

WORKSHOP REPORT

# Increasing the visibility of soot-free and zero emission heavy-duty vehicles in the Transport Decarbonization Agenda of the ASEAN region

Summary of stakeholder group meetings 2021-2022

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Organized by the International Council on Clean Transportation (ICCT) and the United Nations Environment Programme (UNEP) with the support of the Climate and Clean Air Coalition (CCAC)

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## BACKGROUND

Diesel on-road engines currently move a large share of people and goods, yet this reliance on diesel technology comes with significant environmental and health costs. Diesel fuel accounts for more than 40% of global on-road energy consumption and is used to power approximately 90% of all heavy-duty trucks and more than 75% of all buses. Older diesel engines emit high volumes of black carbon and nitrogen oxide, a precursor to particulate matter. Further, older-technology diesel emits what the World Health Organization has defined as Class 1 carcinogen.<sup>1</sup> Heavy-duty vehicles are the leading contributor to transport sector emissions, including 86% of nitrogen oxide emissions in 2015 and 78% of black carbon emissions in 2017. Despite these high shares of emissions, heavy-duty vehicles accounted for less than a quarter of the on-road vehicle fleet in 2017.

Diesel black carbon emissions from heavy-duty vehicles can be controlled by adopting tailpipe emission standards and fuel quality standards for new vehicles equivalent to Euro VI or US 2010.

Progress toward cleaner fuels has enabled the shift to soot-free engine technologies. Sixty-three countries have on-road diesel fuels that average less than 15 parts per million (ppm) fuel sulfur content. At the same time, some countries have access to low-sulfur fuels but have yet to implement corresponding vehicle emission standards to take advantage of these cleaner fuels. Southeast Asia is one region where further diesel fuel quality improvements are particularly needed.

Coordinated actions to harmonize technical regulations in trade blocs such as the Association of Southeast Asian Nations (ASEAN) could enable groups of countries to make faster progress in addressing heavy-duty vehicle emissions than if each country were to develop regulations individually. Alignment of vehicle emission standards, fuel quality standards, and used vehicle import policies among countries with strong economic ties could reduce or eliminate barriers to progress such as competitiveness concerns, cross-border traffic, used vehicle markets, limited access to cleaner fuels, and a limited availability of vehicle models meeting local design specifications.

ASEAN includes ten member states in various stage of development and with different social, cultural, and geographical circumstances. Despite these differences, all member states are pursuing global competitiveness and economic development. Transport of goods, including the use heavy-duty vehicles, is essential to development targets. There is an opportunity to exchange information and global best practices among the member states to address emissions from heavy-duty vehicles would promote cleaner vehicles and fuels.

Efforts to implement measures to address emissions from diesel vehicles require the participation of high-ranking government officials from all member states, mainly from the transport ministries. Participation from other ministries such as environment, energy, or industry is also essential for the project's success. At the ASEAN regional level, transport-related issues are discussed at the working group and senior official

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1 World Health Organization, International Agency for Research on Cancer, "IARC: diesel engine exhaust carcinogenic [press release]," June 12, 2012, <https://www.iarc.who.int/news-events/iarc-diesel-engine-exhaust-carcinogenic/>

levels. High-level matters are presented to the transport ministries during the ASEAN Transport Ministries (ATM) meeting.

The International Council on Clean Transportation (ICCT), in cooperation with the United Nations Environment Programme (UNEP), established a working group on soot-free and zero-emission heavy-duty transport with funding provided by the Climate and Clean Air Coalition (CCAC). During the implementation of this project, the ICCT and UNEP consulted with individual ministerial representatives from ASEAN member countries, as well as with the ASEAN Land Transport Working Group (LTWG) via the ASEAN Secretariat.

## WORKSHOP SERIES ON SOOT-FREE AND ZERO EMISSION HEAVY-DUTY TRANSPORT IN THE ASEAN REGION

The soot-free working group hosted four regional workshops, which were conducted with participation from various regional key ministries.

The primary goals of the workshops were to:

- » Identify country-specific priorities and opportunities for implementing soot-free heavy-duty transport.
- » Discuss potential actions to improve the emissions performance of heavy-duty transport in the ASEAN region by involving key government agencies, such as transport, energy, and environment authorities.
- » Create a critical mass of informed stakeholders and establish a platform to facilitate the exchange of information on soot-free heavy-duty in the ASEAN region.

Each workshop had specific objectives, depending on the topic and audience. The workshops are described in more detail below.

### WORKSHOP 1: TRANSITION TO SOOT-FREE HEAVY-DUTY VEHICLES AND FUELS

August 25–26, 2021, ICCT and UNEP convened the first workshop on emissions of heavy-duty vehicles. The online workshop was attended by 14 participants representing Cambodia, Indonesia, Malaysia, the Philippines, and Vietnam. This workshop aimed to generate and facilitate discussion among ministries, experts, and other stakeholders related to the ASEAN region's emission standards and fuel quality.

#### PRESENTATIONS

- » **Presentation 1:** Dr. Francisco Posada of the ICCT presented on efforts to reduce black carbon, methane, and hydrofluorocarbons that are necessary to complement CO<sub>2</sub> mitigation. Posada stated that on-road diesel vehicles can achieve a 75% reduction in global black carbon emissions in the transport sector by 2030, but only if all countries implement soot-free technology by 2025. He also explained that the working group can provide technical assistance for the development of a roadmap for soot-free vehicles and fuels in the ASEAN region.
- » **Presentation 2:** Mr. Bert Fabian of UNEP presented the need to develop a roadmap

for soot-free heavy-duty for the ASEAN region and described previous initiatives that have already been implemented. This roadmap can be linked with the ASEAN Transport Strategic Plan 2016–2025.

- » **Presentation 3:** Ms. Lingzhi Jin from the ICCT presented on the topic of air quality and the health impacts of heavy-duty vehicles in the ASEAN countries. Jin reviewed best practices and success stories for addressing emissions and identified removing sulfur from the fuel supply as a crucial first step to controlling air pollution from heavy-duty vehicles. Implementing Euro IV and progressing to Euro VI equivalent standards are also key steps to reducing air pollution from vehicles.
- » **Presentation 4:** Dr. Anup Bandivedekar from the ICCT presented a case study of the transition to Euro VI vehicle emissions and fuel quality standards in India, where the country has made tremendous progress on vehicular emission between 2000 and 2010. Bandivedekar explained that although India has adopted Bharat (BS) VI standards, which are equivalent to Euro VI, there are still concerns about implementing BS VI across the country.

## WORKSHOP OUTCOMES

- » The participants were provided recent information on various technologies to achieve soot-free transport, such as electric and hybrid vehicles, diesel Euro VI technology and fuels, and alternative fuels such as compressed natural gas and biofuels.
- » The participants gained a better understanding of the current regulatory status of vehicle emissions and fuel quality in ASEAN member countries and their plans to adopt more stringent standards.
- » The participants and organizers identified potential for future collaboration and regional cooperation in new areas, such as the plan for electrification of heavy-duty vehicles.
- » Soot-free vehicles, fuels, and heavy-duty vehicle electrification were identified by participants as topics for follow-up workshops.

## WORKSHOP 2: TECHNICAL WORKSHOP ON CLEAN FUEL AND VEHICLE EMISSION STANDARDS

The second workshop was held on November 17, 2021, and included representatives from Brunei, Cambodia, Indonesia, Malaysia, Lao PDR, the Philippines, and Vietnam. This workshop aimed to enrich knowledge and information on the latest technology developments for soot-free heavy-duty vehicles and fuels. In addition to the presentations, participants shared information and experiences regarding policymaking related to soot-free vehicles.

## PRESENTATIONS

- » **Presentation 1:** Dr. Francisco Posada from the ICCT presented the technical considerations for transitioning to soot-free vehicle standards and fuels. He provided an overview of how the ASEAN region's transport emissions will grow if it continues on the current trajectory, explaining the region will be the second largest emitter of greenhouse gas after China. Posada explained that there is already technology available to cut down transport emissions by introducing fuel efficiency standards or CO<sub>2</sub> emission standards and electrification. Regarding air pollution, Euro VI offers

much-improved emission control technologies, especially for diesel vehicles.

- » **Presentation 2:** Ms. Kate Blumberg from the ICCT presented a strategic approach to implementing Euro VI standards, using the example of how similar standards have been implemented in four Latin American countries. She outlined four steps necessary for regulatory development: 1. regulatory design; 2. regulatory impact assessment and quantifying the benefits of leapfrogging standards; 3. addressing fuel quality and urea supply; and 4. compliance, enforcement, and verification.

Mr. Bert Fabian from UNEP facilitated the question-and-answer session. Participants from the ASEAN countries were encouraged to share their experiences on planning for the adoption more stringent emissions and fuel quality standards, including the target year for implementation.

### WORKSHOP OUTCOMES

- » Workshop participants improved their knowledge and capacity on soot-free technologies. The content on fuel and emissions standards was tailored to key government officials from relevant ministries with jurisdiction over transport, environment, energy, and others.
- » Participants and organizers identified core issues for improving fuel and emission standards and creating pathways to more stringent standards in ASEAN countries.
- » During the workshop, participants identified resources and support at the country level, as well identified the need for possible support from international agencies to adopt cleaner fuel and more stringent emission standards.

### WORKSHOP 3: TECHNICAL WORKSHOP ON THE ELECTRIFICATION OF HEAVY-DUTY VEHICLES

This third knowledge-sharing workshop was held on April 20, 2022. Participants who attended the online workshop came from government agencies from Cambodia, Indonesia, Lao PDR, Malaysia, the Philippines, Thailand, and Vietnam. The focus of this workshop was to understand more about the role of transport, especially heavy-duty vehicles, in going towards zero emission. Questions regarding what heavy-duty segments can be electrified first, the policies that would support the transition to zero-emission, charging infrastructure buildout, and financing aspects were discussed throughout this event. Speakers for this session came from different agencies and regions.

### PRESENTATIONS

- » **Presentation 1:** Mr. Ray Minjares from ICCT provided updates on global efforts to transition to zero-emission vehicles, the need for phase-out targets, and the challenges and opportunities for the heavy-duty sector. Minjares also identified key policy options to accelerate zero-emission vehicle adoption.
- » **Presentation 2:** Ms. Leticia Pineda from ICCT presented on the zero-emission bus rapid-deployment accelerator (ZEBRA) partnership in Mexico. In the presentation, Pineda explained that the vision of ZEBRA is to shift all new bus procurements in leading Latin American cities to zero-emission technology.
- » **Presentation 3:** Ms. Pamela Chiang from the Asian Development Bank (ADB)

presented current ADB-supported activities promoting e-mobility. These activities include capacity development; technical assistance and project financing through loans, co-financing with other development banks, and grants for technical assistance; and project development, such as the E-smart Bangkok mass rapid transit electric ferries project. Chiang also described ADB's upcoming support to the Asia and Pacific regions.

- » **Presentation 4:** Ms. Faela Sufa from the Institute of Transportation & Development Policy (ITDP) shared her organization's experiences in obtaining funding to assist Indonesian bus rapid transit operator Transjakarta in developing a roadmap for deploying e-bus. ITDP is also seeking funding to support the Ministry of Transport Indonesia in developing transport infrastructure in four provinces in Indonesia.

In addition to the presentation, Mr. Bert Fabian from UNEP informed the meeting that the United Nations Industrial Development Organization is also involved in the global mobility program and is working with the transport, environment, and energy ministries.

## WORKSHOP OUTCOMES

- » Throughout the discussions, participants were informed of difference approaches from each government in the ASEAN region in addressing the topic of transport electrification, including their strategies for implementation in the heavy-duty sector.
- » Many representatives identified significant plans in their respective countries to electrify transport modes beyond the heavy-duty sector. Therefore, the participants were made aware that the ASEAN region may want to consider adopting a regional electrification policy to support country level plans.
- » The participants learned about the Zero Emission Bus Rapid-deployment Accelerator (ZEBRA) Partnership that envisions to shift all new bus procurements in leading Latin American cities to zero-emission technologies, including electric vehicles. This can be an example that can be adopted for the ASEAN region.
- » Participants were provided with quite detailed information from international organization (ITDP), multilateral development banks (ADB) and regional networks (ZEBRA partnership) on best practices, opportunity to collaborate and potential support for technical assistance and funding opportunities for electrification.

## WORKSHOP 4: ACCELERATING ADOPTION OF EURO VI AND ELECTRIC VEHICLES TECHNOLOGY IN THE HEAVY-DUTY TRANSPORT SECTOR

This fourth and closing workshop, held on August 23, 2022, was intended to strengthen and solidify the knowledge of key government officials in ASEAN countries on the latest technology developments for vehicle emission standards, fuel quality, and electrification of heavy-duty transport, as discussed in the previous three workshops.

This workshop also presented an opportunity to facilitate discussion among relevant transport authorities in the ASEAN Region, particularly on moving forward with the targets to adopt higher emissions standards and electrification of the transport sector. Participants attending this workshop came from relevant ministries in Cambodia, Indonesia, Lao PDR, Malaysia, the Philippines, Singapore, Thailand, and Vietnam. Speakers who presented at this workshop came from various countries and agencies.

## PRESENTATIONS

- » **Presentation 1:** Ms. Sandra Cavaliery from the Climate and Clean Air Coalition (CCAC) presented the coalition's activities concerning efforts to deploy soot-free heavy-duty vehicles worldwide. Members of the CCAC network are countries around the world, including several countries in the ASEAN Region. CCAC is still welcoming proposals to support the improvement of transport emissions, including from the heavy-duty transport sector.
- » **Presentation 2:** Professor Savitri Garivait from King Mongkut University of Technology Thonburi (KMUTT) presented the current profile of emissions standards, fuel quality, and electric vehicle technology in ASEAN. In her presentation, she provided analysis performed by KMUTT on opportunities for electrification in 5 ASEAN countries, namely Indonesia, Malaysia, The Philippines, Thailand, and Vietnam, since these five countries contribute more CO2 emissions from the transport sector compared to other countries in the region.
- » **Presentation 3:** Dr. Horizon Gitano from University Sains Malaysia presented Malaysia's diesel and electric vehicle outlook. He provided an overview of incentives by the Malaysian government for electric vehicles, which include heavy-duty transport. He further informed that short-haul and medium trucks could be electrified first for the electrification of heavy-duty transport in Malaysia. Opportunities for electrification in Malaysia include 3-15-ton delivery trucks and 2-wheelers for postal service.
- » **Presentation 4:** Mr. Nick Tan from the Land Transport Authority of Singapore presented his experience in implementing Euro VI Standards nationwide. Singapore adopted the Euro VI standard 2017, starting with gasoline-engine vehicles. Singapore was the first country in the ASEAN region to adopt the Euro VI standard, and has realized benefits in terms of improved air quality. However, for heavy-duty vehicles and other diesel vehicles, countries that want to adopt Euro VI need to secure access to urea additives.
- » **Presentation 5:** Dr. Francisco Posada from the ICCT presented the opportunities for a transition to soot-free and zero-emission heavy-duty vehicles and fuels in ASEAN. The presentation provided a more detailed background on transport emissions in the ASEAN region and the state-of-the-art technologies that can drive the adoption of soot-free and zero-emission heavy-duty vehicles. He also highlighted the key policies needed to achieve soot-free and zero-emission vehicles.

The workshop concluded with a question-and-answer session, where participants discussed the way forward for Euro VI and electric vehicles in the ASEAN region. There were also exchanges of experiences between Singapore, which has been fully implemented Euro VI standards, to other countries that are planning to implement Euro VI such as Thailand and Vietnam.

## WORKSHOP OUTCOMES

- » Key government officials from relevant ministries involved in transport, environment, and energy, enhanced their knowledge of vehicle emission standards, fuel quality, and electrification, particularly for heavy-duty vehicles.
- » Participants shared regional knowledge on how to adopt Euro VI standards and the transition to electric vehicles in ASEAN countries.



- » Participants identified collaboration opportunities among the relevant transport authorities in the ASEAN region, such as through the establishment of an ad-hoc network for Euro VI or zero-emission vehicles, and shared information on possible international support on this topic.

## SOOT-FREE AND ZERO-EMISSION HEAVY-DUTY VEHICLES EVENT AT THE UN-ESCAP COMMITTEE ON TRANSPORT MEETING

ICCT and UNEP organized a side event for the United Nations Economic and Social Commission for Asia and the Pacific Committee on Transport (COT) Meeting in Bangkok, Thailand on November 24, 2022. This event highlighted the issues identified in the series of workshop under the Soot-free Heavy-duty project between 2021 and 2022. It covered the topics of fuel and vehicle emission standards, electrification, and the adoption of Euro VI for heavy-duty vehicles in the ASEAN region.

King Mongkut University of Technology Thonburi (KMUTT) presented the current profile of emission standards, fuel quality, and electric vehicle targets and policies in ASEAN region. Transjakarta, the largest bus rapid transit operator in ASEAN, presented their bus electrification program. ICCT presented the findings of a total cost of ownership study to support Transjakarta's electrification target. The event concluded with a panel discussion on the way forward to Euro 6/VI and electric vehicles in the ASEAN region.

The key outputs from this event are:

- » Key government officials from transport ministries gained enhanced knowledge about the status of the vehicle emission standards and fuel quality, particularly for heavy-duty vehicles in the ASEAN region.
- » Participants engaged in a discussion on opportunities and challenges toward a harmonized approach for Euro VI standards and the transition to electric vehicles in ASEAN countries.
- » Collaboration opportunities among the relevant transport authorities in the ASEAN region were discussed.

## COMMUNICATION WITH ASEAN AND PLAN FOR FUTURE ACTIVITIES

Participants of these workshops, mainly the transport officials from numerous ASEAN member countries were informed that under this CCAC-funded project, UNEP and ICCT had delivered four regional workshops to discuss opportunities, challenges, and the next step towards soot-free heavy-duty transport in the ASEAN Region. UNEP and ICCT also announced that as part of the follow up support, a potential ASEAN-wide roadmap on Euro VI for clean fuels and soot-free heavy-duty vehicles will be developed in 2023.

The workshop series and several bilateral discussions with the ASEAN Secretariat revealed that the topic of soot-free is still an interest for the region to work on. Apart from electrification, ASEAN is also starting to consider exploring the possibility of

using hydrogen as future fuel for the region. This information is useful to plan the topics and priorities for future workshop and knowledge exchange in the region.

## MAIN FINDINGS FROM THE WORKSHOPS

There is a noticeable gap in adopted emission standards in the ASEAN region, with some member countries having adopted the Euro VI standards (Singapore) and other member countries planning to transition to Euro VI (Thailand, Vietnam, Indonesia, Philippines, Malaysia). Indonesia and Thailand have developed significant automotive industries; therefore, there is significant opportunity in these two countries to address diesel soot emissions in particular and overall vehicle emissions in general.

Vehicle electrification is currently receiving lots of attention from the governments of ASEAN member countries. Most of the countries, particularly the five largest emitters in terms of CO<sub>2</sub> (Indonesia, Malaysia, the Philippines, Thailand, and Vietnam), have published strategic documents and implemented policies to accelerate the transition to electric vehicles in their countries. Other countries in the region have also adopted electrification targets.

Presentations and discussions from the workshops have put in evidence that most of the effort for a transition to electrification has been placed on motorcycles, passenger cars, and public transit buses. Specific plans and concrete policies for heavy-duty sector electrification, including converting delivery and long-haul commercial vehicles for goods transport, are not clearly covered in the existent plans.

Regarding government stakeholders, the transport ministries are responsible for transport-related policies, whereas emission standards and fuel quality often fall outside their domain. The workshop series revealed this challenge of inter-governmental cooperation for pushing the adoption of soot-free regulations. Although the transport ministries do not have direct authority for setting up emission and fuel quality standards, they can establish the soot-free requirement to be implemented by transport operators, such as city bus operators. Moreover, most transport officials favor the electrification of public transport as they consider it as something they can directly influence.

ASEAN has operated as an intergovernmental agency since its establishment in 1967. There are three pillars under the ASEAN Community, namely the ASEAN Political-Security Community (APSC), the ASEAN Economic Community (AEC), and the ASEAN Socio-Cultural Community (ASCC). The transport sector falls under the AEC alongside the energy sector. However, the environment sector falls under the ASCC. In most ASEAN countries, emission standards are set by the environment ministries. Hence the transport sector has less influence to accelerate the adoption of more stringent emission standards as there are still challenges for inter-pillar coordination under the ASEAN mechanism. However, according to the ASEAN Secretariat, it is possible to address inter-sectoral cooperation at the country level better to align transport, emission, and fuel policies.