automotive Institute (MAI) **Opening Remarks:** APEC PPSTI **Group Photo**
09.20	**Keynote address: Current global status of fuel economy development** Mr Bert Fabian, UN Environment
09.40	**Keynote address: Malaysian initiative on fuel economy development** Dato' Madani Sahari, Chief Executive Officer, Malaysia Automotive Institute (MAI)
10.00	**Coffee Break**
	Press conference with Q&A session (adjacent room)
10.30	**Update on regional perspective on fuel economy** **European Union:** Dr Axel Friedrich, Sustainable Transport Expert **ASEAN:** Mr Eu Jin Toh, Singapore Land Transport Authority
11.10	**Update on fuel economy development around the world** **Indonesia**: Mr Ahmad "Puput" Safrudin, Joint Committee for Leaded Gasoline (KPBB) **Philippines**: Ms Genevieve Almonares, Department of Energy **Singapore:** Mr Eu Jin Toh, Land Transport Authority
12.10	**Lunch**

13.30	**Cost benefit analysis on fuel economy: Thailand & The Philippines** Dr Peerawat Saisirat, National Metal and Materials Technology Center (MTEC), Thailand
14.00	**Update on fuel economy development around the world** **Bangladesh:** Mr Noor E Alam, Ministry of Road Transport and Bridges **Sri Lanka:** Dr Thusitha Sugathapala, University of Moratuwa, Sri Lanka **Nepal:** Ms Prabha Neupane, Clean Energy Nepal, Nepal **Chinese Taipei:** Ms Shin-Hui Lin, Industrial Technology Research Institute
15.00	**Coffee Break**
15.30	**Beyond taxes, labels and standards: Innovative approaches to promote fuel economy** **Crowdsourcing of vehicle fuel consumption data**: Mr Friedel Sehlleier, GIZ **Electric Vehicles and their link with FE policy**: Dr Yossapong Laoonual, President, Electric Vehicle Association of Thailand (EVAT)
15.40	**Advancing regional collaboration for better fuel economy** Plenary Discussion
16.30	**Wrap-up**

Figure 6: Opening session of the second workshop

TOP: (left) Welcoming Remark by Dato' Madani Sahari, Chief Executive Officer, Malaysia Automotive Institute (MAI) and (right) Opening Remark by Dr Nuwong Chollacoop, on behalf of Thailand Representative to APEC PPSTI

Second workshop participants

As shown in Figure 7 and Table 6, the workshop was attended by 69 participants from ten APEC member economies with a ratio of female ratio of 42% (29 women and 40 men).

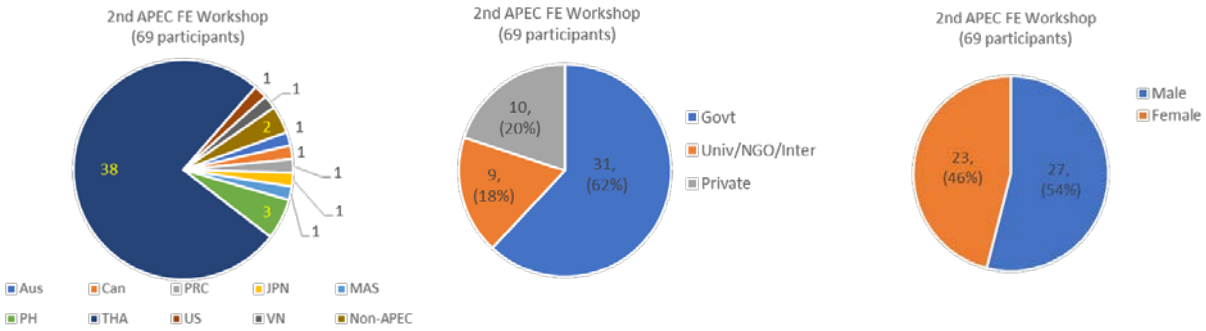


Figure 7: Group photo of the second workshop with breakdown statistics

Table 6: List of participants to 2nd APEC Workshop

No	Name	Affiliation	Economy	Gender	E-mail*
1	Dato Madani Sahari	Malaysia Automotive Institute (MAI)	Malaysia	M	
2	Dr Nuwong Chollacoop	National Metal and Materials Technology Center (MTEC)	Thailand	M	nuwongc@mtec.or.th
3	Mr Robert Earley	Sino-Canadian Commodities Consulting Co. Ltd.	Canada	M	rob@sinocanadian.net
4	Mr Beny Irzanto	ASEAN Secretariat	Indonesia	M	
5	Mr Aditya Mahalana	GIZ	Indonesia	M	aditya.mahalana@giz.de
6	Mr Ahmad "Puput" Safrudin	KPBB	Indonesia	M	puput@kpbb.org
7	Mr Alfred Sitorus	KPBB	Indonesia	M	
8	Mr Amalia Bendang	KPBB	Indonesia	M	
9	Ms Keiko Hirota	Japan Automobile Research Institute (JARI)	Japan	F	khirota@jari.or.jp

No	Name	Affiliation	Economy	Gender	E-mail*
10	Mr Ahmad Salwadi Salleh	Economy Planning Unit, Ministry of Economic Affairs	Malaysia	M	
11	Ms Amelia Jindi	Freelance	Malaysia	F	
12	Ms Jeyashri Kisna	GIZ	Malaysia	F	jeyashri.kisna@giz.de
13	Mr Ahmad Zainal Abidin	Malaysia Automotive Institute (MAI)	Malaysia	M	
14	Mr Ahmad Zaki Motten	Malaysia Automotive Institute (MAI)	Malaysia	M	
15	Ms Fateha Aziz	Malaysia Automotive Institute (MAI)	Malaysia	F	fateha@mai.org.my
16	Mr Muhammad Qamarul Hafiz Ahmad Razali	Malaysia Automotive Institute (MAI)	Malaysia	M	
17	Dr Horizon Gitano	Economy Planning Unit, Ministry of Economic Affairs	Malaysia	M	
18	Ms Sandra Portugal	National Council of Science Technology and Technological Innovation	Peru	F	sportugal@concytec.gob.pe
19	Ms Glynda Bathan	Clean Air Asia	Philippines	F	glynda.bathan@cleanairasia.org
20	Ms Aimee Caisalo	Clean Air Asia	Philippines	F	aimee.cabalo@cleanairasia.org
21	Mr Joemier Pontawe	Clean Air Asia	Philippines	M	joemier.pontawe@cleanairasia.org
22	Ms Kathleen Dematera	Clean Air Asia	Philippines	F	kathleen.dematera@cleanairasia.org
23	Ms Valerie Kristina Gabiana	Clean Air Asia	Philippines	F	valerie.gabiana@cleanairasia.org
24	Mr Antonio Basco	Department of Energy	Philippines	M	
25	Ms Genevieve Almonares	Department of Energy	Philippines	F	genevieve1230@yahoo.com
26	Mr Glenn Denton	F&L Asia Ltd.	Philippines	M	
27	Ms Hannah Ebro	GIZ	Philippines	F	hannah.ebro@giz.de
28	Ms Melissa Cruz	GIZ	Philippines	F	
29	Mr Ernesto Abaya	University of the Philippines	Philippines	M	

No	Name	Affiliation	Economy	Gender	E-mail*
30	Ms Evangeline Nova		Philippines	F	
31	Mr Eu Jin Toh	Land Transport Authority	Singapore	M	TOH_EU_Jin@lta.gov.sg
32	Mr You Wei Aw	Stratas Advisors	Singapore	M	
33	Ms Shin-Hui Lin	Industrial Technology Research Institute (ITRI)	Chinese Taipei	F	EmilyLin@itri.org.tw
34	Dr Yossapong Laoonual	Electric Vehicle Association of Thailand (EVAT)	Thailand	M	yossapong@evat.or.th
35	Ms Carolin Capone	GIZ	Thailand	F	carolin.capone@giz.de
36	Ms Chuenchanok Jantanalikhit	GIZ	Thailand	F	Chuenchanok.jantanalikhit@giz.de
37	Ms Gessarin Gunthawong	GIZ	Thailand	F	gessarin.gunthawong@giz.de
38	Ms Janthorn Dilokkomol	GIZ	Thailand	F	Janthorn.Dilokkomol@giz.de
39	Mr Papondhanai Nanthachatchavankul	GIZ	Thailand	M	papondhanai.nanthachatchavankul@giz.de
40	Mr Friedel Sehlleier	GIZ TCC	Thailand	M	friedel.sehlleier@giz.de
41	Dr Penyarat Saisirirat	King Mongkut's University of Technology North Bangkok	Thailand	F	penyaratc@kmutnb.ac.th
42	Dr Thepparat Klamrassamee	King Mongkut's University of Technology Thonburi	Thailand	M	t.klamrassamee@gmail.com
43	Dr Manida Tongroon	National Metal and Materials Technology Center (MTEC)	Thailand	F	manidat@mtec.or.th
44	Dr Peerawat Saisirirat	National Metal and Materials Technology Center (MTEC)	Thailand	M	peerawas@mtec.or.th
45	Ms Kamolporn Pornroekwiangping	ONEP	Thailand	F	
46	Ms Chutinthorn Mankhong	OTP	Thailand	F	
47	Ms Wipada Unlumlert	OTP	Thailand	F	wipada52@hotmail.com

No	Name	Affiliation	Economy	Gender	E-mail*
48	Mr Bert Fabian	UNEP	Thailand	M	bert.fabian@un.org
49	Mr Doan Tham Thi Hong	DEPARTMENT OF ENVIRONMENT, MINISTRY OF TRANSPORT	Viet Nam	M	
50	Mr Tuan Nguyen Anh	GIZ	Viet Nam	M	
51	Mr Nguyen Huu Tien	Ministry of Transport of Viet Nam	Viet Nam	M	
52	Prof Le Anh Tuan	School of Transportation Engineering (STE), Hanoi University of Science and Technology (HUST)	Viet Nam	M	tuan.leanh@hust.edu.vn
53	Prof Tran Thi Thu Huong	Thanhtay University	Viet Nam	F	huong.tran@thanhtay.edu.vn
54	Mr Werner Hofegger	AVL	Austria	M	
55	Mr Noor-E- Alam	Roads and Highways Department	Bangladesh	M	jewel.rhd2018@gmail.com
56	Mr Kok Sothea	Lecturer	Cambodia	M	
57	Dr Roland Haas	GIZ	Germany	M	
58	Mr Alvin Mejia	Wuppertal Institute	Germany	M	
59	Axel Friedrich	Freelance	Germany	M	axel.friedrich.berlin@gmail.com
60	Mr Nandhakumar Kalaimani	IIT Madras	India	M	
61	Ms Xaysomnuk Souvannavong	Ministry of Public Works and Transport	Lao PDR	F	
62	Ms Aminath Maiha Hameed	Ministry of Environment and Energy	Maldives	F	
63	Mr Phone Myint Maung	Ministry of Industry	Myanmar	M	
64	Ms Prabha Neupane	Clean Energy Nepal	Nepal	F	
65	Ms Jyoti Prajapati	Institute for Advanced Sustainability Studies e.V	Nepal	F	

No	Name	Affiliation	Economy	Gender	E-mail*
66	Mr Sampath Ranasinghege	Clean Air Sri Lanka	Sri Lanka	M	
67	Prof A.G. Thusitha Sugathapala	Senior Lecturer	Sri Lanka	M	agtsugathapala@gmail.com
68	Mr Don Jayamizer	Freelance	Sri Lanka	M	
69	Ms Rebecca Ashton	FIA Foundation	UK	F	

*For those who allows their emails to be listed.

Second workshop presentation and discussion

The second workshop was concisely structured for one day as a pre-event to international conference, "10th Better Air Quality (BAQ2018)", which focused on reducing air pollution from vehicle through fuel economy policy, in order to bring experts and stakeholders from both APEC and non-APEC membered economies to discuss on advancing regional collaboration for better fuel economy. Figure 8 showed various presentations and discussion, where presentation file is shared at https://www.transportandclimatechange.org/2018/12/06/regional-policy-dialogue-on-fuel-economy-in-asia-2nd-apec-workshop-on-policy-dialogue-on-fuel-economy-platform/ and https://www.globalfueleconomy.org/blog/2018/november/apec-policy-dialogue-on-fuel-economy.

Figure 8: Various presentations and discussion during the second workshop

The keynote address on “Current global status of fuel economy development” was delivered by Mr Bert Fabian from UN Environment focusing on how benefit of improved fuel economy has been realized in many economies with various progress. Fuel economy policy options were mainly categorized into vehicle fuel efficiency standard, fiscal measures, market-based approaches and information measures with shown examples, progress and key learning from many economies, as shown in Figure 9.

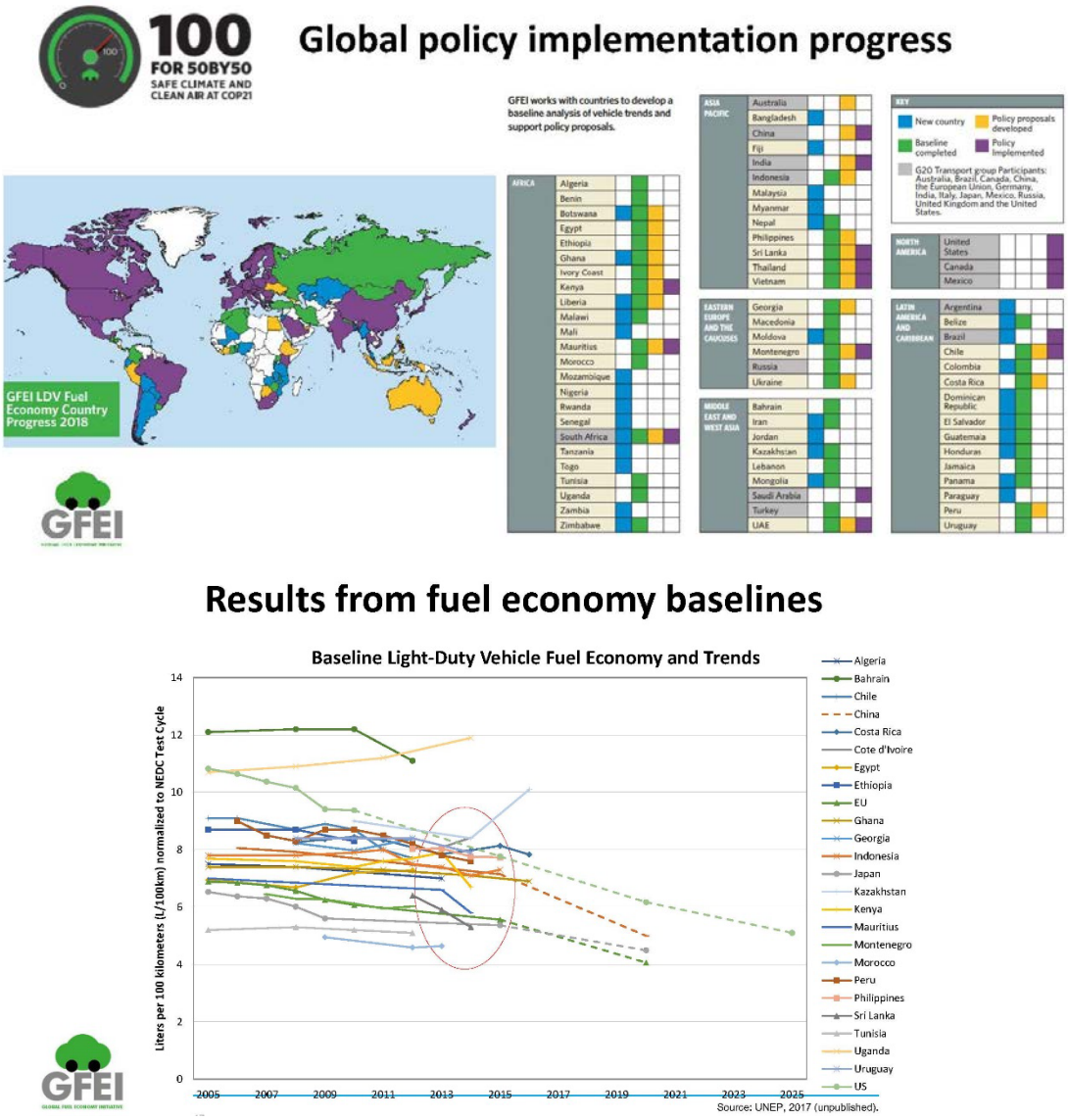
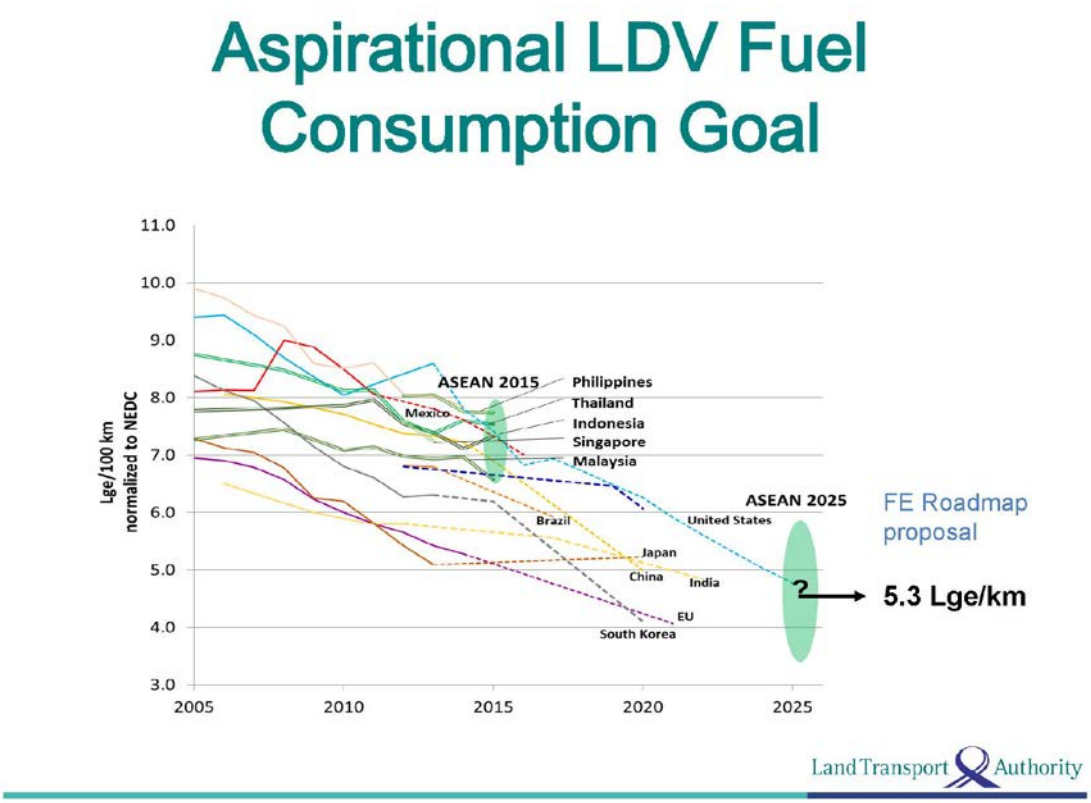


Figure 9: Fuel economy policy progress and results in many economies

Another keynote address on “Malaysian initiative on fuel economy development” was delivered by Dato’ Madani Sahari, Chief Executive Officer of Malaysia Automotive Institute (MAI) focusing on how MAI has followed up on Automotive Policy, especially on NAP2014 promoting Energy Efficient Vehicle (EEV) with an aim for Malaysia to be EEV hub by 2020. EEV is defined as vehicle that meet a set of defined specification in terms of carbon emission level and fuel consumption (l/100km), including hybrid, EV and alternatively fueled vehicles e.g. CNG, LPG, biodiesel, ethanol, hydrogen and fuel cell.

Next two presentations were fuel economy updates on regional perspective from Europe and ASEAN. European update was delivered by Dr Axel Friedrich from Germany focusing on how real-world driving condition could greatly differ from those

standard driving cycles. With not so strict fuel economy policy implementation, Paris agreement target may not be reached. Hence, more CO_2-reduction target was needed with both technical and economical feasibilities. On the other hand, ASEAN update was delivered by Mr Toh Eu Jin from Singapore focusing on ASEAN Fuel Economy Roadmap for transport sector with focus on light duty vehicle (2018-2025), which was recently adopted during 24th ASEAN Transport Ministers Meeting on 8-9 November 2018 in Bangkok, Thailand (https://asean.org/storage/2019/03/ASEAN-Fuel-Economy-Roadmap-FINAL.pdf). Details of roadmap is shown in Figure 10, with the vision to transform the ASEAN light duty vehicle market into one of the world's most fuel efficient by 2025, helping to meet regional and domestic goals for sustainable transport, energy efficiency and climate change mitigation, while supporting the vision of the ASEAN Economic Community 2025, and ensuring health and quality of life of people across the region." Aspirational LDV fuel consumption goal is to improve from sale-weighted average of 7.2 Lge/100km in 2015 to 5.3 Lge/100km in 2025, with five supporting goals and actions.



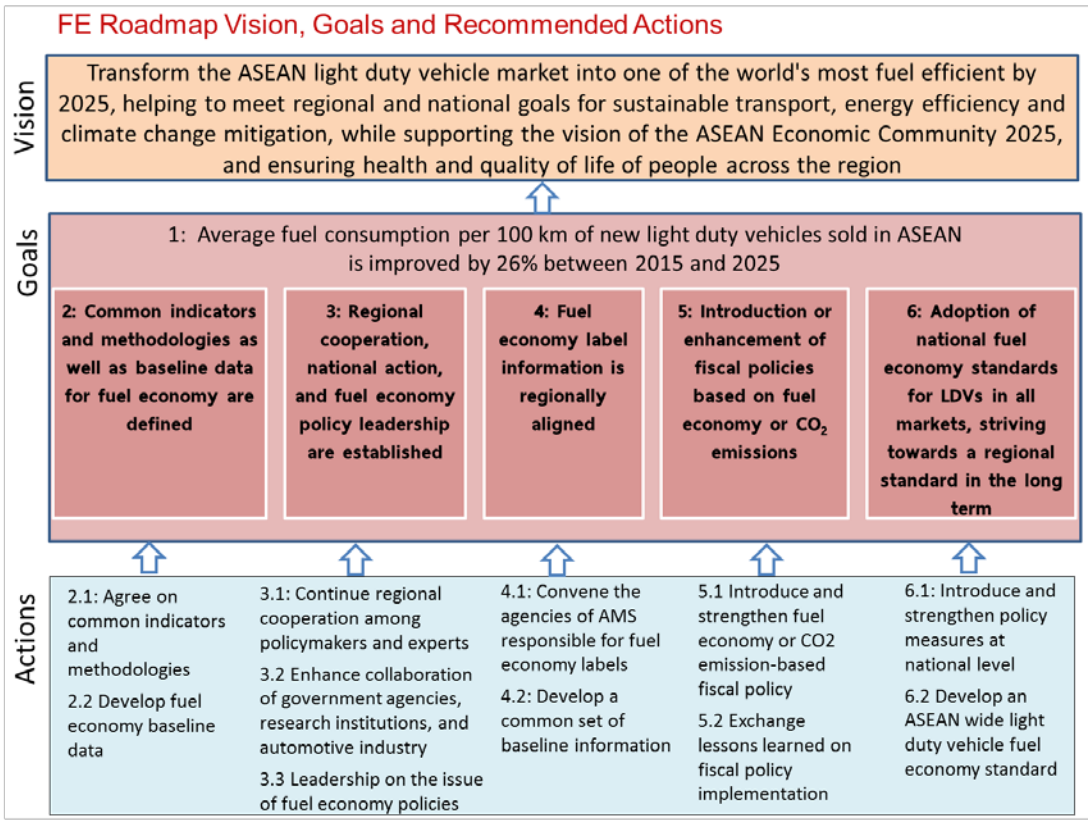
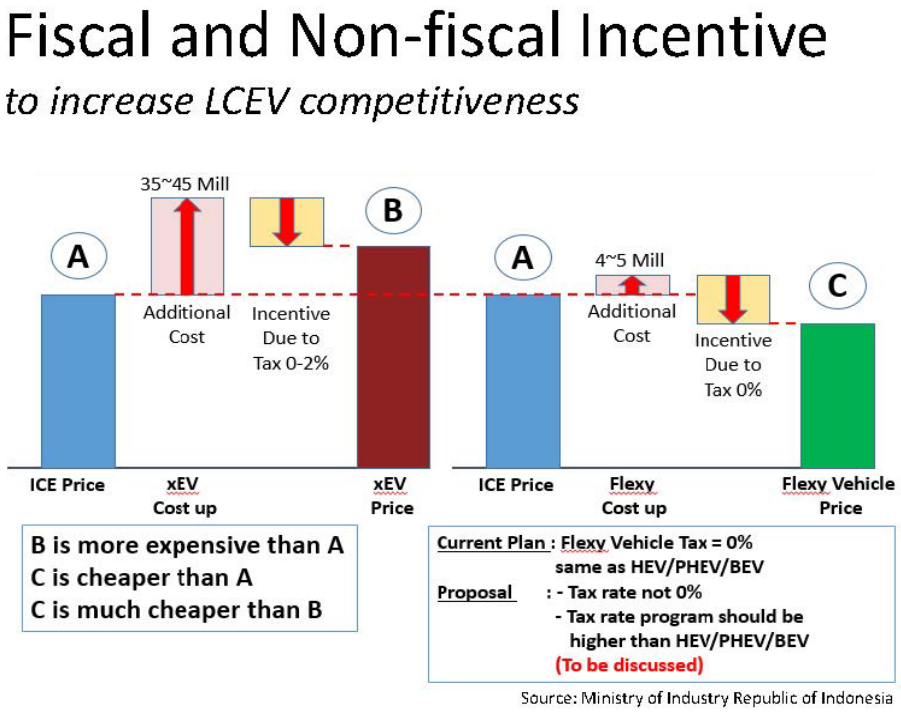


Figure 10: Detail of ASEAN Fuel Economy Roadmap

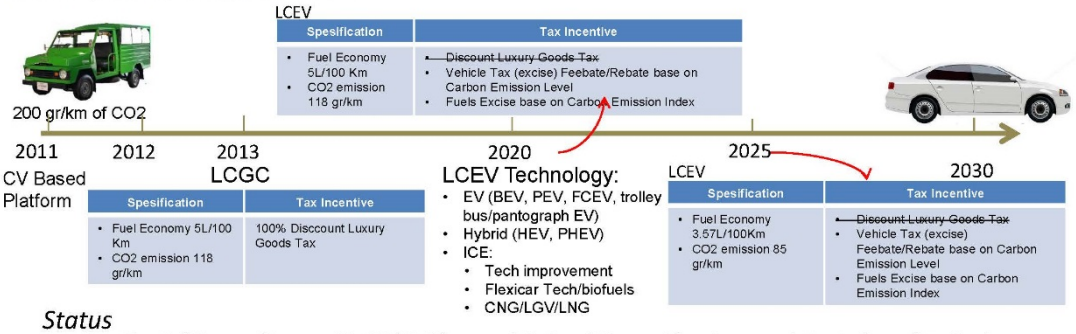
Next three presentations were fuel economy updates from three APEC membered economies. First was presentation by Mr Ahmad “Puput” Safrudin on

Indonesian update focusing on how transport sector can support Indonesian Nationally Determined Contribution (NDC) through Low Carbon Emission Vehicle (LCEV) campaign with fiscal and non-fiscal incentive in the fuel economy roadmap and carbon tax scheme proposed by Ministry of Industry, as shown in Figure 11. Second was presentation by Ms Genevieve Almonares on Philippine update focusing on Philippine Energy Standards and Labeling Program (PESLP), which include vehicle economy label covering new (internal combustion engine or hybrid) M1 (passenger vehicles with not more than eight seats in addition to driver's seat) and N1 (commercial vehicles with maximum mass not exceeding 3.5 tons), as shown in Figure 12. Third was presentation by Mr Eu Jin Toh on Singapore update focusing on how transport can support Singapore's target to UNFCC through promotion of low emissions and energy efficient vehicles, such as Fuel Economy Labelling Scheme (FELS) and Carbon Emission-based Vehicle Scheme (CEVS). FELS has been mandated since 2009 with CEVS introduced in January 2013 to incentivise a purchase of less carbon-intensive vehicle models, i.e. low carbon emission vehicle receives a rebate while high carbon emission vehicle incurs surcharge on top of registration taxes. CEVS was revised in July 2015 to take into account of improved vehicle technology. Recently, vehicular emission scheme (VES) was introduced in January 2018 to expand coverage to four new pollutants (hydrocarbons, carbon monoxide, nitrogen oxides and particulate matter) in addition to CO_2 criteria in CEVS. Details are shown in Figure 13



Fuel Economy Roadmap

And Carbon Tax scheme



Status

1. Presidential Decree (Perpres No 22/2017) toward National Energy Planning mandates to formulate Fuel Economy Standard and implemented by 2020.
2. Government Decree No 41/2013 mandates to adopt LCEV
3. Policy option on LCEV:
   - LCEV Technology: direct leapfrog to EV **versus** technology-mix approach (ICE improvement tech, flexiCar, EV)
   - Fiscal incentive: discounted luxury goods VAT **versus** Carbon Excise with feebate/rebate scheme
     - To reform Government Regulation PP No 41/2013 toward Luxury Goods VAT mandates to adopt LCEV with discounted luxury goods VAT
   - Non fiscal incentive => Market base incentive:
     - Fuel Economy Labeling
     - Shifting urban mobility to mass public transport and non motorized mobility (walking and cycling).
     - Scraped Car.

LCEV: technology-mix approach (ICE improvement tech, flexi-Car, EV) options with tax feebate/rebate scheme base on grCO2/km level.

Ministry of Industry Proposal

fiscal incentive base on luxury goods VAT deduction

	Category		Fuel Consumption (km/l)		CO2 (g/km)	E/G Volume (cc)		
			Gasoline	Diesel		< 1.5	1.5 - 3.0	> 3.0
LCEV	Passenger Vehicle	(< 10 person)	>15.5	> 17.5	<150	15%		40%
			15.4 – 11.6	17.4 - 13.1	151 - 200	20%		40%
			11.5 – 9.3	13.0 - 10.5	201 - 250	25%		40%
			< 9.3	< 10.5	> 250	40%		50%
		(≥ 10 person / Minibus)	>11.6	> 13.1	< 200	15%		30%
			<11.6	< 13.1	> 200	20%		30%
	Commercial	Pick Up	>15.5	> 17.5	< 150	5%		20%
			15.5-11.6	17.4 - 13.1	150 - 200	10%		20%
			<11.6	< 13.1	> 200	15%		30%
		Truck, Bus	All type	All type	All type	0%		
	Program	LCGC	20	21.8	120	0%	-	-
		Hybrid, PHEV	> 23	> 26	< 100	0%		20%
			23 – 18.5	25.9 - 21	101 – 125	2%		20%
			18.4 – 15.5	20.8 - 17.5	126 – 150	5%		20%
		Flexy Engine (E100/B100)	-	-	-	8%		
		EV/FC	All type	All type	All type	0%		

Source: Ministry of Industry Republic of Indonesia

Figure 11: Indonesian plan for fuel economy roadmap

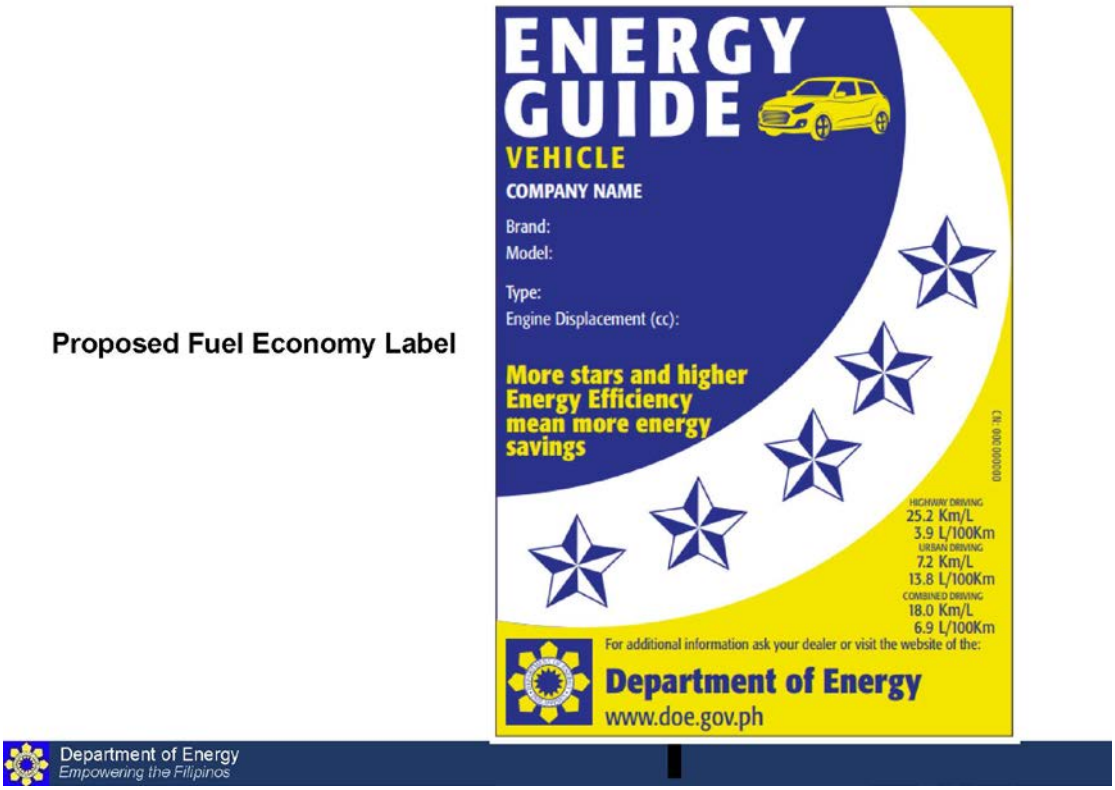
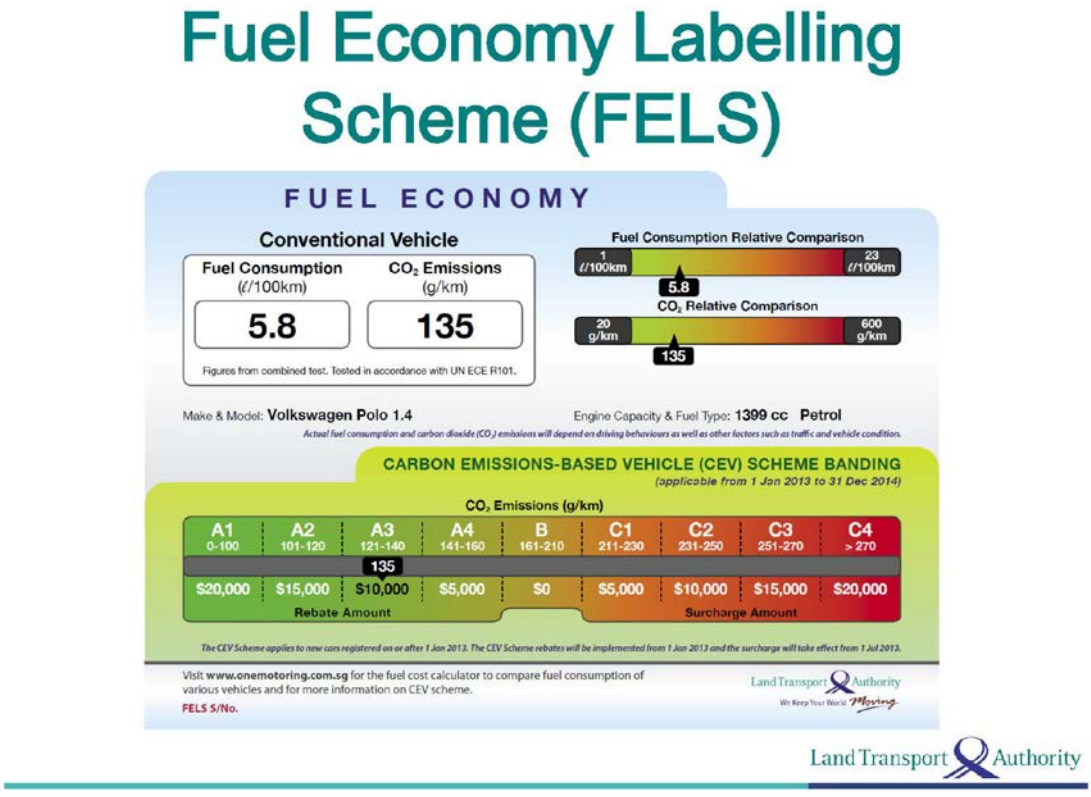


Figure 12: Philippine plan for fuel economy roadmap



Carbon Emissions-Based Vehicle Scheme (CEVS) [2013-2015]

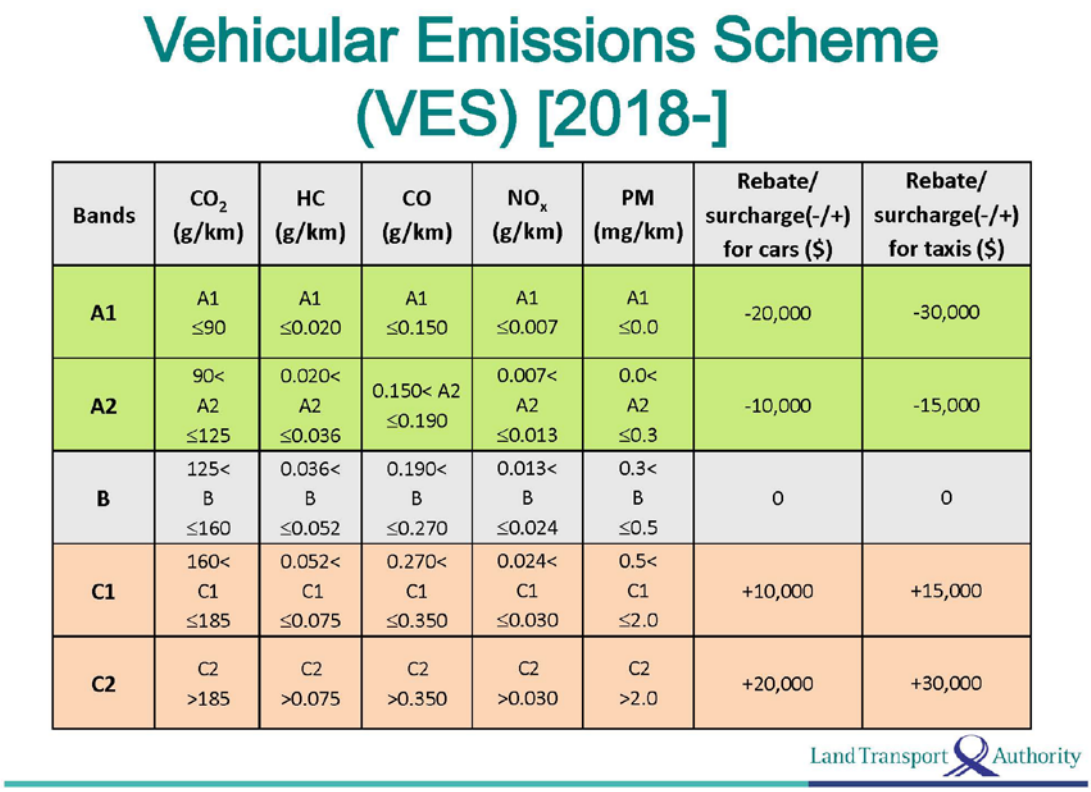
Band	Carbon emission (CO_2g/km)	REBATE (FROM 1 JAN 2013)		SURCHARGE (FROM 1 JULY 2013)	
		Cars	Taxis	Cars	Taxis
A1	0 to 100	$20,000	$30,000		
A2	101 to 120	$15,000	$22,500		
A3	121 to 140	$10,000	$15,000		
A4	141 to 160	$5,000	$7,500		
B	161 to 210	$0	$0	$0	$0
C1	211 to 230			$5,000	$7,500
C2	231 to 250			$10,000	$15,000
C3	251 to 270			$15,000	$22,500
C4	271 & above			$20,000	$30,000

Land Transport Authority

Carbon Emissions-Based Vehicle Scheme (CEVS) [2015-2017]

Band	Revised CEVS (Jul2015 - Jun2017) CO_2 g/km	Rebate (-)/Surcharge (+) for Cars ($)	Rebate (-)/Surcharge (+) for Taxis ($)
A1	0 to 95	-30,000	-45,000
A2	96-105	-15,000	-22,500
A3	106-120	-10,000	-15,000
A4	121-135	-5,000	-7,500
B	136-185	0	0
C1	186-200	+5,000	+7,500
C2	201-215	+10,000	+15,000
C3	216-230	+15,000	+22,500
C4	231 & above	+30,000	+45,000

Land Transport Authority



Bands	CO_2 (g/km)	HC (g/km)	CO (g/km)	NO_x (g/km)	PM (mg/km)	Rebate/ surcharge(-/+) for cars ($)	Rebate/ surcharge(-/+) for taxis ($)
A1	A1 ≤90	A1 ≤0.020	A1 ≤0.150	A1 ≤0.007	A1 ≤0.0	-20,000	-30,000
A2	90< A2 ≤125	0.020< A2 ≤0.036	0.150< A2 ≤0.190	0.007< A2 ≤0.013	0.0< A2 ≤0.3	-10,000	-15,000
B	125< B ≤160	0.036< B ≤0.052	0.190< B ≤0.270	0.013< B ≤0.024	0.3< B ≤0.5	0	0
C1	160< C1 ≤185	0.052< C1 ≤0.075	0.270< C1 ≤0.350	0.024< C1 ≤0.030	0.5< C1 ≤2.0	+10,000	+15,000
C2	C2 >185	C2 >0.075	C2 >0.350	C2 >0.030	C2 >2.0	+20,000	+30,000

Figure 13: Singapore plan for fuel economy roadmap

Next was presentation by Dr Peerawat Saisirat from Thailand focusing on cost benefit analysis on fuel economy by recourse to FEPIT (Fuel Economy Policies Implementation Tool) with case study from Thailand and The Philippines. For Thailand analysis, scenario was constructed in alignment with Thailand Nationally Determined Contribution (NDC) benchmarking to Global Fuel Economy Initiative (GFEI) target of 4.4 Lge/100km in 2030. Vehicle mix of 2016 was input into FEPIT to predict the new vehicle mix in 2030 to achieve GFEI target. Then, Total Cost of Ownership (TCO) was calculated for passenger car and pick-up truck segments. Even though energy-efficient technology incurred additional cost, the analysis showed that passenger car segment could be cost-competitive without subsidy; whereas, pick-up truck segment needed some subsidy from customer's viewpoint. Overall analysis on government viewpoint showed that government can benefit on higher income, lower fuel import and greater CO_2 reduction despite the pick-up truck subsidy. On the other hand, FEPIT analysis on Philippines excise tax reform with scenarios on both new vehicle registration and fuel tax. However, since excise tax reform was based on vehicle price, not CO_2 tailpipe emission or fuel economy, the effect on fuel economy was less effective than expected with no incentive for customer to buy energy-efficient vehicles. It should be noted that

this scenarios analyses were based on best available transport data with most sensible assumption, which may change as other information becomes available.

Next four presentations were fuel economy updates from Bangladesh, Sri Lanka, Nepal and Chinese Taipei. First presentation was delivered by Mr Noor E Alam from Bangladesh focusing on how baseline fuel economy data was monitored to show gradual improvement from 9 L/100km in 2005 to 7 L/100km in 2015 with recent tax incentive for electric and hybrid vehicle resulting in a sharp rise of hybrid vehicle sales in 2017-2018, as shown in Figure 14. Second presentation was delivered by Mr Thusitha Sugathapala from Sri Lanka focusing on fuel economy initiatives with baseline fuel economy being updated and fuel economy standard with labelling program being developed. Recent tax incentive on hybrid and electric vehicle has been clearly reflected on the vehicle registration and average fuel economy, as shown in Figure 15. Third presentation was delivered by Ms Prabha Neupane from Nepal focusing on fuel economy data gathering on rising vehicle registration in Nepal. Many policies have been put forth such as Transport Policy, Environment Friendly Vehicle and Transport Policy (20% of total vehicle being environmental friendly by 2020), Nationally Determined Contribution (50% independence from fossil by effective mass public transport and energy efficient/electric vehicle), Vehicle Mass Emission Standard. Some are being drafted, such as Sustainable Transport Strategy: 2015-2040, Pollution Control Strategy and Action Plan, Low Carbon Economic Development Strategy and Action Plan for Electric Mobility 2018. However, major challenges are inadequate baseline information with lack of data sharing mechanism, inadequate knowledge and technical challenges, weak institutional capacity and challenge on effective implementation of existing plans and policies. Fourth presentation was delivered by Ms Shin-Hui Lin from Chinese Taipei focusing on fuel economy regulation, which showed lower rate fuel consumption than vehicle growth rate due to vehicle energy efficiency management. Trend of fuel economy on new vehicle showed improvement due to vehicle fuel economy standard on all segments, such as passenger car, light duty vehicle and motorcycle. Next stage of vehicle fuel economy regulation will be even tighter with target in 2022, as shown in Figure 16.

Where Bangladesh Stands?

Year	Non-OECD Average	Global Average	Bangladesh Average
2005	8.5	8.8	8.98
2008	8.5	8.3	8.01
2010	8.4	8.1	7.04
2012	8.2	7.8	7.43
2014	8	7.6	7.5
2015	7.9	7.6	7.07

RECENT TAX INCENTIVE FOR EV/ HYBRID VEHICLE

Electrical Vehicles	SD %	VAT %	AIT %	RD %
Electric Battery-operated 3-wheelers	20 (25)	15	5	4
Electric Battery-operated 2-wheelers	20 (25)	15	5	4
Hybrid Vehicles				
Up to 1600 cc - Reconditioned and New	25 (45)	15	5	4
1601 to 2000 cc- Reconditioned and New	45 (100)	15	5	4
2001 to 3000 cc- Reconditioned and New	60 (200)	15	5	4
3001 to 4000 cc- Reconditioned and New	100 (350)	15	5	4
4001 cc and above- Reconditioned and New	300 (500)	15	5	4

E-Mobility in Bangladesh (Journey started in 2002)

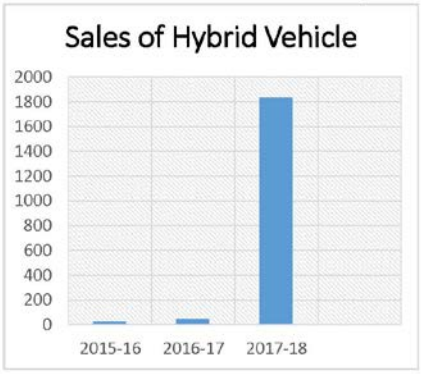
- First import in 2002-2003
- Sales picked up from 2017 due to tax incentive and Recon Hybrid

Popular hybrid brand

Car: Toyota prius/AQUA, BMW (PHEV)
SUV: Nessan X-Trialis ,Honda vesel
Microbus: Toyota Esquiare

Issues with Hybrid Vehicle :

- Recon. Hybrid : Battery life
- Lack Maintenance facilities

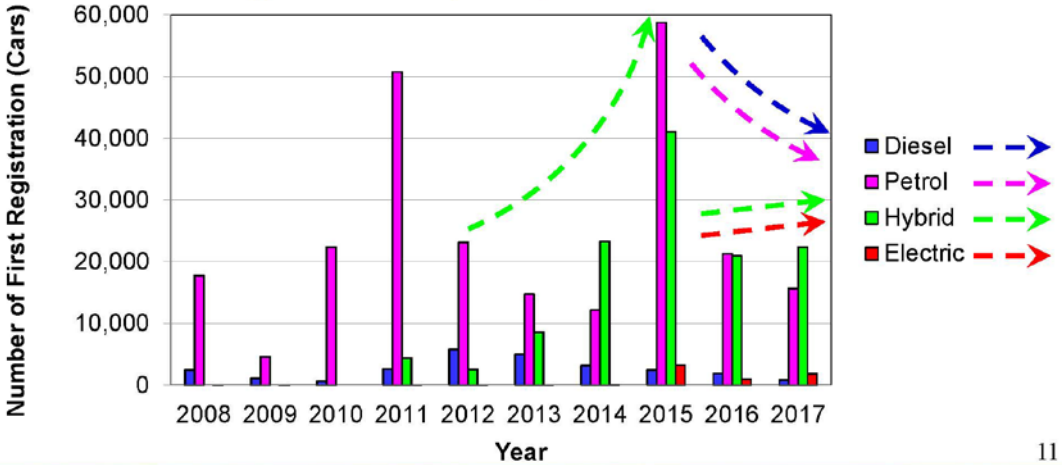


Source : NBR 2017

Figure 14: Fuel economy update in Bangladesh

Fuel Economy Initiatives

- Progress: Some Outcomes
  - ✓ Emergence of hybrid/electric vehicles



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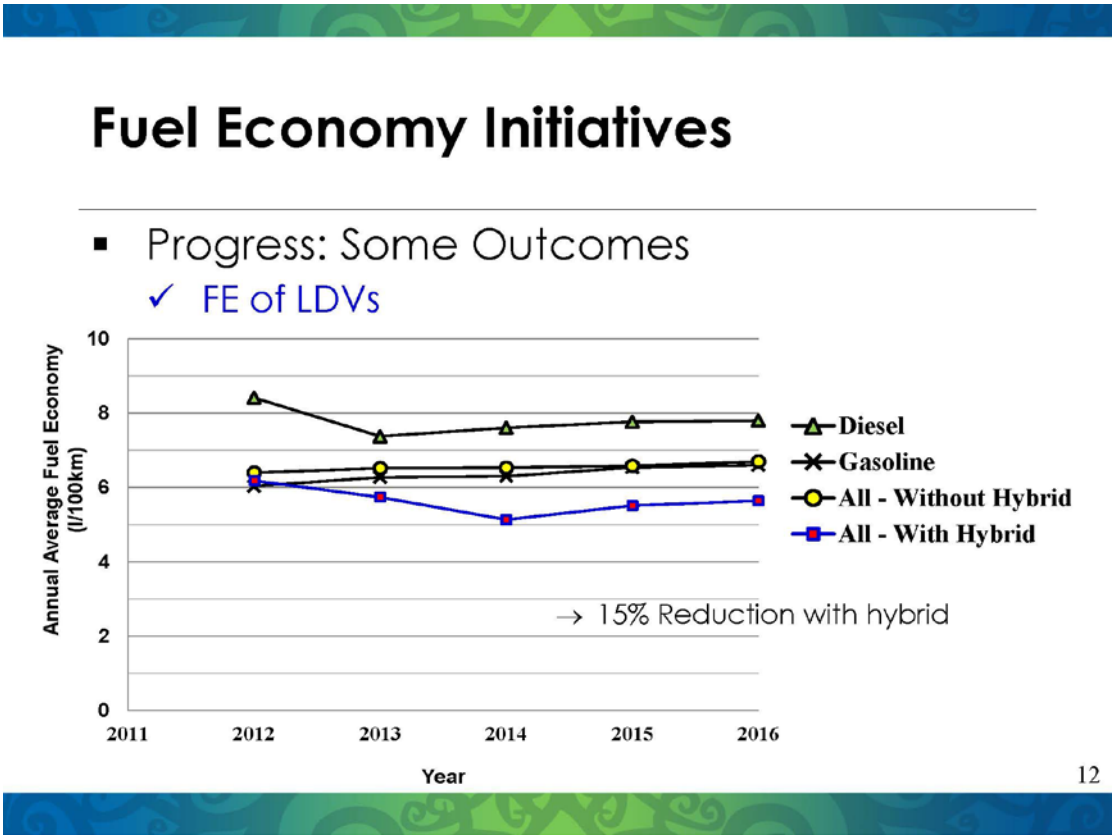
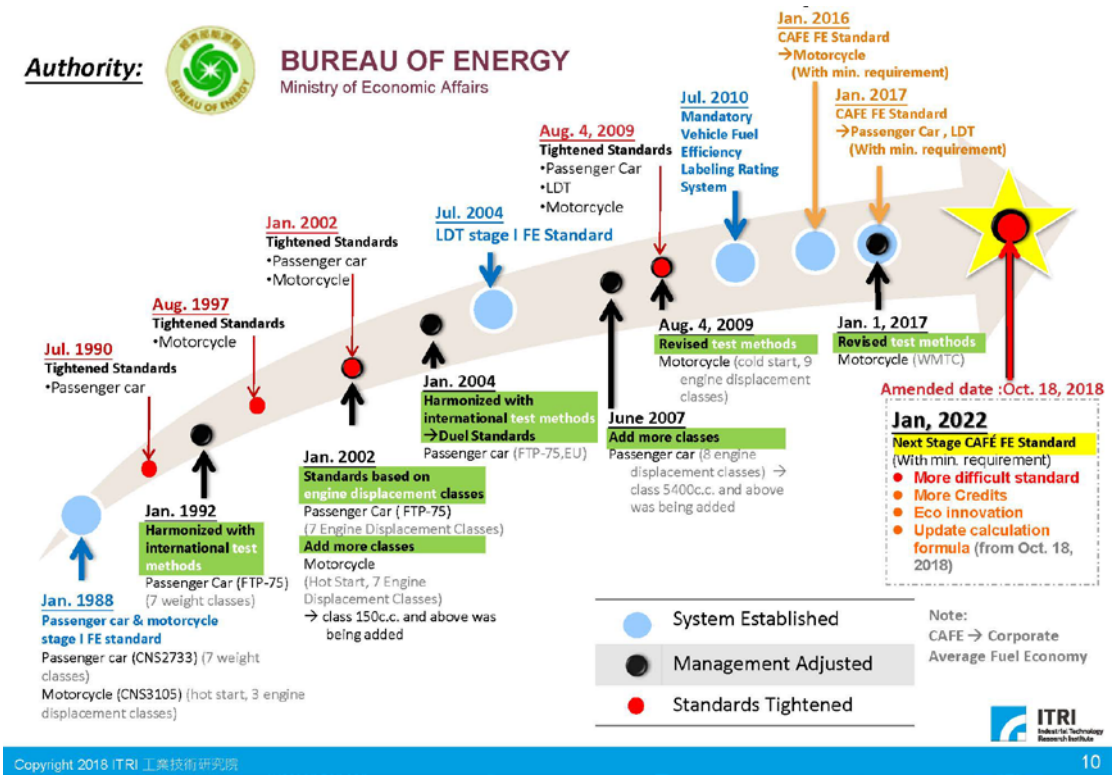


Figure 15: Fuel economy update in Sri Lanka



Vehicle Fuel Economy Standard

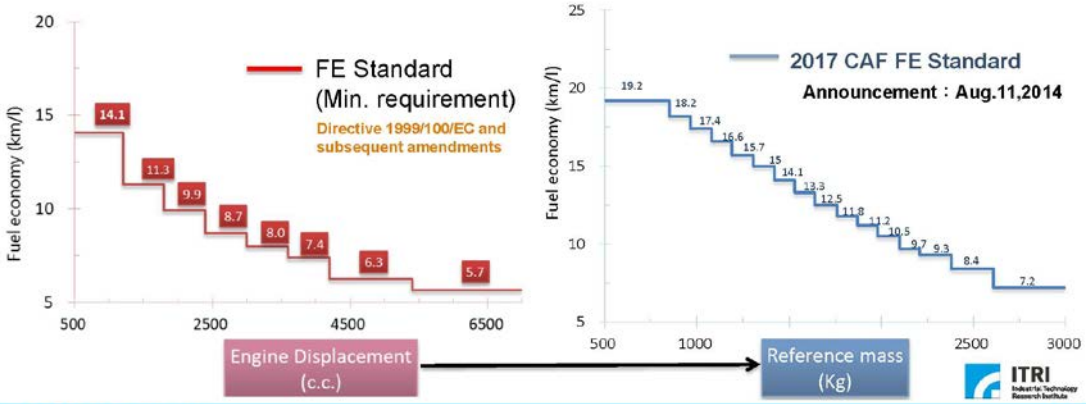
Passenger Car

FE Standard(min. requirement) (Passenger Car) → Fuel Efficiency Improvement → 2017 FE Standard (incl. CAFE) (Passenger Car)

min. requirement

CAFE Effective Date： Jan.1, 2017

Any passenger car manufactured or imported by any entity shall comply with the following Fuel Economy Standards:



Vehicle Fuel Economy Standard

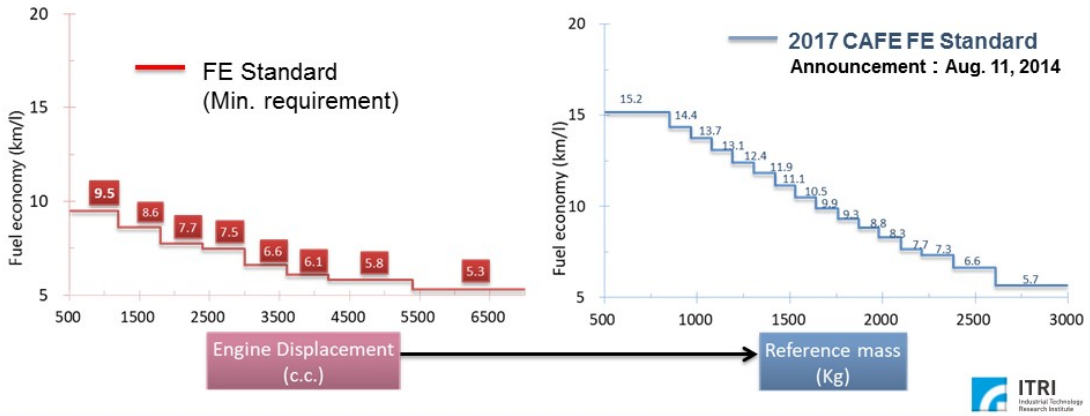
Light Duty Truck

FE Standard(min. requirement) (LDT) → Fuel Efficiency Improvement → 2017 FE Standard (incl. CAFE) (LDT)

min. requirement

CAFE Effective Date： Jan.1, 2017

Any passenger car manufactured or imported by any entity shall comply with the following Fuel Economy Standards:



Vehicle Fuel Economy Standard

Motorcycle

FE Standard (Motorcycle) → Fuel Efficiency Improvement → **2016 FE Standard (incl. CAFE) (Motorcycle)**

Announcement：Aug. 11, 2014
Effective Date： Jan.1, 2016

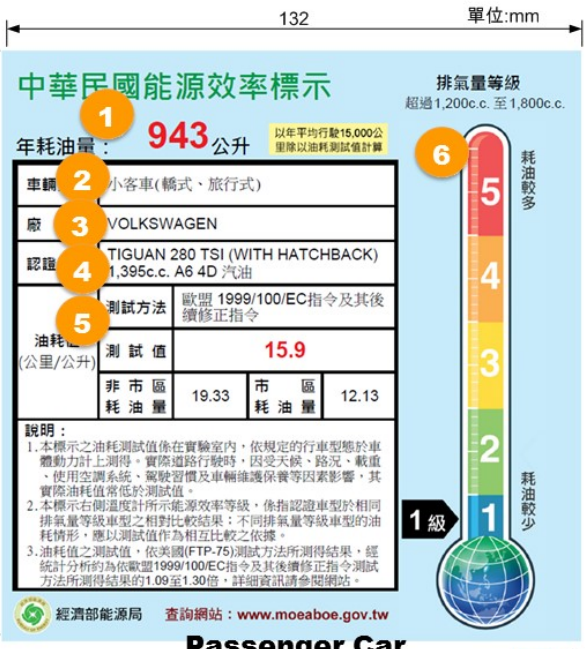
Engine Displacement (c.c.)	FE Standard (min. requirement) (km/L)
Below 50	48.2
Over 50 to 100	40.6
Over 100 to 150	38.0
Over 150 to 250	28.0
Over 250 to 500	21.1
Over 500 to 750	16.6
Over 750 to 1000	15.8
Over **1000** to **1400**	**14.7**
Over **1400**	**13.1**

Revise the class of engine displacement

Engine Displacement (c.c.)	2016 FE Standard (min. requirement) (km/L)	2016 CAFE Average fuel economy limits (km/L)
Below 50	48.2	54.5
Over 50 to 100	40.6	46.7
Over 100 to 150	38.0	43.8
Over 150 to 250	28.0	31.0
Over 250 to 500	21.1	26.5
Over 500 to 750	16.6	18.7
Over 750 to 1000	15.8	18.1
Over **1000** to **1250**	**14.7**	**15.8**
Over **1250** to **1500**	**13.1**	**14.7**
Over **1500**	**12.8**	**14.1**

Fuel Economy label

1. Annual fuel consumption
2. Vehicle type
3. Name of manufacturer
4. Certified vehicle model
5. Fuel economy:
   test procedure;
   combined fuel economy value;
   urban and extra-urban fuel economy. (For motorcycle :urban and constant-speed fuel economy)
6. The energy efficiency ranking

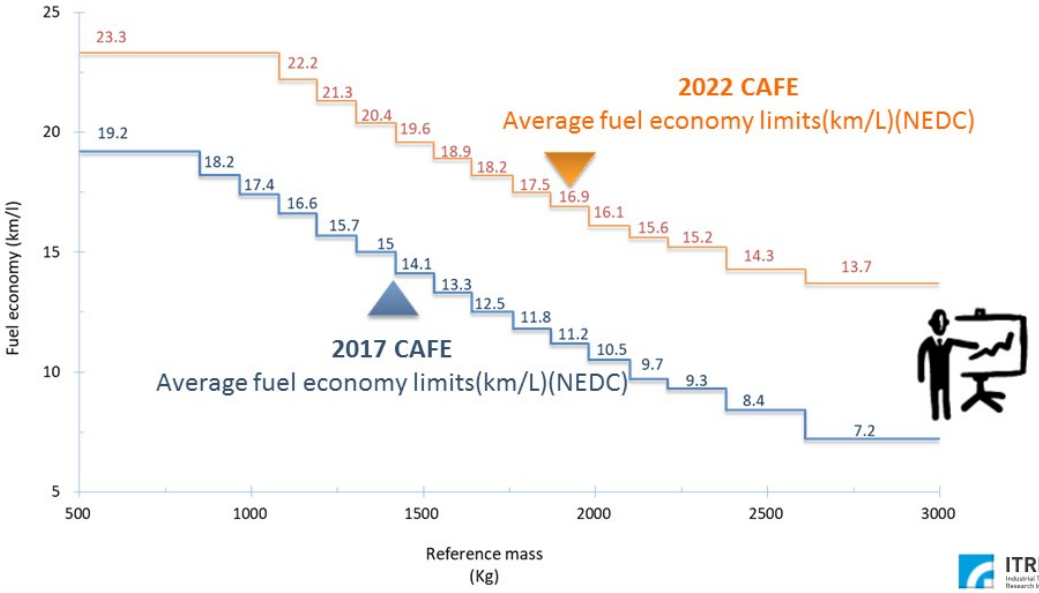


Passenger Car

The Next Stage of Vehicle FE Regulation

2022 CAFE Fuel Economy Standard

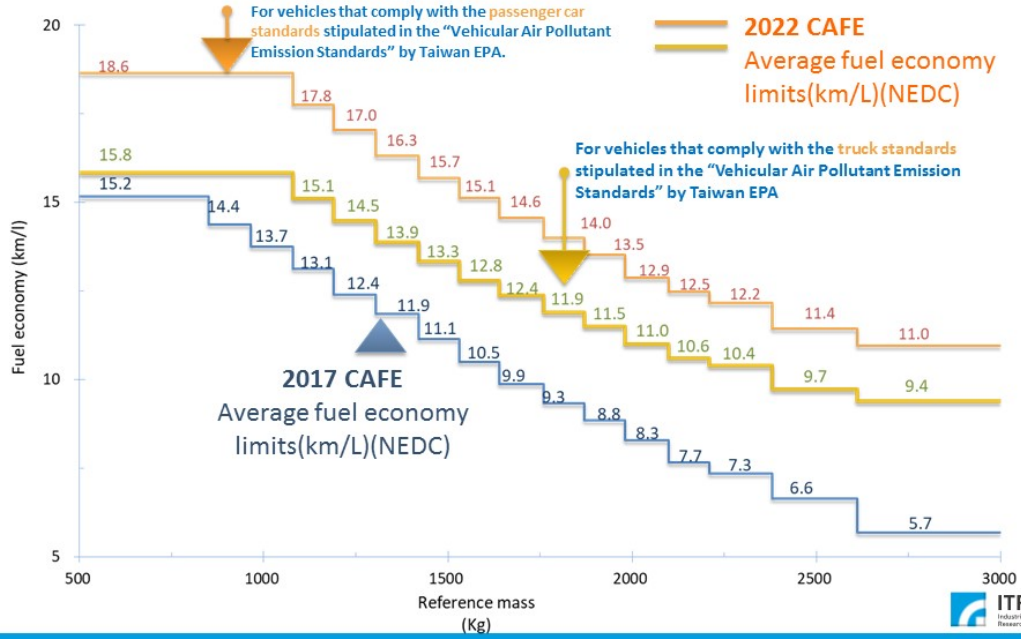
Passenger Car (Announcement : Oct. 18, 2018)



The Next Stage of Vehicle FE Regulation

2022 CAFE Fuel Economy Standard

Light Duty Truck (Announcement : Oct. 18, 2018)



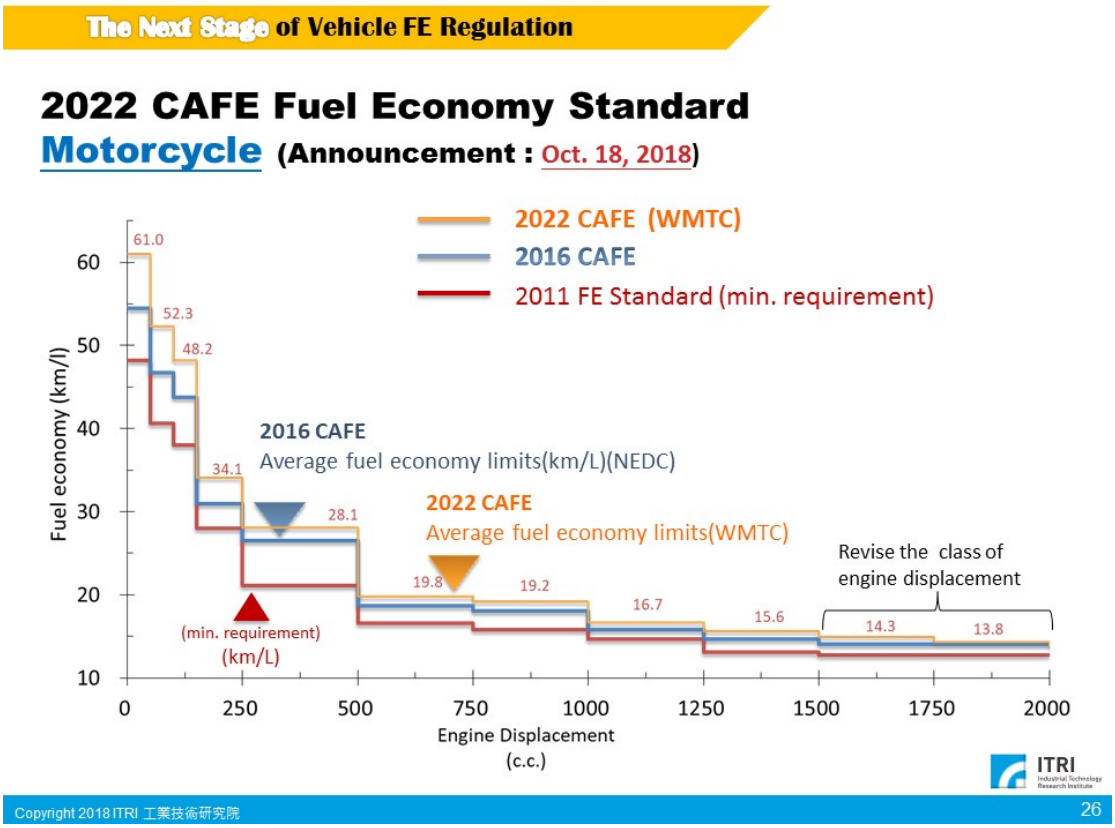


Figure 16: Fuel economy update in Chinese Taipei

Next two presentations were focused on other innovative approaches to promote fuel economy beyond taxes, labels and standards. First presentation was delivered by Mr Friedel Sehlleier from GIZ, who was a major force behind ASEAN Fuel Economy Roadmap, focusing on innovative technique to monitor vehicle fuel consumption data through interactive mobile application called Chatbot. Together with Toyota, GIZ has developed a digital tool to crowdsource real-world fuel economy data from drivers and to promote transparency on vehicle fuel consumption to policymakers and consumers. The tool consists of a chatbot and a web platform. Second presentation was delivered by Dr Yossapong Laoonual from Thailand focusing on how electric vehicle promotion would indirectly improve fuel economy of the vehicle segment.

Last session on advancing regional collaboration for better fuel economy allowed participants to exchange ideas, especially from the economies with fuel economy policy implemented to the economies with fuel economy policy being initiated at some stage.

Conclusion

From both workshops and follow-up to selected participants from certain APEC economies, recommendations for fuel economy policy implementation are based on the principle of fuel economy policy, as shown in Figure 5(c)

1. Information approach should be initiated first for vehicle fuel economy labelling, as have been focused in APEC EWG 05 2014A, so that fuel consumption data can be publically and transparently accessible for car buyers to make decision.
2. Fiscal approach should be followed together with vehicle fuel economy labelling to incentivise fuel efficient vehicle through taxing mechanism, ranging from one-time excise tax to annual registration tax. As a function of fuel consumption in L/100km (or CO_2 emission in gCO_2/km), there are various taxing scheme, e.g. step-wise, linear function, or even feebate, where rebate could be awarded to very fuel efficient vehicle. Details of CO_2-step, slope of linear function or feebate criteria can be adjusted periodically to monitor government income. In addition, fiscal approach could be indirectly applied, such as fuel tax, so that market will favor fuel efficient vehicle automatically. Often, fiscal approach for fuel efficient vehicle could specifically target electric vehicle. With recent promotion of electric vehicle, average fuel economy has been shown to improve as well.
3. Standard approach could be utilized once auto industry is generally equipped with fuel efficient technology for fair competition. Although this approach is very attractive to government due to no subsidy involved, there should be many consultations with auto industry for cooperative and smooth implementation. Fuel economy standard could come in a form of Minimum Energy Performance Standard (MEPS), where individual vehicle must be more fuel efficient than the criteria before being sold in the market, or Corporate Average Fuel Economy (CAFÉ), where automotive company must have average fuel economy of all car models to be more fuel efficient than the criteria (i.e. car company is allowed to sell luxurious vehicle with poor fuel efficiency, as long as the company also sells fuel efficient vehicle to have company-average fuel economy better than the criteria)
4. It should be noted that all three approaches above should have dynamic criteria subjected to periodic revision to update criteria with emerging technologies and market situation.

Glossary

APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
BAQ	Better Air Quality Conference
BEV	Battery-Electric Vehicles
BOI	Board of Investment
CAA	Clean Air Asia
CAFC	Corporate Average Fuel Consumption
CAFÉ	Corporate Average Fuel Economy
CEO	Chief Executive Officer
CEVS	Carbon Emission-based Vehicle Scheme
CO2	Carbon dioxide
COP	Conference of the Parties
EEP	Energy Efficiency Plan
ESV	Energy-Saving Vehicles
EV	Electric vehicle
EVAT	Electric Vehicle Association of Thailand
EWG	Energy Working Group
FCV	Fuel Cell Vehicles
FE	Fuel Economy
FELS	Fuel Economy Labelling Scheme
FEPIT	Fuel Economy Policies Implementation Tool
GFEI	Global Fuel Economy Initiative
GHG	Greenhouse gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
HUST	Hanoi University of Science and Technology
HV	Hybrid Vehicle
ICCT	The International Council on Clean Transportation
IEA	International Energy Agency
IRR	Implementing Rules and Regulations
JST	Japan Science and Technology Agency
Km	Kilometer
KPBB	Komite Penghapusan Bensin Bertimbel
L	Liter
LCEV	Low Carbon Emission Vehicle

LDV	Light Duty Vehicle
MAI	Malaysia Automotive Institute
MEPS	Minimum Energy Performance Standard
MOST	Ministry of Science and Technology
MPV	Multi-Purposed Vehicle
MTEC	National Metal and Materials Technology Center
NDC	National Determined Contribution
NEV	New Energy Vehicles
OECD	Organisation for Economic Cooperation and Development
PESLP	Philippine Energy Standards and Labeling Program
PHEV	Plugin-Hybrid Electric Vehicles
PPSTI	Policy Partnership on Science, Technology and Innovation
SUV	Sport Utility Vehicle
TAPMA	Thai Autoparts Manufacturers Association
TCC	Transport & Climate Change
TCO	Total Cost of Ownership
TIS	Tripetch Isuzu Sales Co, Ltd
VES	Vehicular Emission Scheme
ZEV	Zero Emission Vehicle

APPENDIX: Summary of Evaluation Forms

APEC Project Evaluation Result

The First APEC Workshop on Policy Dialogue on Fuel Economy Platform

Statement	Strongly Agree	Agree	Disagree	Comment
The objectives of the training were clearly defined.	66.67%	33.33%	0.00%	Didn't know it was a training
The project achieved its intended objectives.	55.56%	44.44%	0.00%	
The agenda items and topics covered were relevant.	77.78%	16.67%	5.56%	
The content was well organized and easy to follow.	72.22%	27.78%	0.00%	
Gender issue were sufficiently addressed during implementation.	56.25%	43.75%	0.00%	Very memorable to have even balance at an automotive event Great!
The trainers/experts or facilitators were well prepared and knowledgeable about the topic.	83.33%	16.67%	0.00%	
The materials distributed were useful.	61.11%	33.33%	5.56%	
The time allotted for the training was sufficient.	72.22%	27.78%	0.00%	

1. How relevant was this project to you and your economy?

Criteria	5 (very)	4 (mostly)	3 (somewhat)	2 (a little)	1 (not much)
Score	58.82%	35.29%	0.00%	5.88%	0.00%

Explain

- Seeing possibility of government movement towards fuel economy.
- FE Technology is the key of car making.
- Learning experience of other economies + challenges of other economies very interesting
- Especially because central government agencies are looking into energy company. For example, local trade ministry wants to improve local manufacturing industry. This is good opportunity of work to be standardized.
- Since our economy has yet to implement CO_2-emission-based vehicle taxation and other types of FE policies, everything discussed was helpful.

2. In your view what were the project's result achievements?

Explain

- Sharing of case studies, using FEPIT to evaluate FE policy impact.
- Network, new tools, more data.
- Harmonize experts in APEC economies.
- Potential for future collaboration. Connecting policy makers and experts for sharing knowledge.
- Sharing of information from each economy/organization.
- Exchange of information between economies and learning together with industry
- Sharing of APEC economies experience in implementing FE.
- FE Platform for ASEAN
- Fuel economy standard for Thailand
- It achieved in sharing latest movement of FE policy in each economy especially TH is being under recommending the policy to Govt.
- Initiate each economy to setup the plan to achieve FE target.
- Understanding more about government agency. Duty to drive the fuel economy and its purpose.
- Sharing best practice for each economy and share Thailand FE analysis project and scenarios.
- Update knowledge on FE.
- Collaboration.

3. What new skill and knowledge did you gain from this event?

Explain

- Info on the movement of the industry toward dull efficiency.
- FE policy and implementation.
- Fuel economy analysis technique. Understand best practice for each economy fuel economy initiations.
- Understanding more about vehicles technology development.
- Explore the new technology to improve FE
- FEPIT simulation is very useful.
- FE evaluation tool.
- FE strategy for an economy.
- Lots of them, FE, standard, excise duty, and how Govt can use them in different tests and achieve its standard.
- FEPIT
- Understanding of APEC/ASEAN fuel economy policies and economies.
- Availability of FEPIT tool.
- Get updated information.
- Potential for more structure exchanges/engagement.
- FEPIT, FE policy status in other economies.
- Practice shared and FEPIT.

4. Rate your level of knowledge of and skill in the topic prior to participating in the event

Criteria	5 (very)	4 (mostly)	3 (somewhat)	2 (a little)	1 (not much)
Score	5.26%	15.79%	36.84%	31.58%	10.53%

5. Rate your level of knowledge of and skill in the topic after participating the event:

Criteria	5 (very)	4 (mostly)	3 (somewhat)	2 (a little)	1 (not much)
Score	21.05%	36.84%	31.58%	0.00%	10.53%

Explain

- There's so much room for improvement.
- Information of FE policy in each economy were well updated.
- Broaden FE knowledge of other economies.

6. How will you apply the project's content and knowledge gained at your workplace? Please provide examples (e.g. develop new policy initiatives, organise trainings, develop work plans/strategies, draft regulations, develop new procedures/tools etc.)

Explain

- Idea to develop policy recommendation.
- Develop work plan to improve the fuel economy for local to lead community.
- Making report and report to supervisions for mid-term planning.
- Share presentation and links.
- Organize trainings, develop work plans.
- Learn more about FEPIT. Met more experts.
- In trend FE policies
- Develop strategies to work with other economies
- Helping government agencies understand the international context and using the FEPIT tool.
- Create a policy recommendation to our Finance minister.
- Monitor FE policy impact.

7. What needs to be done <u>next by APEC</u>? Are there plans to link the project's outcomes to subsequent collective actions by fora or individual actions by economies?

- Share workshop results.
- Follow up project for analysis of FE planned strategies. For other APEC economy.
- Move deep detail and history of policy for each economy.
- Implement standard and monitor it. Implement standards also for commercial vehicle, motorcycle.
- Yes
- Work on standard + policy harmonization.
- Link discussion with high level officials form APEC economies.
- Training and knowledge transfer more economies.
- 2nd workshop
- A regional FE initiative maybe.

8. How could this project have been improved? Please provide comments on how to improve the project, if relevant.

- More participant from other APEC economies.

- Use the same pattern for all economies presentation -i.e. the same contents. So it may be easier to follow
- Perhaps more participants from other economies.
- Stretching/standing/physical activity.
- The rest could be addressed through the network created for resource sharing.
- FORM a reginal framework.

The Second APEC Workshop on Policy Dialogue on Fuel Economy Platform

Statement	Strongly Agree	Agree	Disagree	Comment
The objectives of the training were clearly defined.	54.29%	45.71%	0.00%	
The project achieved its intended objectives.	45.71%	54.29%	0.00%	Needs more comments + discussion
The agenda items and topics covered were relevant.	71.43%	28.57%	0.00%	
The content was well organized and easy to follow.	48.57%	51.43%	0.00%	Fonts way too small; screen too small
Gender issue were sufficiently addressed during implementation.	30.00%	63.33%	6.67%	Not evident from the presentation; Can't relate how gender issues relevant in this; Not relevant; Quite high number of female participants; Please encourage more female experts; What gender issue?
The trainers/experts or facilitators were well prepared and knowledgeable about the topic.	55.88%	44.12%	0.00%	
The materials distributed were useful.	48.00%	52.00%	0.00%	Limited materials for distributed due to obvious readout;

Statement	Strongly Agree	Agree	Disagree	Comment
				No materials were distributed; Have yet to receive distributed materials; Please upload presentation somewhere and inform participant or give QR code to download in advance; Not relevant
The time allotted for the training was sufficient.	21.88%	78.13%	0.00%	

1. How relevant was this project to you and your economy?

Criteria	5 (very)	4 (mostly)	3 (somewhat)	2 (a little)	1 (not much)
Score	40.00%	40.00%	17.14%	0.00%	2.86%

Explain

- Excessive fuel consumption in transport factor is a challenging issue
- Since we have just begun, I need all the information I can gather.
- We can pick up from the presentations of different economies on the policies and what procedure that can be copied in the economy.
- Because it's depended the politic between economies.
- Perhaps there is a need to look more closely, social aspects of fuel economy issues.
- Related to my on-going research
- I don't have FE in my economy
- Learning from various experience from many economies.

2. In your view what were the project's result achievements?

Explain

- Development of methodology for development off FE initiative

- Know about what's happening all around and learn from them.
- Showing of technologies.
- Showing of how different economies do in FE
- It is very good session
- Get information related to fuel economy from several economies.
- Need more work and unity.
- I know there are fuel economy development in the world and ASEAN
- Get FE information of all economies and experience of developed economy is useful for our work, especially the roadmap for FE for ASEAN.
- Update on regional perspective on fuel economy; cost benefits analyses on fuel economy Thailand and the Philippines.
- Sharing the status and look for solution
- Development of FE policy in the region
- Reduced emission
- To exchange information and guide economies for better policy
- Best practice from many economies
- FE for vehicles in ASEAN and around the world
- Have to collaboration in ASEAN until achieving goal
- Information sharing
- OK
- Success to guide many economies in the harmony to achieve low carbon emission vehicle
- Enhance the knowledge and experience showing on fuel economy related policy development in Asia
- KLISP 1.3.1 & 1.3.2 outcomes can be achieved with support of our project

3. What new skill and knowledge did you gain from this event?

Explain

- Updated information from different parts of the world
- Most of all, recap part of the platform and get in contact with experts.
- FE should be focused on standards.
- A lot especially on understanding of fuel economy
- Can see and compare regulation, implementation regarding the fuel economy of each economy.
- Different policies, plans and methodology used across the region on fuel economy.
- Fuel Economy.

- Standard emission, the policies going to implement in the fact.
- FE educator and data base establishment on FE.
- Mobility apps.
- The scope of regulation.
- Ways to know fuel efficiency
- Best practices from other members.
- More information of other economy on LCEV program
- FE policy in many economies
- Efforts of various Asian economies with similar problems
- FE policies around the world
- FE regulation and implementation
- Update the current status of fuel economy in ASEAN and some economies in Asia.
- Policy aspects
- Networking mostly
- The strategy to achieve LCEV & how to calculate
- Methods of fuel economy/efficiency and eco labeling development, cost benefit analysis
- Fuel economy and fuel efficiency is equally important to promote sustainable transport

4. Rate your level of knowledge of and skill in the topic prior to participating in the event

Criteria	5 (very)	4 (mostly)	3 (somewhat)	2 (a little)	1 (not much)
Score	2.94%	29.41%	50.00%	14.71%	2.94%

5. Rate your level of knowledge of and skill in the topic after participating the event:

Criteria	5 (very)	4 (mostly)	3 (somewhat)	2 (a little)	1 (not much)
Score	8.82%	70.59%	20.59%	0.00%	0.00%

Explain

- I have been involved with the project for several years.
- Working toward implementation of fuel economy policy in science and technology. Getting advice from the experts in the room has been an experience.

- Some of membered economies policy and action plans may useful to pick-up some points in the action plans for FE.
- I am keen to join this program in future
- Gained knowledge on fuel economy policies.
- Many question or discussion in this event.
- Collecting status of other economy
- supported on FE roadmap

6. How will you apply the project's content and knowledge gained at your workplace? Please provide examples (e.g. develop new policy initiatives, organise trainings, develop work plans/strategies, draft regulations, develop new procedures/tools etc.)

Explain

- Development of FE regulations
- Develop new policy initiative.
- Try not to repeat the mistakes.
- We have some points on the programs in FE. Some of the ideas from the policy dialogue may be used or added to the existing actions plans and policies.
- Re-echo to co-workers what we learned here and use the knowledge learned to write properly for FE
- Very useful in setting up accretion and strategy of auto.
- Update my work on fuel economy policies of Asia Pacific.
- New policies initiatives for standard of using vehicle.
- Consider take some experience of developed economy to apply in our economy (step by step)
- Organize trainings; develop work plans, draft regulations.
- Develop strategies
- Brainstorming strategies
- Collect database/ information and study relationship between incessive implementing and successiveness measure.
- Learn new research project.
- Public education on LCEV
- FE policy report for Thailand
- Develop insights and recommendation in my research.
- Learn experience from other economies on FE baseline development.
- Draft regulation, provide training
- Develop work plans/ strategies

- Policy research activities
- Include some observations to plans
- Fiscal incentive policy; public education on LCEV
- Develop new fuel economy labeling saving and organize training to capacity development
- Disseminate knowledge and FE roadmap to my partners in multisector

7. What needs to be done <u>next by APEC</u>? Are there plans to link the project's outcomes to subsequent collective actions by fora or individual actions by economies?

- Harmonize the methodologies in the region for FE regulation.
- More training and knowledge buildup assistances.
- APEC may think of providing assistance on developing policies of FE to economies that need assistance.
- ASEAN fuel economy baseline
- Educate the public. Standardize FE units and labeling.
- APEC should donate some fund to bring new standard of training for implement impact.
- Support developing economy in ASEAN to develop EV and FE workshop.
- Thank
- Capacity building
- Important in definition of standard
- More awareness to public
- Report from today and share with participant.
- Some presentation from transport companies could be useful.
- Haven't attended APEC meeting before.
- Support to ASEAN economies to implement FE roadmap
- We organize Asian Automotive Research Institute Summit (AAIS)
- Probable to collect data and share among ASEAN economies
- Multi-sectoral dialog among gov and private to set up roadmap LCEV/FE standard in the region
- In depth policy dialogues with regard to new subjects with promoting and initiative in new region and other part of world
- Fuel quality harmonization across ASEAN; Provide tool/technical learning to calculate fuel economy

8. How could this project have been improved? Please provide comments on how to improve the project, if relevant.

- Reused and shape lesson learned /best practices.
- The project to be improve. Set a higher target to promote higher fuel saving and higher CO2 emission reduction.
- Interactive session workshop.
- Some speakers are not native English speakers. Provide translation services?
- To encourage with useful global.
- Monitor is too small. Difficult to see clearly
- Structure of definition + control.
- More discussion and implementation.
- Proceed legally with economies.
- Awareness of people, experts to help build a common roadmap for FE of vehicles.
- Develop platform in ASEAN together
- JARI should cooperate with this project; if possible, I would like to link to AAIS
- Provide overall summary comparing and contrasting various economies
- Proceed legally binding in the economies of Asia Pacific.
- Organize economy-specific programs to support the economy initiative.