


ANNUAL REPORT 2018

**icct**  
THE INTERNATIONAL COUNCIL  
ON CLEAN TRANSPORTATION

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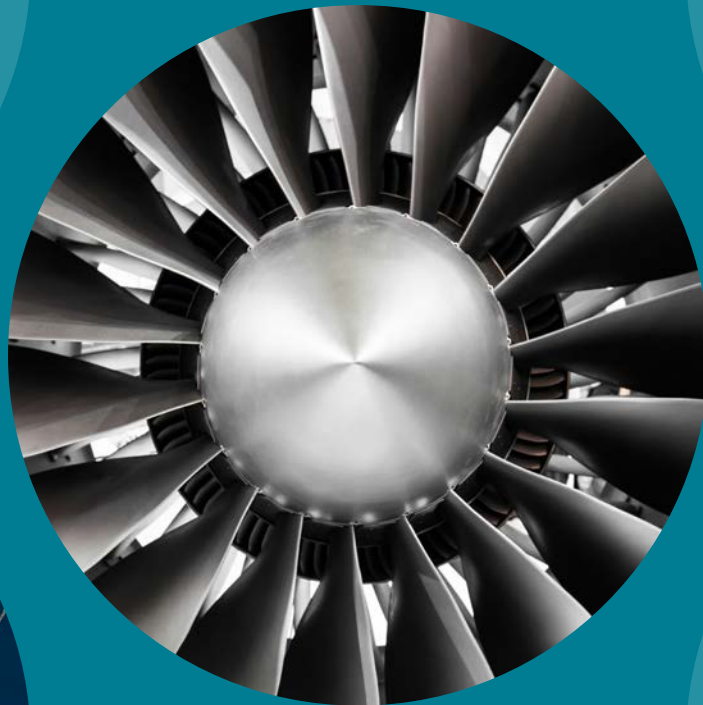
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# MISSION

The International Council on Clean Transportation is an independent nonprofit organization which provides unbiased technical and scientific research. Our mission is to improve the environmental performance and energy efficiency of road, marine, and air transportation, in order to benefit public health and mitigate climate change.

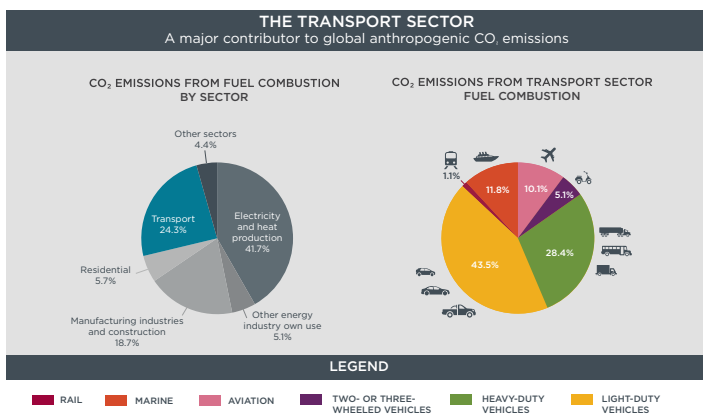


# ICCT'S 2018 YEAR IN REVIEW

Last year saw great strides in global efforts to combat transport emissions.

The International Maritime Organization agreed to a long-term greenhouse gas (GHG) strategy which aims to reduce international shipping's GHG emissions at least 50% below 2008 levels by 2050. If the international maritime sector were a country, it would rank sixth in the world for GHG emissions, slightly above Germany.

China, Brazil, and Mexico each adopted world-class emission standards for heavy-duty vehicles in 2018. If implemented effectively, these standards that will dramatically lower diesel soot pollution, which contributes to both premature mortality and climate change.



Sources: Based on IEA data from IEA CO<sub>2</sub> Emissions from Fuel Combustion © OECD/IEA 2017, www.iea.org/statistics. Licence: www.iea.org/lic. as modified by ICCT. Transport sector CO<sub>2</sub> emissions are adjusted to reflect higher ICCT estimates for marine emissions. © Inter. N., Conner, S., Roy, B., Hao, X., & Rutherford, D. (2017). Greenhouse gas emissions from global shipping, 2013-2015. Retrieved from https://www.theicct.org/sites/default/files/publications/Global\_shipping\_GHG\_emissions-2013-2015\_ICCT-Report\_17022017\_vf.pdf. CO<sub>2</sub> emissions for road transport, rail, and aviation are based on IEA data from the Mobility Model version 2.7P 2017 © OECD/IEA 2017; tank-to-wheel GHG estimates by transport sub-sector (excluding marine) are adjusted to align with transport sector CO<sub>2</sub> emissions estimates in IEA CO<sub>2</sub> Emissions from Fuel Combustion.

The European Union finalized efficiency standards for passenger cars that require a reduction in CO<sub>2</sub> emissions of 37.5 percent by 2030, and which would achieve a fleetwide average 59 g/km or 81 miles per gallon on the U.S. test cycle. These standards also include a zero and low-emission vehicle sales target of 15% in 2025 and 35% in 2030.

Events in the United States were not as promising. In 2018, the U.S. administration signaled its intention to roll back the 2025 passenger vehicle fuel economy standards. Our research found that the proposed regulation used a deeply flawed methodology that artificially inflated cost estimates and reduced benefits. We also found mounting evidence that automakers can readily meet or exceed the 2025 targets. We have urged the administration to reconsider.

Elsewhere in the world, the ICCT was active in region-spanning initiatives such as encouraging the adoption of zero-emission vehicles, eliminating soot emissions from public bus fleets, ensuring emissions compliance in the real world, supporting robust fuel-efficiency standards, and moving freight onto greener pathways.

What's next for the ICCT? We plan to focus on research that will not only assist in making existing transportation technologies cleaner but will also hasten the transition to electric and zero-emission technologies. That will mean, among other things, helping cities monitor real-world emissions from cars, truck, and buses, providing technical support for India's transition to cleaner vehicles, and urging European regulators to strengthen and expand post-Euro 6 standards.

Clearly, the ICCT's core mission of decarbonizing transport is more urgent than ever.

Drew Kodjak  
Executive Director

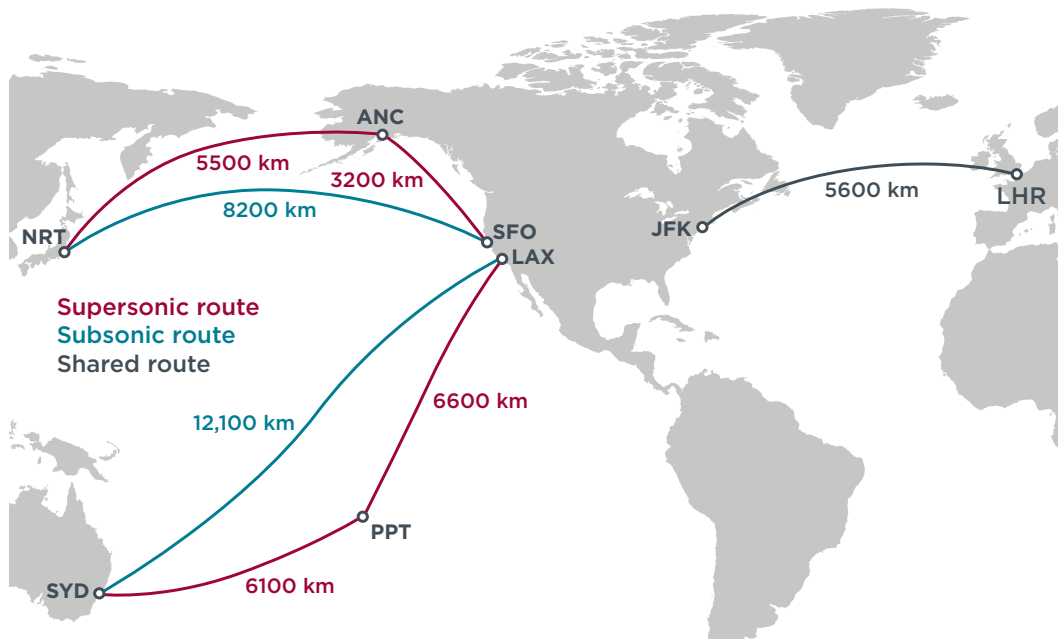
# AVIATION

The ICCT's aviation program works to ensure that policy for the aviation sector is informed by high-quality, transparent analysis of the environmental performance of aircraft and airlines.

Aviation is a major contributor to climate pollution, accounting for about 850 million tonnes of CO<sub>2</sub> in 2017. The aviation team at the ICCT produces real-world data and analysis to help efforts to reduce the impact of air travel on the environment. Researchers from the ICCT have been at the forefront of assessments of the environmental impacts of emerging supersonic transport aircraft that demonstrate the need for effective international standards. Also in 2018, an ICCT study showed that a majority of U.S.-based passenger aircraft will already meet the International Civil Aviation Organization's (ICAO) 2028 CO<sub>2</sub> standards without additional efficiency improvements. The findings illustrate an opportunity for the U.S. Environmental Protection Agency to strengthen the standards by applying them to all in-service aircraft.

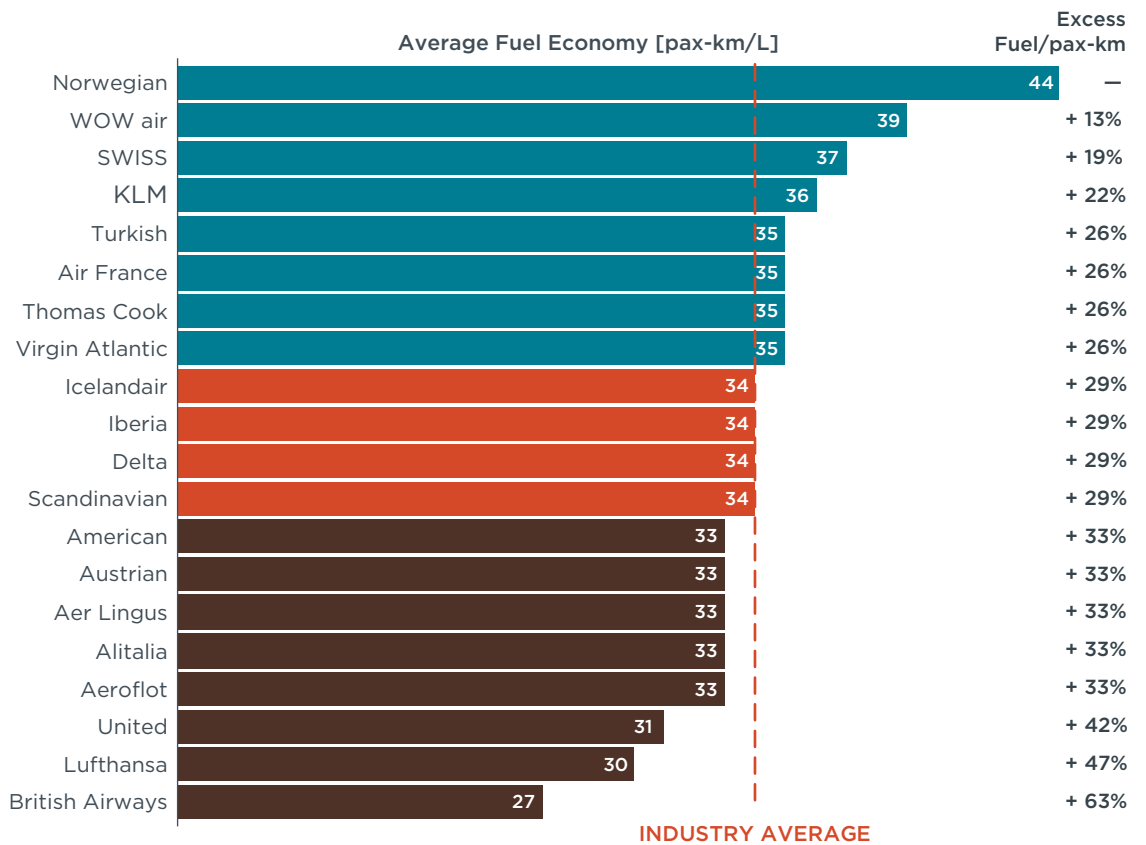
## AIRLINE EFFICIENCY RANKINGS

The ICCT's aviation team released an updated efficiency ranking for transatlantic routes, revealing fuel efficiency improvements of an average of 1% per year since 2014, less than the industry goal. The ICCT also performed a ranking of transpacific airlines, revealing an efficiency performance gap of 64% between the most and least fuel-efficient carriers, the widest gap identified in ICCT studies to date. With an increase in demand for air travel, these rankings illustrate the urgent need for more fuel-efficient aircraft.



CO<sub>2</sub> emissions per passenger on representative supersonic (red) and subsonic (green) routes  
([Environmental performance of emerging supersonic transport aircraft](#))





**Fuel efficiency of 20 airlines on transatlantic passenger routes, 2017**  
 ([Transatlantic airline fuel efficiency ranking, 2017](#))

**PUBLICATIONS OF NOTE:**

[U.S. Passenger Jets under ICAO's CO<sub>2</sub> Standard, 2018-2038](#)  
 (working paper)

[Transatlantic airline fuel efficiency ranking, 2017](#)  
 (white paper)

[Environmental performance of emerging supersonic transport aircraft](#) (working paper)

[Transpacific airline fuel efficiency ranking, 2016](#)  
 (white paper)

# COMPLIANCE AND ENFORCEMENT

ICCT research plays a crucial role in illuminating the scale and scope of disparities between vehicle-efficiency targets and pollutant emissions standards and “real-world” behavior in everyday use.

In 2018, the ICCT helped to launch The Real Urban Emissions (TRUE) Initiative, a partnership of expert groups with a shared interest in reducing vehicle emissions and improving urban air quality. The TRUE Initiative collects and publishes real-world emissions data in order to reveal the magnitude and scope of excess vehicle emissions. The data is intended to inform consumers and support efforts at the city level to improve urban air quality.

In December, TRUE released the results of its London remote sensing campaign, undertaken to increase the availability of information about exhaust emissions throughout the city. The campaign, a collaboration with the City of London, found certain models of London's black taxis produce, on average, higher NO<sub>x</sub> emissions than diesel passenger cars covered by the same emissions standard. In addition, they found average NO<sub>x</sub> emissions from London's buses have declined significantly over the past 5 years.

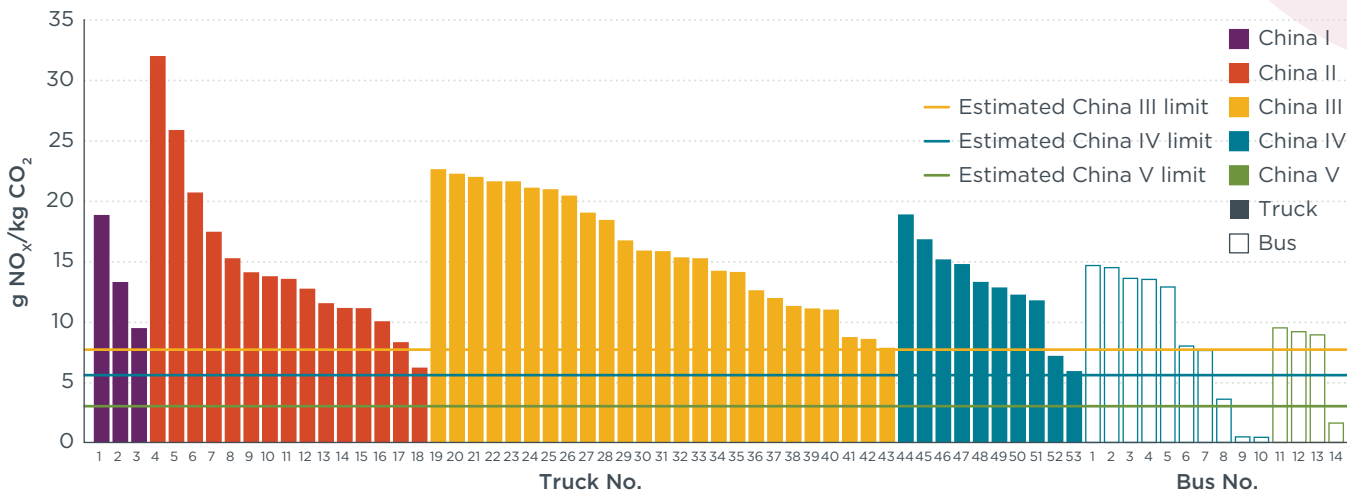


## LABORATORY AND ON-ROAD TESTING IN CHINA

There is growing evidence that vehicle emissions under real-world driving conditions can be significantly higher than certified values. Researchers from the ICCT examined two gasoline cars certified under the China 5 emission standards using both lab tests and a Portable Emissions Measurement System. NO<sub>x</sub> emissions were found

to be significantly higher than the standards in more realistic driving conditions. Carbon monoxide emissions in some cases exceeded the China 5 limit by 2.8 times. In addition, on-road fuel consumption was found to be up to 50% worse than the certified values. The findings point to a need for the inclusion of more realistic test procedures and robust in-use compliance programs.

## REMOTE SENSING CAMPAIGN IN LONDON



Real-world NO<sub>x</sub>/CO<sub>2</sub> emissions of diesel HDVs, by vehicle compared to standards in China  
([Real-world emissions in China: A meta-study of PEMS data](#))

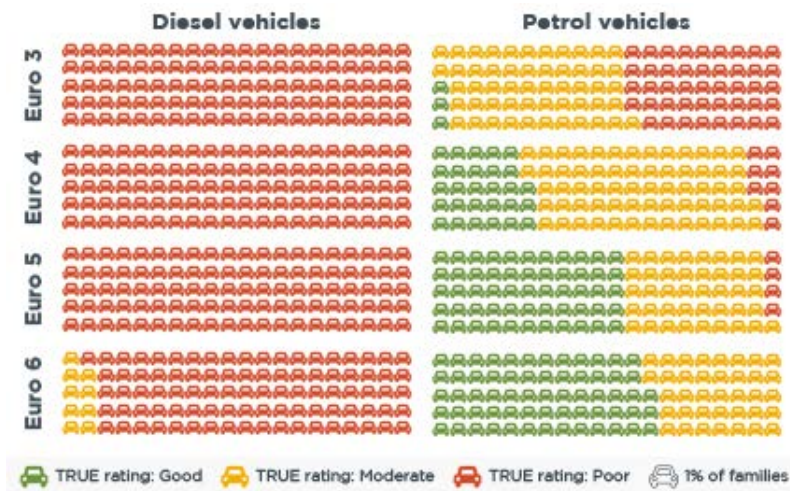
### PUBLICATIONS OF NOTE:

[Remote sensing of motor vehicle emissions in London](#)  
(white paper)

[Remote sensing of motor vehicle exhaust emissions](#)  
(white paper)

[Real-world emissions in China: A meta-study of PEMS data](#)  
(white paper)

[Determination of real-world emissions from passenger vehicles using remote sensing data](#) (consulting report)



Share of passenger vehicle families receiving a green, yellow, or red TRUE Initiative rating grouped by fuel type and Euro standard.  
([Explanation of the TRUE real-world passenger vehicle emissions rating system](#))

# CLEAN AIR

The ICCT advises governments and civil society organizations on strategies to address the public health and near-term climate impacts of outdoor air pollution from motorized transportation.

Just one out of ten people breathe clean air today, according to the World Health Organization. As a major contributor to this outdoor air pollution, the transport sector is responsible for nearly 400,000 annual premature deaths and 1 trillion U.S. dollars in annual health damages. In 2018, the ICCT released a progress assessment regarding the introduction of low-sulfur fuels and cleaner diesel vehicles. The study found soot-free standards in the largest vehicle markets are projected to reduce global black carbon emissions from diesel road transport by 37% by 2040, equivalent to 40% below 2010 levels.

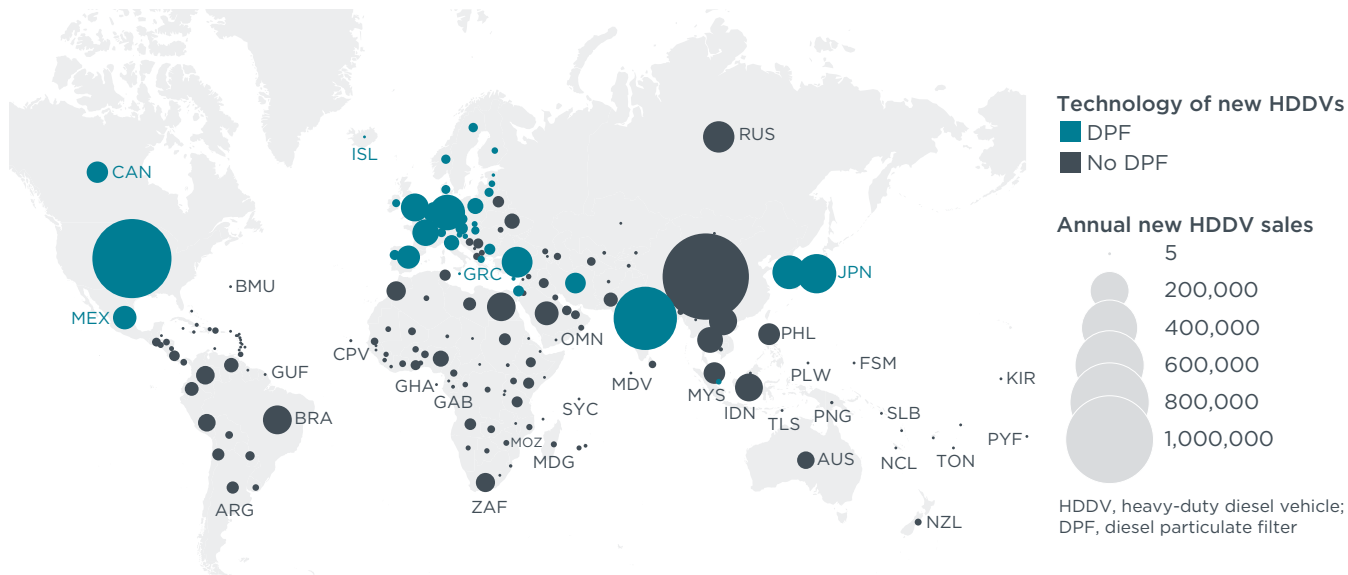
**PUBLICATIONS OF NOTE:**

[Global progress toward soot-free diesel vehicles in 2018](#)  
(report)

[Cost-benefit assessment of the China VI emission standard for new heavy-duty vehicles](#)  
(working paper)

**ZEBRA PARTNERSHIP**

In October, the ICCT announced together with the C40 Cities Climate Leadership Group the launch of the Zero Emission Bus Rapid-deployment Accelerator (ZEBRA). The ZEBRA partnership will deliver technical assistance in C40 cities—particularly Santiago, Sao Paulo, Medellin, and Mexico City—to develop a fleet-wide zero emission deployment strategy. The partners will work to secure commitments from major bus and engine manufacturers to make available zero emission bus technology in Latin America. The partners will seek commitments from financing institutions to make available 1 billion U.S. dollars for investment in zero emission bus infrastructure by 2021.



**Implementation of soot-free standards for new heavy-duty diesel vehicles (HDDV) among Marrakech Communiqué signatories under adopted policies in 2021.**  
 ([Global progress toward soot-free diesel vehicles in 2018](#))

# ELECTRIC VEHICLES

The ICCT analyzes trends in electric-vehicle technologies and vehicle markets to evaluate what policies and incentives are most effective in accelerating the global transition to electric vehicles.

Zero-emission vehicles are a vital component of plans to reduce emissions from the transportation sector. Researchers with the ICCT are analyzing the growing body of data which shows how a wide range of policies are supporting the transition. This year, researchers assessed how charging infrastructure deployment, battery and technology cost, taxation, and direct government support policies at the country and local level are influencing the electric vehicle market.

ICCT research revealed that nearly half of the world's electric vehicle sales are concentrated in 25 cities. These cities use a combination of strategies to ensure electric vehicle model availability, incentives to reduce vehicle price, infrastructure to ensure convenience, and campaigns to educate consumers. In addition, many of these cities offer vehicle licensing and other financial incentives. ICCT researchers also analyzed how taxation policy in different European countries may induce consumers to opt for low-emission vehicles.

#### **PUBLICATIONS OF NOTE:**

[Modernizing vehicle regulations for electrification](#) (briefing)

[Using vehicle taxation policy to lower transport emissions: An overview for passenger cars in Europe](#) (report)

[Electric vehicle capitals: Accelerating the global transition to electric drive](#) (briefing)

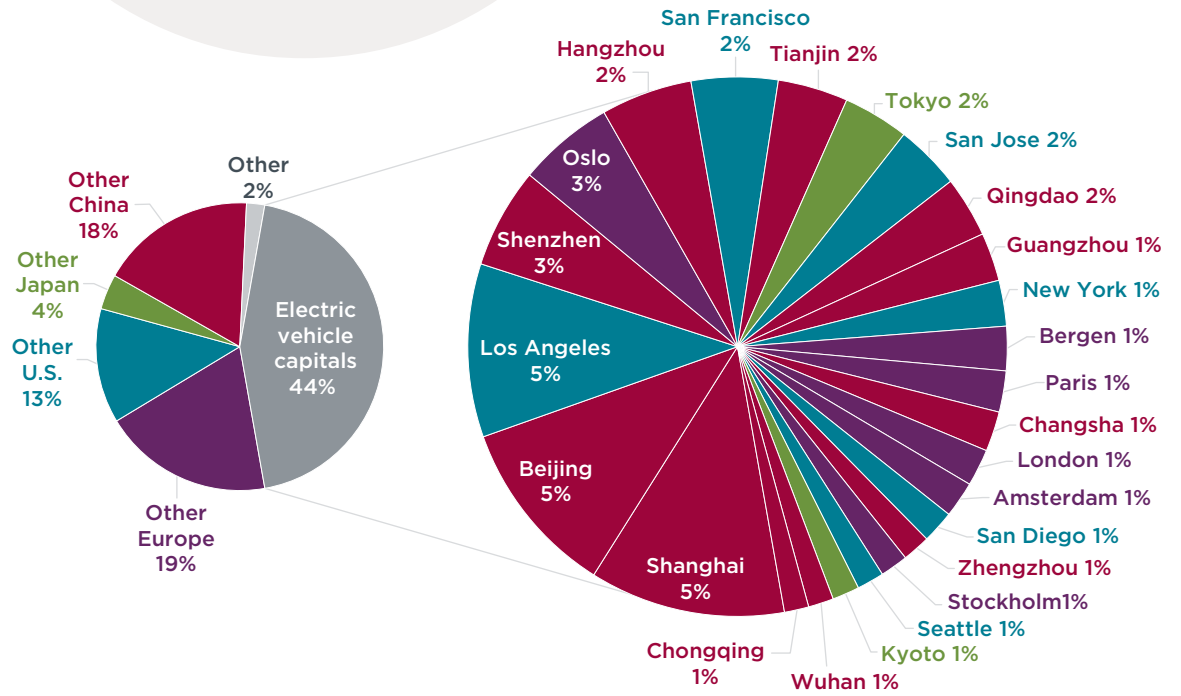
[Lessons learned on early electric vehicle fast-charging deployments](#) (white paper)

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## **POWER PLAY: HOW GOVERNMENTS ARE SPURRING THE ELECTRIC VEHICLE INDUSTRY**

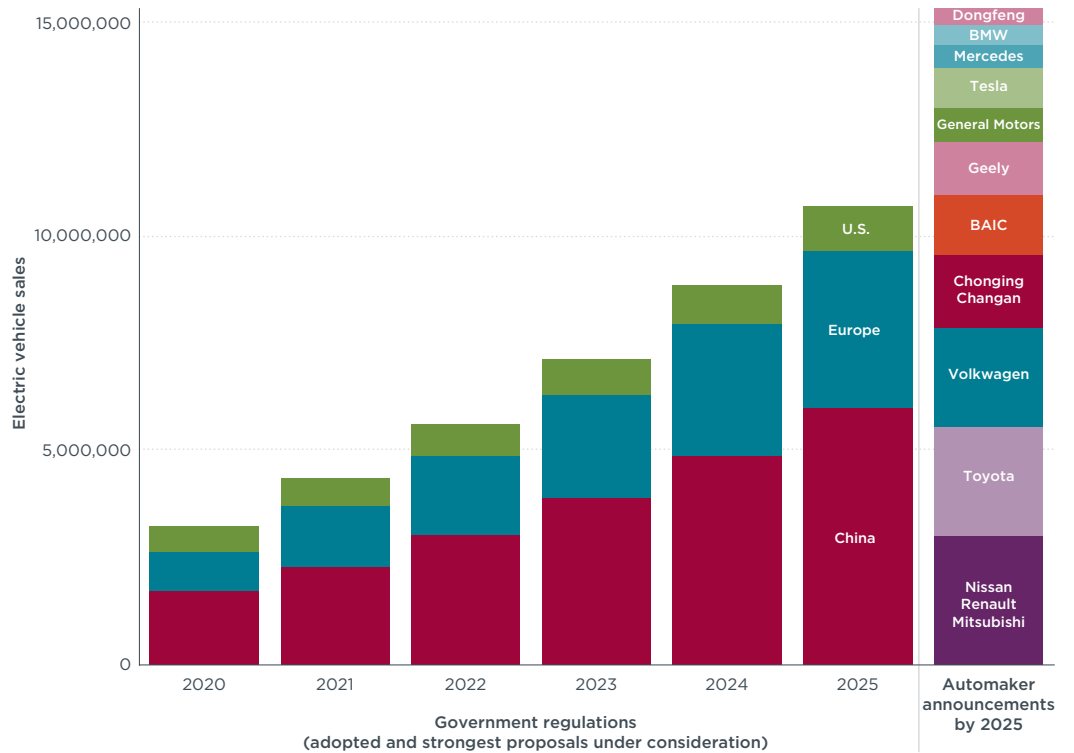
ICCT researchers undertook a detailed assessment of electric passenger vehicle manufacturing and sales, revealing that China, Japan, South Korea, and the United States account for nearly all global electric vehicle production. In 2017, China's battery cell production for light-duty electric vehicles was 11 times that of the United States and 22 times that of Europe. The study showed that more than 80% of the world's new automobiles are subject to standards that encourage industry investments in vehicle technology. Leading electric vehicle markets also have specific regulations, infrastructure investments, and consumer incentives for electric vehicle purchases in place.





**Electric vehicles in 25 electric vehicle capitals and as a share of the global electric vehicle stock**

([Electric vehicle capitals: Accelerating the global transition to electric drive](#))



**Government regulations and 2025 automaker targets for electric vehicles**

([Modernizing vehicle regulations for electrification](#))

# FUELS

The ICCT works to identify the fuels that offer the greatest carbon reductions and works with policymakers to ensure biofuel feedstock sustainability, account for indirect effects, and support the commercialization of emerging low-carbon technologies.

Low-carbon fuels can substantially reduce the climate impact of transport. But not all alternative fuels are improvements over fossil fuels. Researchers at the ICCT have assessed biofuel mandates in energy policies around the globe to inform policymakers of their real-world impacts. Research from the ICCT in 2018 concerning the fuels sector included the indirect land-use change (ILUC) risk of biofuels, renewable methane potential, and the production of alternative jet fuel. Researchers at the ICCT highlighted to policymakers that Canada's proposed Clean Fuel Standard would deliver approximately half of its target for GHG reductions due to ignoring emissions from ILUC. ICCT research on the issue gained national attention.

## EUROPEAN UNION RENEWABLE FUEL POLICY

The European Union's Renewable Energy Directive proposed phasing out the contribution of high indirect land-use change (ILUC) risk biofuels towards renewable energy targets but created an exception for low ILUC risk biofuels. However, the definition of low ILUC risk biofuels used would not necessarily result in reduced ILUC. The Commission subsequently adopted language recommended in public comments submitted by the ICCT that would reduce the amount of high ILUC palm oil that will make its way into European cars and trucks. As a result, the associated environmental damage should be substantially reduced.

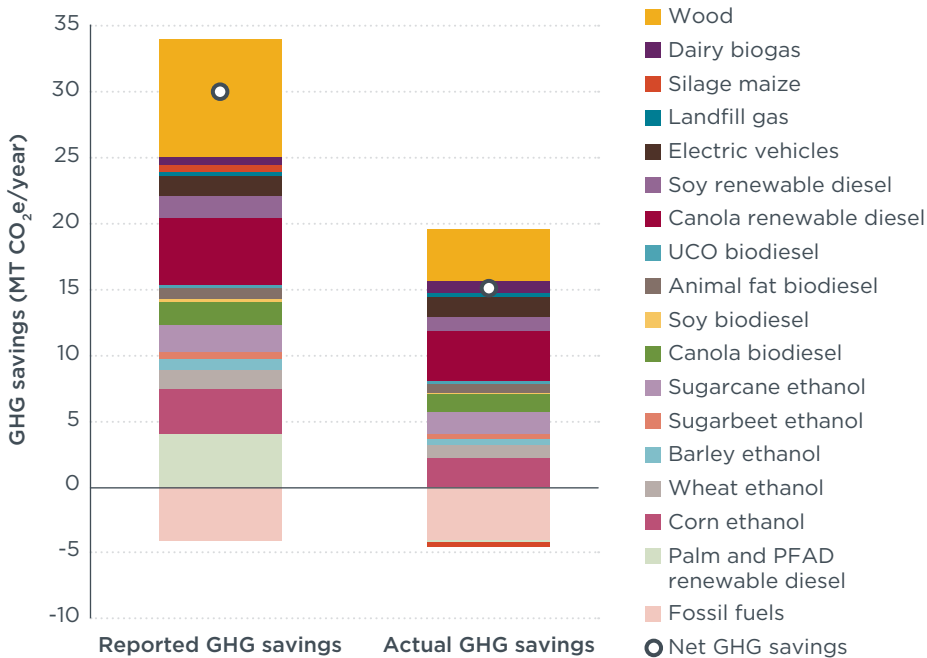
### PUBLICATIONS OF NOTE:

[Analysis of high and low indirect land-use change definitions in European Union renewable fuel policy](#) (working paper)

[What is the role for renewable methane in European decarbonization?](#) (briefing)

[The potential for low-carbon renewable methane in heating, power, and transport in the European Union](#) (working paper)

[A comparison of induced land-use change emissions estimates from energy crops](#) (white paper)



**Reported vs. real GHG savings from the Clean Fuel Standard in 2030**  
(Canada lags the United States in climate accounting of biofuels)

# GREEN FREIGHT

The ICCT aims to improve the real-world environmental performance of freight systems by focusing on technology and its impacts on supply chain operations, with an eye toward integrating policies to promote green freight programs.

Green freight programs assist regulators in developing policies to minimize emissions from freight movement, and support industry initiatives to optimize energy efficiency and reduce emissions from their logistics supply chains. Researchers at the ICCT helped to coordinate the Global Green Freight Action Plan, which aims to develop and align green freight programs worldwide while incorporating the reduction of short-lived climate pollutants, such as black carbon. Over 50 organizations and countries have pledged their support for the Action Plan, thus providing a platform for global and regional cooperation. In China, the ICCT supports port cities in developing alternative and clean freight movement strategies to help regions meet their air quality targets.

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## GREEN FREIGHT WORKSHOP

On October 3<sup>rd</sup>, the ICCT convened an International Green Freight Workshop in San Diego, California to examine how to expand and harmonize programs worldwide. The event was a cumulation of input gathered in four regional green freight workshops held in Africa, Asia, Europe, and Latin America. The event surveyed existing programs by leading companies, examined what steps are needed to scale up efforts, and explored new opportunities for industry and government to work together to align government policies and programs and industry action. A follow-up symposium is planned to leverage the momentum built by this workshop.



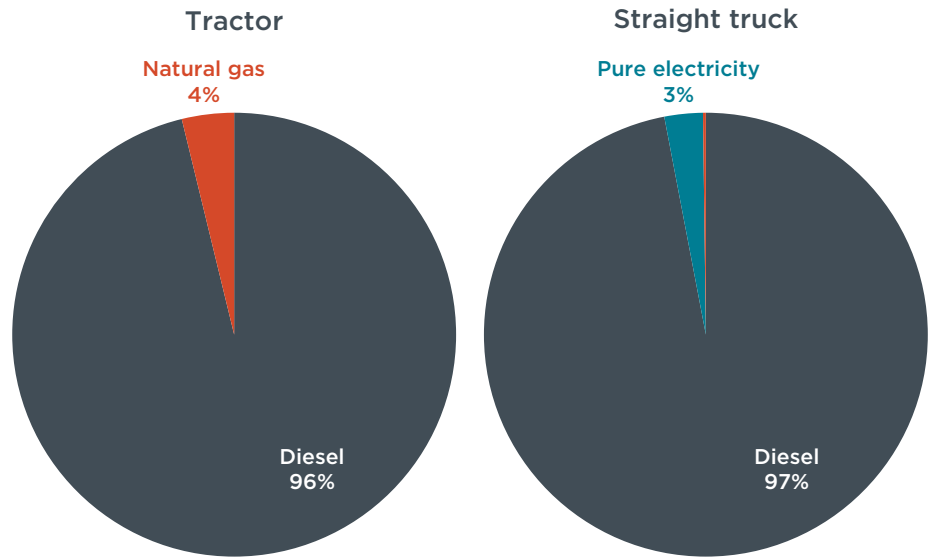
**Participants in the October 2018 International Green Freight Workshop**  
([International Green Freight Workshop](#))

**PUBLICATIONS OF NOTE:**

[China Green Freight Assessment: Enabling a cleaner and more efficient freight system in China](#) (briefing)

[Beyond road vehicles: Survey of zero-emission technology options across the transport sector](#) (working paper)

[Costs of emission reduction technologies for diesel engines used in non-road vehicles and equipment](#) (working paper)



**Fuel shares by vehicle segment in China, 2016**

([China Green Freight Assessment: Enabling a cleaner and more efficient freight system in China](#))

# HEAVY-DUTY VEHICLES

The ICCT contributes practical expertise and works to identify effective, technologically ambitious measures to reduce climate impacts and local air pollution from heavy-duty vehicles, which contribute an increasing share of total carbon emissions from transportation.

## **PUBLICATIONS OF NOTE:**

[EU HDVs: Cost effectiveness of fuel efficiency technologies for long-haul tractor-trailers in the 2025-2030 timeframe](#)

(white paper)

[Recommendations for the proposed heavy-duty vehicle CO<sub>2</sub> standards in the European Union](#) (position brief)

[Cost-benefit assessment of the China VI emission standard for new heavy-duty vehicles](#)

(working paper)

[Compliance pathways in the U.S. Phase 2 heavy-duty vehicle efficiency regulation](#)

(working paper)

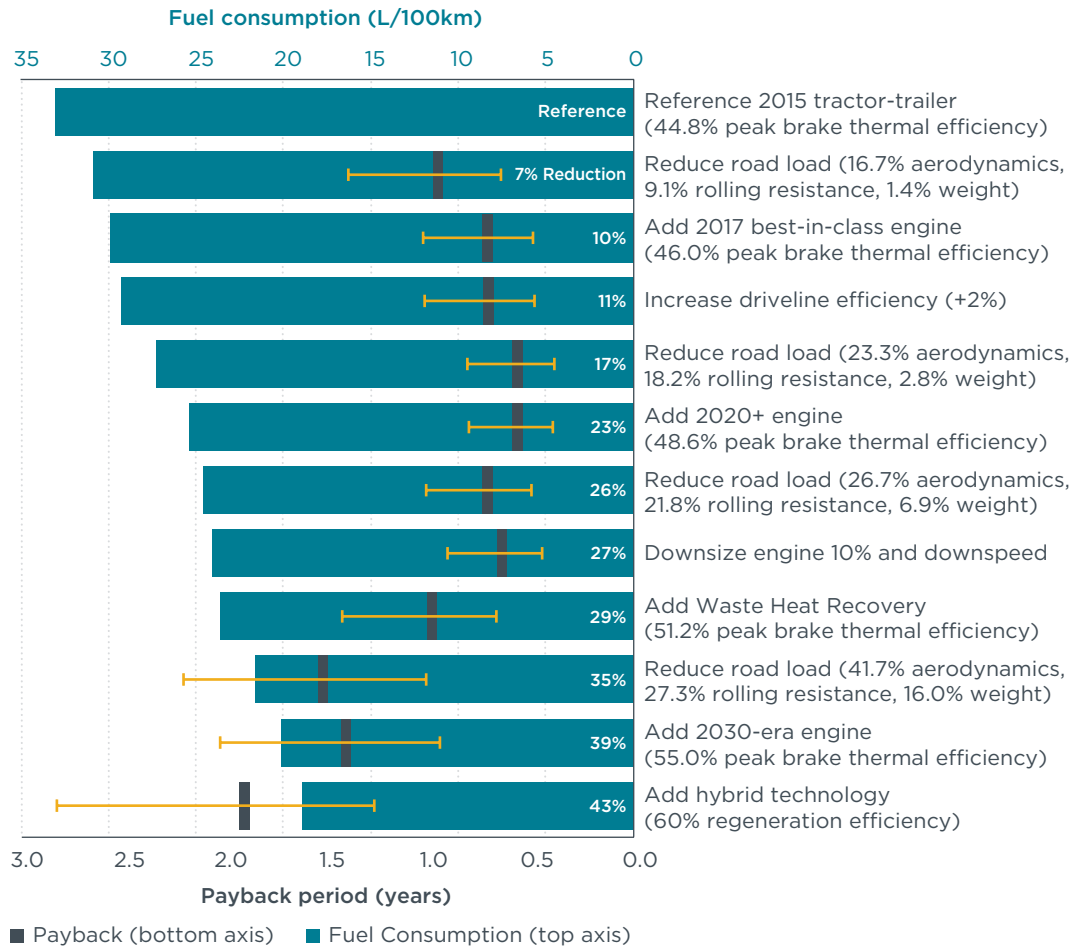
The ICCT has been at the forefront of research into how emissions and fuel consumption standards are an important tool for reducing emissions in the transport sector and how fuel efficiency technologies can be cost-effectively implemented in heavy-duty fleets. Nations around the globe have made significant headway on the implementation of standards for heavy-duty vehicles. In 2018, Brazil joined the United States, Canada, Europe, Japan, India, South Korea, Turkey, Mexico, and China in employing standards that significantly reduce emissions from heavy-duty vehicles. Also in 2018, the European Commission released a regulatory proposal for setting the first ever CO<sub>2</sub> emission standards for new heavy-duty vehicles sold in the European Union. Researchers with the ICCT offered specific policy recommendations aimed at improving the environmental outcomes of the standards.

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## **ON THE WAY TO ZERO-EMISSION HEAVY-DUTY TRANSPORT IN EUROPE: TECHNOLOGICAL OPPORTUNITIES AND THE NEED FOR ACTION**

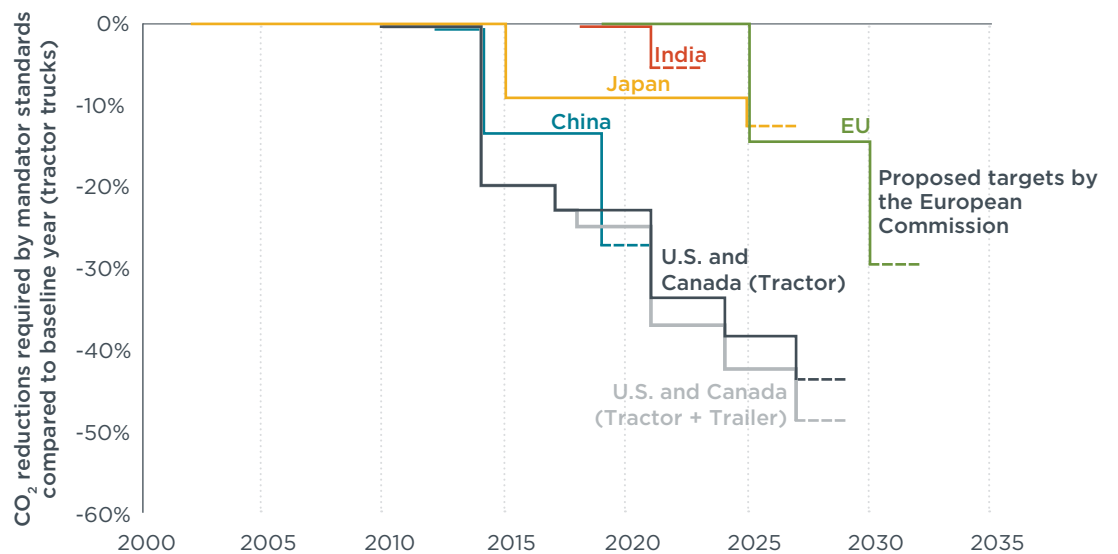
In December, the ICCT and the Oeko-Institut hosted an event in Brussels, Belgium on zero-emission heavy-duty transport. The event featured expert technical analysis of zero-emission technologies and explored how national efforts can be scaled to a European level, helping to achieve climate change, air quality, and clean energy goals.





**Cumulative fuel-consumption impacts and associated 2030 payback periods for tractor-trailer efficiency technologies**

(EU HDVs: Cost effectiveness of fuel efficiency technologies for long-haul tractor-trailers in the 2025-2030 timeframe)



**Tractor-truck standards around the world relative to the baseline in the first phase of the standards**

(The European Commission's proposed CO<sub>2</sub> standards for heavy-duty vehicles)

# MARINE

The ICCT's research has informed policies that address the climate impacts of shipping, including the development of emission control areas, Energy Efficiency Design Index targets for new vessels, and controls for black carbon emissions.

In April, the International Maritime Organization (IMO) adopted a resolution codifying an initial GHG strategy for international shipping. This strategy requires that GHG emissions be cut in half by 2050 and that international shipping be completely decarbonized by the end of the century. To assist with the application of the strategy, ICCT researchers identified short- and mid-term measures that can be enacted by fleets to help achieve the IMO target, including slowing ships down and improving the efficiency of new ships. Additional ICCT work on the impact of marine emissions in 2018 included studies on NO<sub>x</sub> emissions and the establishment of coastal emission control areas in China.

In October, the IMO agreed develop a ban on heavy fuel oil (HFO) in Arctic waters, taking into account the benefits and costs to industry and Arctic communities. ICCT researchers provided most of the technical information underpinning the HFO ban, including the number and types of ships using HFO in the Arctic, and where they operate.

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## 5TH ANNUAL WORKSHOP ON MARINE BLACK CARBON EMISSIONS

In September, the ICCT convened the 5<sup>th</sup> annual workshop on marine black carbon emissions. Workshop participants identified more than a dozen appropriate technological solutions and operational practices to reduce black carbon from ships. Measures identified included the use of liquefied natural gas or distillate fuels, the deployment of diesel particulate filters, and zero-emission technologies such as batteries and fuel cells. The resulting report was submitted to the IMO.

### PUBLICATIONS OF NOTE:

[NO<sub>x</sub> emissions from merchant vessels in coastal China: 2015 and 2030](#) (working paper)

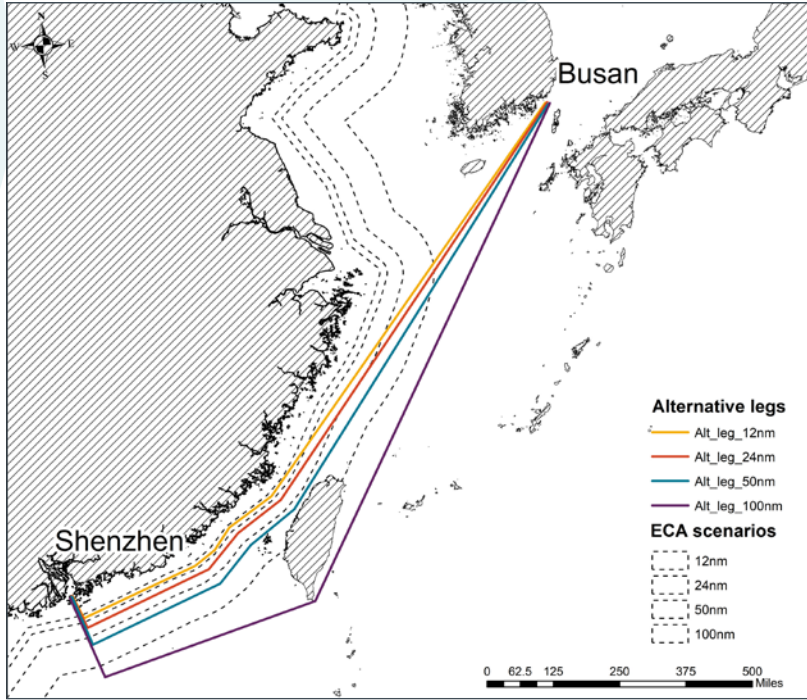
[Relating short-term measures to IMO's minimum 2050 emissions reduction target](#) (working paper)

[Delineating a Chinese emission control area: The potential impact of ship rerouting on emissions](#) (white paper)

[The International Maritime Organization's initial greenhouse gas strategy](#) (policy update)

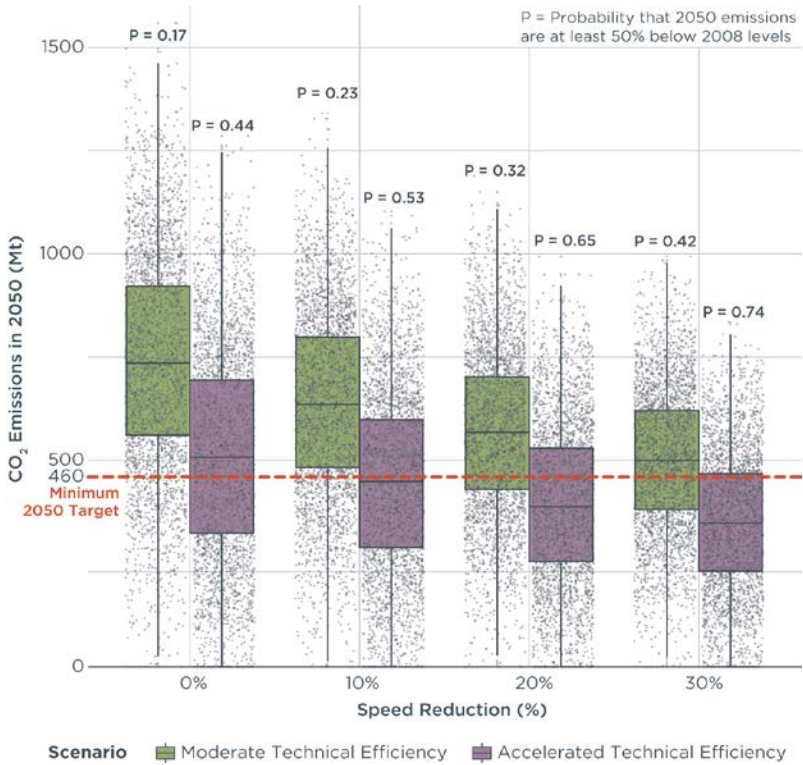


Participants in the 5th annual workshop on marine black carbon emissions in San Francisco, CA  
[\(5th annual workshop on marine black carbon emissions\)](#)



**Emission control area scenarios and alternative legs between Shenzhen, China, and Busan, Korea**

[\(Delineating a Chinese emission control area: The potential impact of ship rerouting on emissions\)](#)



**2050 International shipping CO<sub>2</sub> emissions and associated probability (P) of meeting IMO's minimum 2050 emissions target by improving technical efficiency and implementing speed reduction.**

[\(Relating short-term measures to IMO's minimum 2050 emissions reduction target\)](#)

# PASSENGER VEHICLES

The ICCT works with governments, researchers, nongovernmental organizations, and private-sector stakeholders to reduce fuel consumption, greenhouse gas emissions, and air pollution from the global light-duty vehicle fleet.

Passenger vehicles produce about half of all transportation-related GHG emissions. In 2018, the ICCT worked internationally to help inform policymakers of technology trends and best practices of emission, fuel efficiency, and GHG standards for PVs. Researchers assessed the consequences of rolling back the 2025 Corporate Average Fuel Economy (CAFE) standards in both the United States and Canada, evaluated the role of off-cycle credits in the United States and European Union, and assessed the impact of vehicle taxation and CO<sub>2</sub> standards on reducing CO<sub>2</sub> emissions from new passenger cars in the European Union.

Researchers also performed a benefits assessment of adopting fuel economy and CO<sub>2</sub> emission standards in South Africa and evaluated efficiency technology trends and real-world fuel consumption of light-duty vehicles in China.

## SUPPORT FOR GLOBAL FUEL ECONOMY INITIATIVE ACTIVITIES

Researchers from the ICCT are assisting international regulators and stakeholders with improving fleet efficiency. In early January, an ICCT representative participated in an event in Lima, Peru on financial incentives to promote cleaner vehicles in the country. The ICCT staff member lead a technical training session on the feebate tool, co-developed by the ICCT, which simulates the impact of customized feebate systems on fleet average fuel economy, total CO<sub>2</sub> emissions, and budget stream. Also in 2018, an ICCT representative delivered a multi-day training session on vehicular fuel efficiency technologies and regulations for the Gulf Cooperation Council.

### PUBLICATIONS OF NOTE:

[Using vehicle taxation policy to lower transport emissions: An overview for passenger cars in Europe](#) (report)

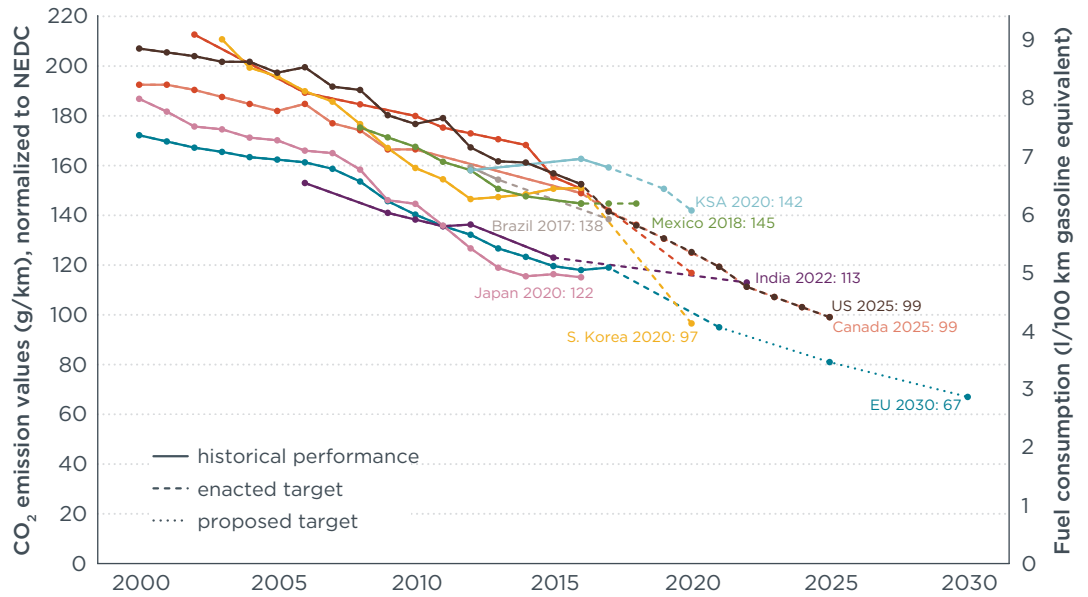
[Fuel-efficiency technology trend assessment for LDVs in China](#) (working paper series)

[Evaluation of real-world fuel consumption of light-duty vehicles in China](#) (white paper)

[New vehicle fuel economy and CO<sub>2</sub> emission standards emissions evaluation guide](#) (consulting report)



ICCT's Zifei Yang with participants at the fuel economy feebate system workshop in Lima, Peru

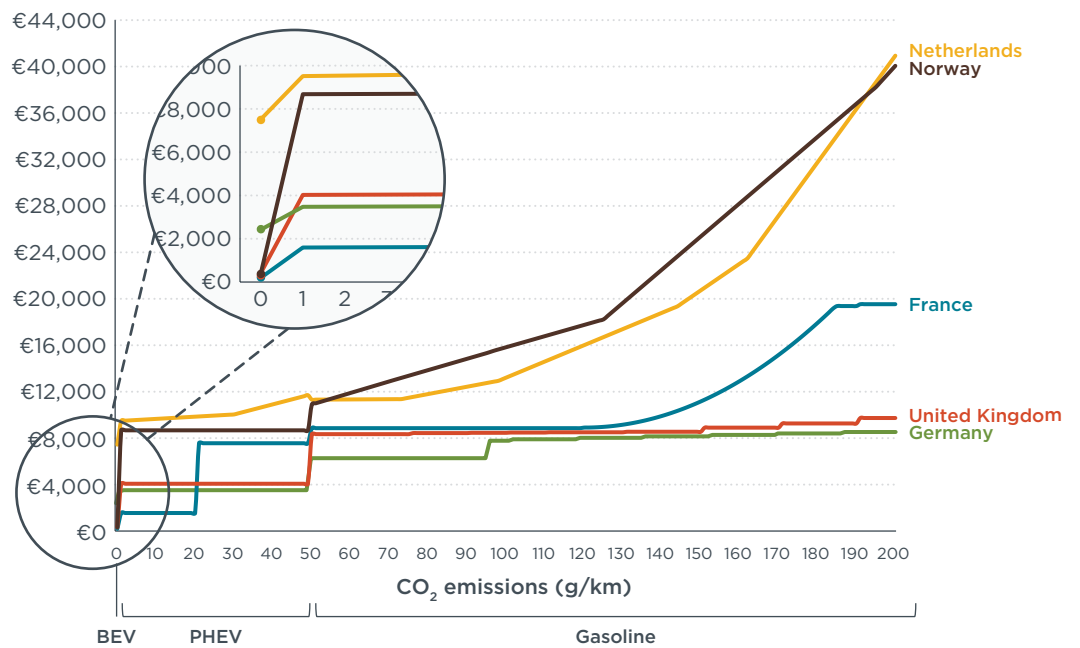


**Comparison of global CO<sub>2</sub> regulations for new passenger cars**

(CO<sub>2</sub> emissions from new passenger cars in the EU: Car manufacturers' performance in 2017)

**Privately owned car**

Tax costs minus bonus payments over a four-year holding period (€)



**Comparison of tax liability for a privately-owned car depending on CO<sub>2</sub> emissions**

(Using vehicle taxation policy to lower transport emissions: An overview for passenger cars in Europe)

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