ANNUAL REPORT **2020**

icct

THE INTERNATIONAL COUNCIL
ON CLEAN TRANSPORTATION

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TABLE OF CONTENTS

About us 1

Impact in 2020 2

ICCT highlights by region 3

North America 4

Latin America 8

Europe 12

China 16

India 20

Asia 24

Global 28

Supporters 32

ABOUT US

The ICCT was established in 2001 as an independent source of technical and policy expertise on clean transportation with the core mission of improving the environmental performance and energy efficiency of road, marine, and air transportation, in order to benefit public health and mitigate climate change. In the last five years we have worked successfully with regulators and lawmakers around the world, playing a constructive role in shaping 48 distinct regulations and policies, which are together projected to result in billions of tons of carbon dioxide reductions and prevent thousands of premature deaths over the next decade and beyond.

Today, the ICCT has an annual operating budget of $13 million, a staff of more than 60, and offices in Washington, San Francisco, Berlin, and Beijing, with new offices planned in Brazil and India. Our core work focuses on the key transportation segments—passenger vehicles, heavy-duty vehicles, marine, and aviation—as well as the fuels that power them. Our geographic focus is on the major automotive markets—China, US/Canada/Mexico, Europe, India, and Brazil—as well as other growing markets in the Middle East, Latin America, Southeast Asia, and Africa. In addition, we work at the sub-national level with major provinces, states, and cities. More information can be found on our website at www.theicct.org.

MISSION

The International Council on Clean Transportation is an independent nonprofit organization founded to provide first-rate, unbiased research and technical and scientific analysis to environmental regulators. 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.

IMPACT IN 2020

Presence in **7** countries

181 research papers and blog posts published

8 webinars organized

28 videos produced

1,014,000 website page views

17% growth in Twitter followers

34% growth in LinkedIn followers

71% growth in WeChat followers

3,100 newsletter subscribers

Mentioned in **741** press articles across 46 countries

96 staff members

ICCT HIGHLIGHTS BY REGION

NORTH AMERICA

In 2020, the United States government released the final rule rolling back the 2021–2026 U.S. light-duty vehicle efficiency standards. Researchers at the ICCT identified faulty assumptions in the regulatory analysis for the standards, including inflated technology costs, diminished associated benefits, and modeling errors. In related research, ICCT developed a database of real-world driving emissions from vehicles in the United States. The database includes nearly 60 million emission records and is intended to support further research and the development of evidence-based emissions control policies in the United States. Preliminary analysis included a review of emission trends compared to implementation of different phases of emission standards and an assessment of the role of older vehicles in total emission. The database will be expanded to include emissions measurement from additional geographic areas.

ICCT researchers also provided research to hasten the transition to electric vehicles. An update on electric vehicle adoption in U.S. cities revealed that although the electric share of new vehicle sales in the United States overall remained at 2%, the share increased in many local markets as local and state promotion actions ramp up. Researchers also undertook assessments of the charging infrastructure required to support the transition to electric vehicles, including a city-specific assessment for San Francisco. On the heavy-duty vehicle front, ICCT released a survey of the zero-emission heavy-duty vehicle market, which showed that manufacturers are well-positioned to transition away from combustion engines.

The cost of diesel emissions-control technology to meet California low NO_x standards in 2024 and 2027

In 2020, the California Air Resources Board was developing new regulations to address disparities in real-world and certified NO_x emissions from heavy-duty diesel engines. Researchers at the ICCT estimated the cost of the technology required to meet CARB's envisioned regulatory changes in 2024 and 2027. They found that meeting the envisioned CARB 2024 targets would require very modest increases in technology complexity and costs, ranging from $100 to $1,100. However, meeting the envisioned 2027 targets would require significant changes in current technology and costs, driven by 90% lower federal test protocol

(FTP) NO_x targets, requirements for low-load driving cycles typical of urban driving, and longer useful life mandates. Cost estimates for meeting the targets ranged from an additional $1,800 to $3,200, depending on the truck class, compared with systems meeting the 2010 EPA standards.

Tables: Incremental total cost of the proposed 2024 and 2027 CARB standards as compared with EPA 2010 standards in 2024.

Regulatory step	HDV class 6–7 7.0 L engine	HDV class 8 13.0 L engine
Baseline technology costs EPA 2010 in 2024	$2,570	$3,997
Total costs to meet CARB 2024	$2,675 – $3,575	$4,102 – $5,090
Incremental costs to meet CARB 2024	**$105 – $1,005**	**$105 – $1,093**

Regulatory step	HDV class 6-7 7.0 L engine		HDV class 8 13.0 L engine	
Baseline technology costs EPA 2010 in 2027	$2,431		$3,769	
Total costs to meet CARB 2027	Low-cost durability case	High-cost durability case	Low-cost durability case	High-cost durability case
	$4,214–$4,288	$4,925–$4,996	$5,919–$6,031	$6,864–$6,988
Incremental costs EPA 2010 to CARB 2027	**$1,803–$1,877**	**$2,514–$2,585**	**$2,170–$2,282**	**$3,115–$3,239**

(Source: *Estimated cost of diesel emissions-control technology to meet the future California low NO_x standards in 2024 and 2027*, https://theicct.org/publications/cost-emissions-control-ca-standards)

While important for the companies involved, Ben Sharpe, a senior researcher and Canada regional lead with the Washington, D.C.-based International Council on Clean Transportation (ICCT), says the deal is also a "really important development" for Canada's domestic EV manufacturing ambitions. "The fact that Lion, a Quebec-based manufacturer, is providing the electric buses shows that Canada can play a vital role in electric vehicle production in North America and globally," says Sharpe.

"Transdev-Lion deal for 27 electric school buses shows why Quebec is winning in the EV economy," *Electric Autonomy*, https://electricautonomy.ca/2020/06/25/transdev-lion-electric-school-bus-deal/

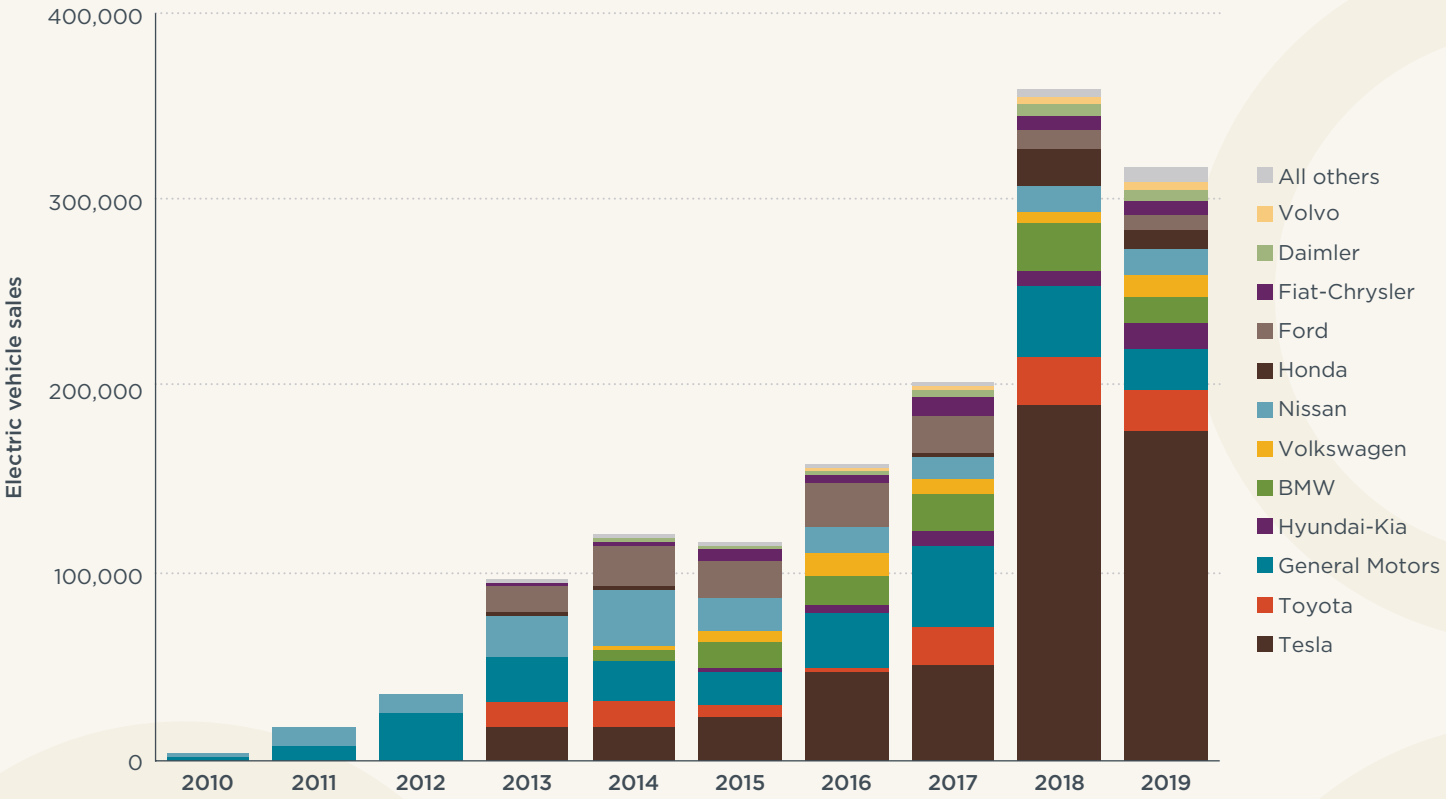

Figure: Automaker electric vehicle sales in the United States through 2019.
(Source: *Update on electric vehicle adoption across U.S. cities*, https://theicct.org/publications/ev-update-us-cities-aug2020)

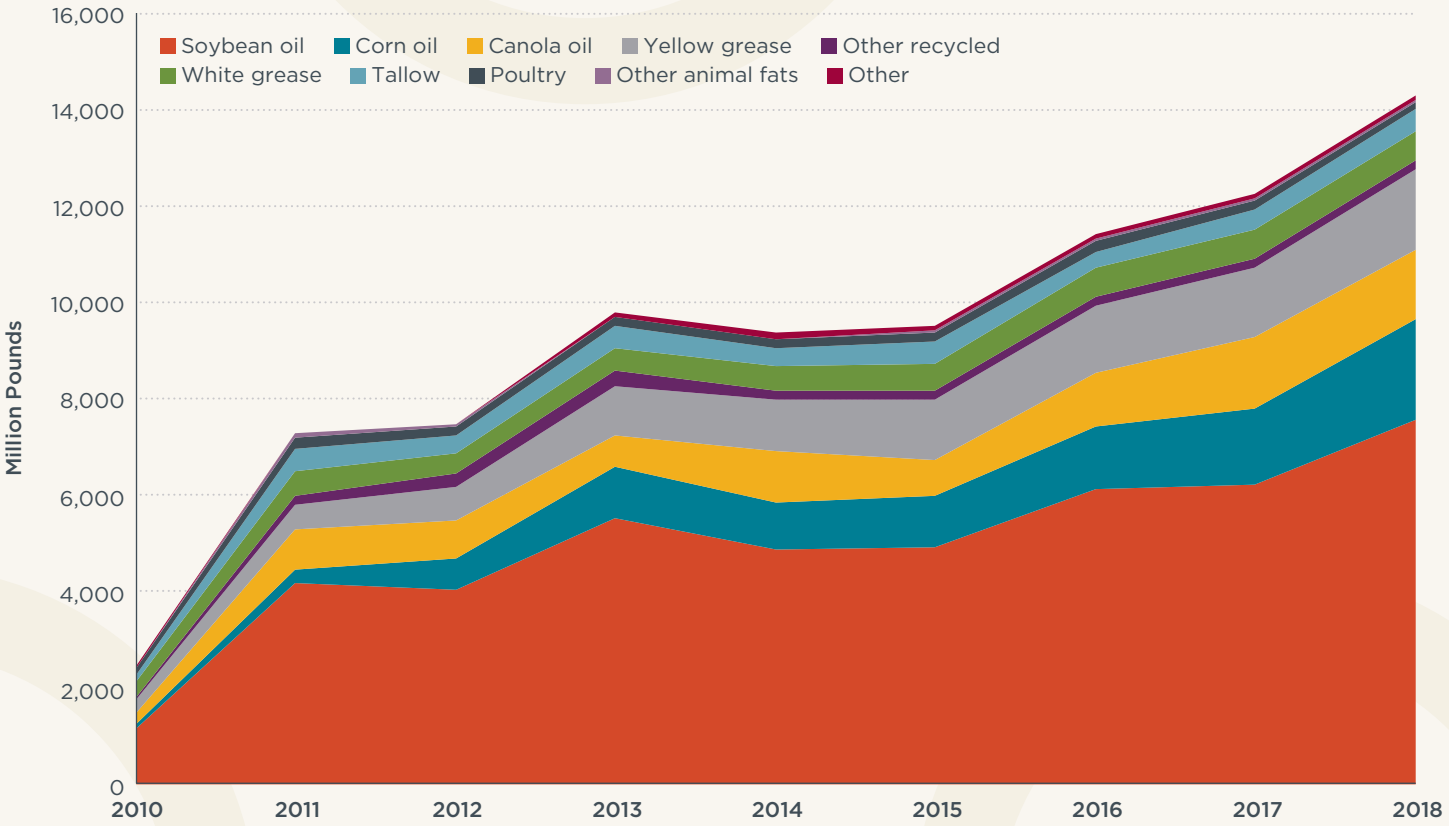

Figure: Feedstock inputs to biodiesel production in the United States.
(Source: *Potential biomass-based diesel production in the United States by 2032*,
https://theicct.org/publications/potential-biomass-based-diesel-production-united-states-2032)

PUBLICATIONS OF NOTE

Development and application of a United States real-world vehicle emissions database (report)
https://theicct.org/publications/true-us-database-development-oct2020

In-use NO_x emissions and compliance evaluation for modern heavy-duty vehicles in Europe and the United States (white paper) https://theicct.org/publications/inuse-nox-hdvs-us-eu

Update on electric vehicle adoption across U.S. cities (briefing)
https://theicct.org/publications/ev-update-us-cities-aug2020

Potential biomass-based diesel production in the United States by 2032 (working paper)
https://theicct.org/publications/potential-biomass-based-diesel-production-united-states-2032

LATIN AMERICA

ICCT's presence in Latin America expanded in 2020 with the opening of a new office in São Paulo and the hiring of three full-time consultants in Mexico City and Bogotá. Our work focused on preventing COVID-driven backsliding on clean transportation as manufacturers in the region lobbied for delays in implementing vehicle emissions standards. ICCT used its analytical and publishing power to make the case that manufacturers are better off in the long run committing to clean transportation than not doing so.

Public transit is affordable, accessible, and popular in Latin America, but bus fleets are typically powered by high-polluting diesel engines that produce outsize shares of climate pollutants. In 2020, ICCT focused on changing the face of public transit through the Zero Emission Bus Rapid-deployment Accelerator (ZEBRA) partnership, which aims to ensure that all future buses in Latin America are zero-emission. By December, the partnership announced that a coalition of 17 investors and bus manufacturers were committing to initiatives that would bring 3,000 electric buses to the streets of Latin America—essentially a down payment on creating a fleet of clean public transport across the continent.

Cost-benefit analysis of Euro VI heavy-duty emission standards in Argentina

Although heavy-duty vehicles (HDVs) are just 3%–4% of Argentina's on-road vehicles, not including motorcycles, they contribute an estimated 60% of the country's fleet emissions of exhaust fine particulate matter (PM2.5) and 70% of its nitrogen oxide (NOx) emissions. Researchers at the ICCT used data specific to Argentina's heavy-duty fleet to compare the benefits of implementing Euro VI standards with the costs of compliance. Results show that over the next 30 years each $1 invested in soot-free standards will produce $3.60 in health benefits from reduced ambient PM2.5 alone. However, delaying the standards to 2025 would diminish the net benefits over the next 15 years by 33% compared with implementation in 2023 and by 51% compared with implementation in 2021.

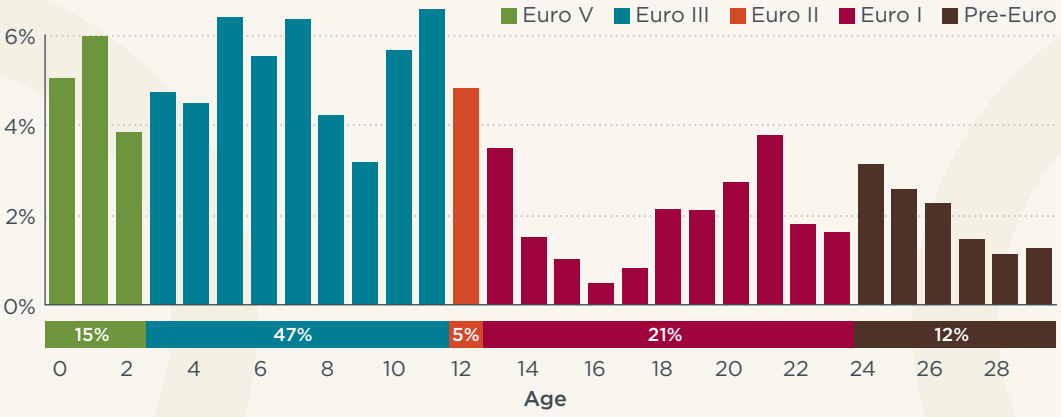

Figure: Share of HDVs by age and equivalent Euro standard in Argentina, 2018. (Source: Cost-benefit analysis of Euro VI heavy-duty emission standards in Argentina, https://theicct.org/publications/cost-benefit-analysis-euro-vi-hdv-argentina)

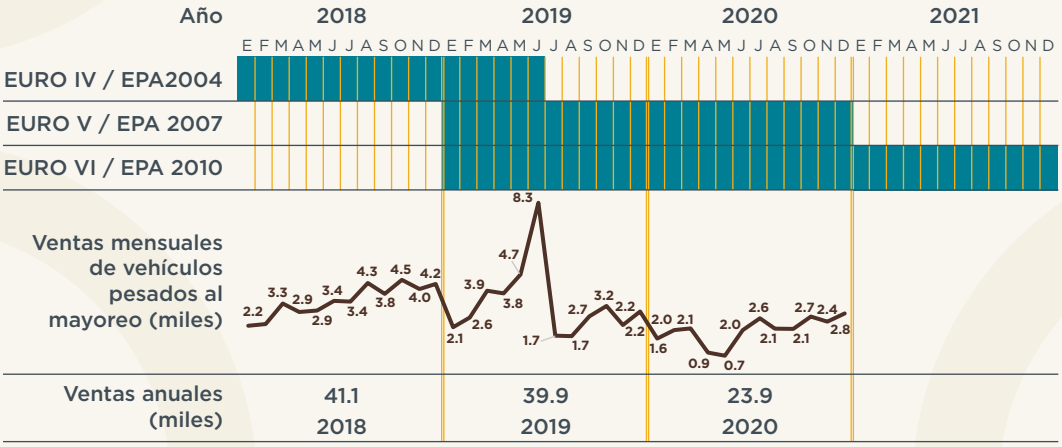

Figure: Cronograma de aplicación de estándares de la NOM 044 (versión feb. 2018); ventas mensuales al mayoreo de vehículos pesados en el mercado interno de México. (Source: Retraso de la NOM 044 a costa de la salud, https://theicct.org/blog/staff/retraso-de-nom-044-mar2021)

"Kate Blumberg, director for Latin America at ICCT, pointed out that there is a real supply of vehicles to electrify fleets and also profitability that favors companies that are now betting on this type of energy to reduce polluting emissions. Lacking, she said, is a comprehensive vision among governments to promote the transition and in Mexico we are 20 years behind California and other parts of the United States."

Aurora Serrano, "The long-term vision is for electric vehicles," Magazzine del Transporte, January 26, 2021, https://revistamagazzine.com/camiones/la-vision-a-largo-plazo-es-de-vehiculos-electricos/

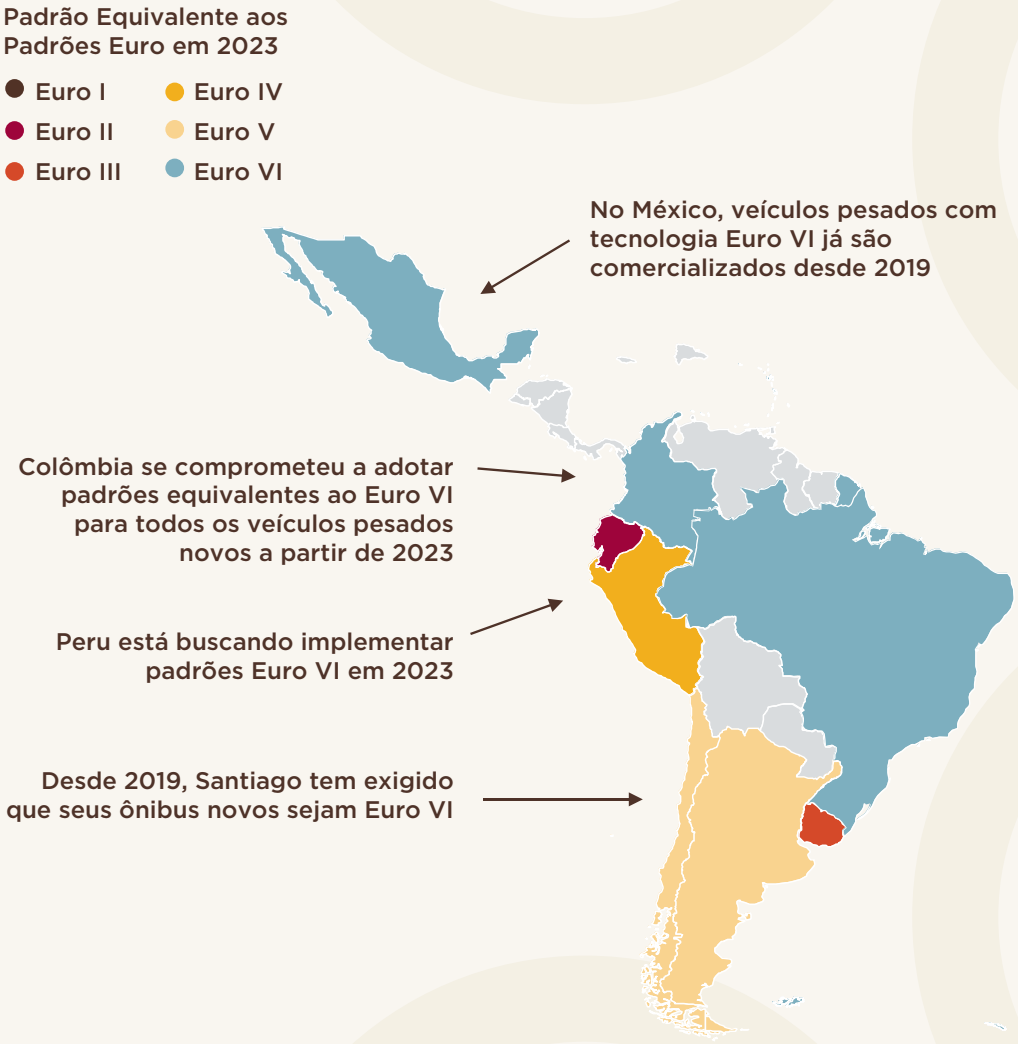

Figure: Euro-equivalent standards implementation in Latin American countries. (Source: A crise da Covid-19 não justifica o adiamento da adoção de limites de emissão mais rigorosos para os veículos no Brasil, https://theicct.org/blog/staff/covid-e-proconve-20200807)

PUBLICATIONS OF NOTE

Brazil PROCONVE L-7 and L-8 emission standards for light-duty vehicles (policy update)
https://theicct.org/publications/brazil-proconve-l-7-and-l-8-emission-standards-light-duty-vehicles

Razones para no retrasar más la implementación de la NOM 044 (position brief)
https://theicct.org/publications/no-retrasar-nom-044-agosto2020

EUROPE

As in other markets around the world, the COVID-19 pandemic had wide-ranging effects on the vehicle market in Europe. In response to the economic downturn caused by measures intended to confine the spread of COVID-19, purchase premiums and vehicle replacement programs were considered in some countries to spur the economic recovery of the automotive industry. Researchers at the ICCT quantified the GHG and pollutant emissions impacts of potential vehicle replacement programs in the largest European vehicle markets. They found that vehicle replacement programs would achieve the largest environmental benefit if they were limited to battery electric vehicles only. In addition, incentivizing an earlier exchange of old cars with battery electric vehicles instead of combustion engine vehicles would reduce 89%-93% of GHG emissions in Austria, France, and Sweden, while 62% of the GHG emissions would be avoided in Germany. Researchers also undertook a related study in which they assessed the impact of the pandemic on the heavy-duty vehicle market in light of the overlap with the CO_2 standards baseline period.

Also in 2020, researchers at the ICCT's Europe office launched an ongoing publication series to provide a monthly snapshot of the European and German conventional and electric vehicle market. The series tracks new car registrations by country and manufacturer, in addition to fleet-average emissions, to allow comparisons over time.

Real-world usage of plug-in hybrid electric vehicles

In September, ICCT researchers in Europe released an assessment of the fuel consumption and tail-pipe CO_2 emissions of plug-in hybrid electric vehicles (PHEVs) during real-world operation. The study found that PHEV fuel consumption and tail-pipe CO_2 emissions in real-world driving, on average, are approximately two to four times higher than type-approval values. However, decreasing combustion engine power while increasing all-electric range and frequency of charging was found to improve real-world fuel consumption and CO_2 emissions of PHEVs. Specifically, real-world fuel consumption and CO2 emission levels decrease by 2%–4% with each 10 kW of system power taken out of a PHEV. At the same time, adding 10 km of all-electric range improves real-world values by 8%–14%.

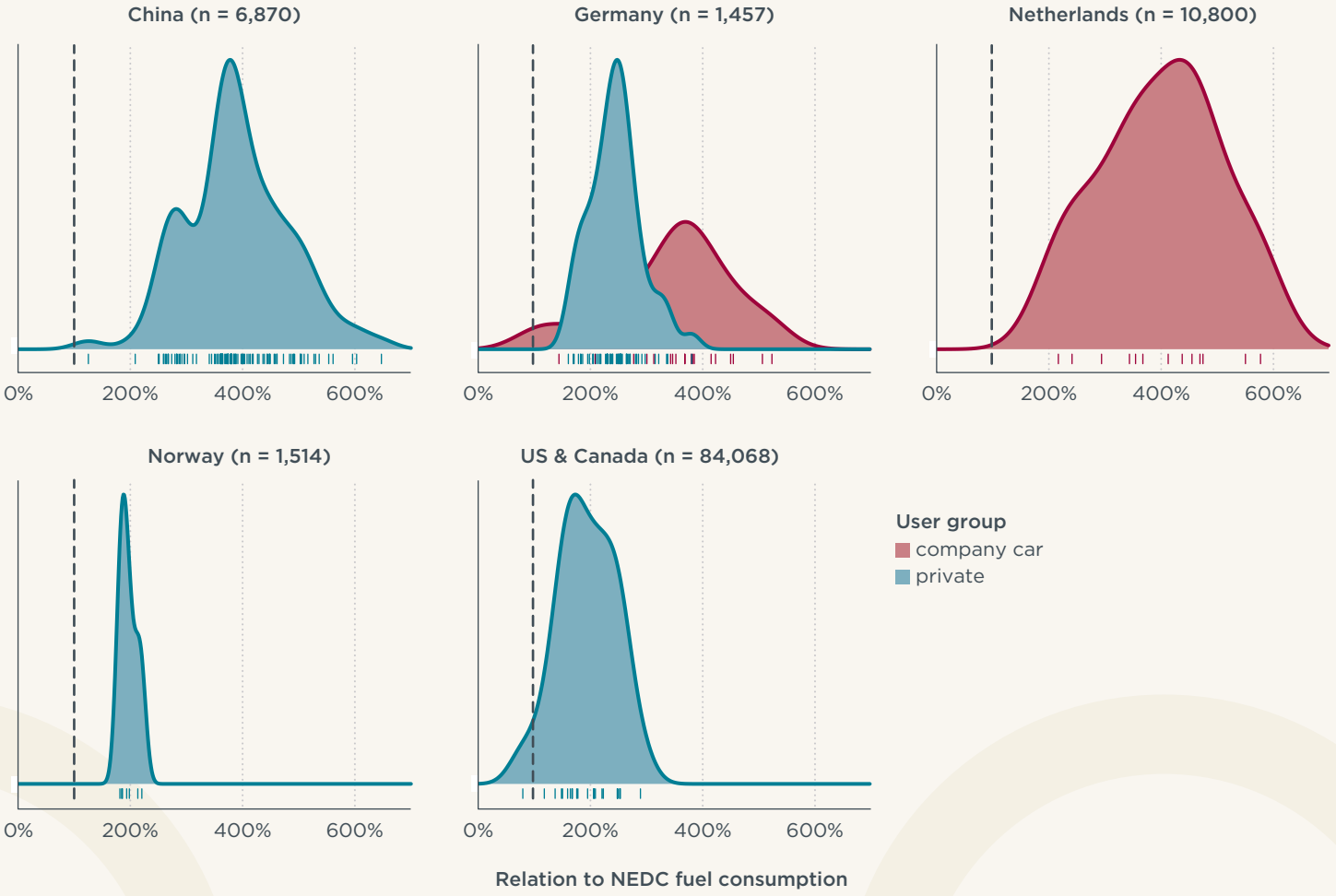

Figure: Distribution of real-world fuel consumption of PHEVs in relation to NEDC test cycle. (Source: *Real-world usage of plug-in hybrid electric vehicles: Fuel consumption, electric driving, and CO_2 emissions*, https://theicct.org/publications/phev-real-world-usage-sept2020)

According to experts, the targets of countries to ban sales of new gas and diesel vehicles won't be effective without accompanying action. "Those targets need to be complemented by whole range of measures at the national and regional level, such as informing consumers about the vehicles on offer or building of the necessary charging infrastructure," said Peter Mock, managing director of the International Council on Clean Transportation in Europe.

"Britain to ban the sale of new gas, diesel and hybrid cars from 2035," *NBC News,* https://www.nbcnews.com/news/world/britain-ban-sale-new-gas-diesel-hybrid-cars-2035-n1129616

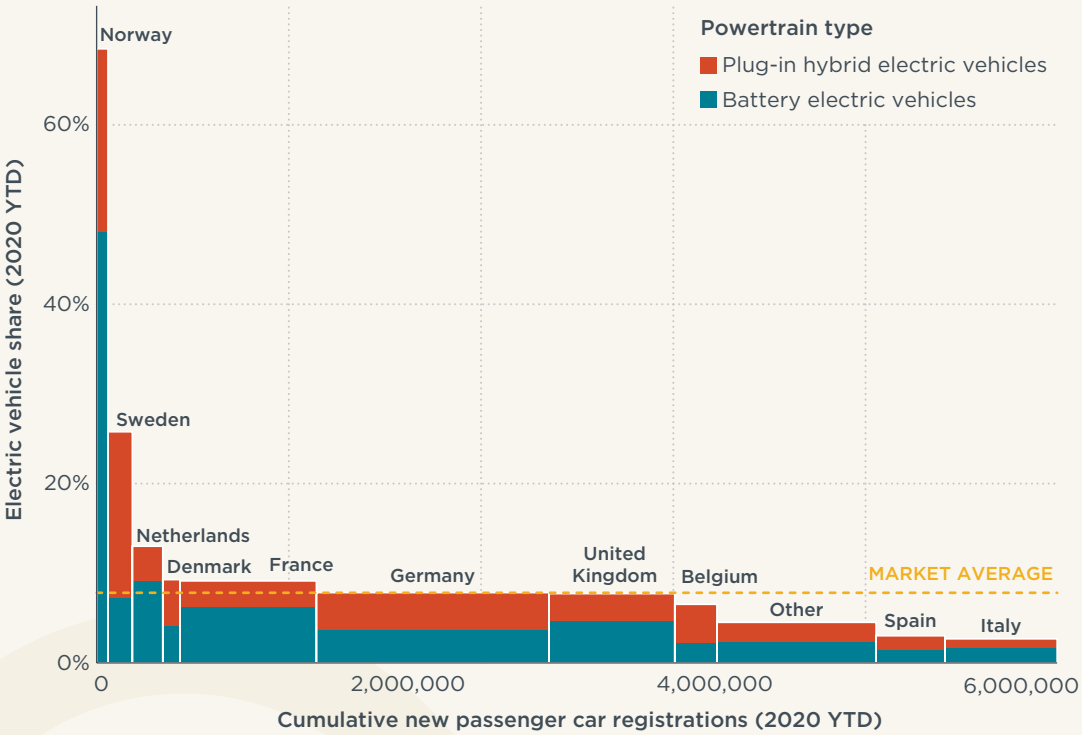

Figure: Share of electric vehicles, by country, including information on market size, January–July 2020. (Source: *Market monitor: European passenger car registrations, January–July 2020*, https://theicct.org/publications/market-monitor-eu-car-registrations-jan-july-2020)

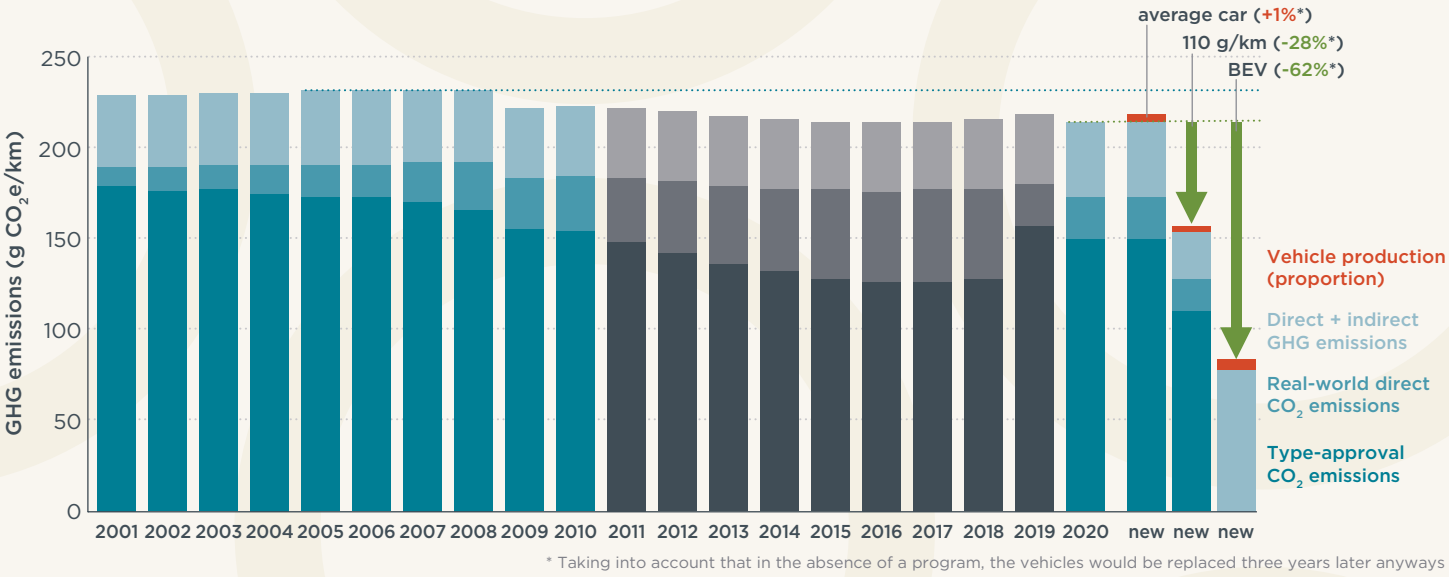

Figure: GHG emission impact of a hypothetical 2020 vehicle replacement program in Germany
(Source: *Green vehicle replacement programs as a response to the COVID-19 crisis: Lessons learned from past programs and guidelines for the future*, https://theicct.org/publications/vehicle-replacement-programs-covid-19-may2020)

PUBLICATIONS OF NOTE:

On the way to "real-world" CO_2 values: The European passenger car market in its first year after introducing the WLTP (white paper)
https://theicct.org/publications/way-real-world-co2-values-european-passenger-car-market-its-first-year-after

Electrifying EU city logistics: An analysis of energy demand and charging cost (report)
https://theicct.org/publications/optimizing-charging-logistics-nov2020

Fulfilling electric vehicle charging infrastructure needs in Greater London and its boroughs (working paper)
https://theicct.org/publications/London-ev-charging-nov2020

The EU heavy-duty CO_2 standards: Impact of the COVID-19 crisis and market dynamics on baseline emissions (working paper)
https://theicct.org/publications/eu-heavy-duty-co2-standards-baseline-impact-Dec2020

CHINA

ICCT work in China focused on driving efficiency increases for fossil-powered vehicles as well as analyzing China's promotion of zero-emission vehicles. On the efficiency front, we worked on papers analyzing compliance with existing national standards on fuel quality, and on vehicle emissions maintenance. And we outlined reasons China should not postpone adoption of China 6 standards, which was under consideration. We also reported on China's vision for fuel efficiency increases, and carbon emission decreases, out to 2030.

Most exciting was our documenting of China's seriousness in expanding its fleet of zero-emission vehicles of all kinds. The government spelled out its plans to subsidize electric vehicles over the 2020-2022 period—a strong driver of the electrification of vehicle fleets in the country. Most impressively, Chinese firms were busy making China the world leader in electric buses, which were increasingly adopted domestically as well as abroad.

Environmental impacts of a modal shift to rail in Tangshan

As a strategy to reduce air pollution in the region, the industrial city of Tangshan plans to shift transport of all iron ore imports from the Tangshan port from truck to rail. ICCT researchers evaluated the environmental and energy performance of this strategy by comparing the fuel life-cycle emissions and energy use of various truck and rail technologies. They found that, although the modal shift would eliminate 30,000 truck trips daily, doing so with the current train fleet would reduce local emissions of nitrogen oxides but increase tank-to-wheel emissions of particulate matter (PM). Additionally, upstream emissions are higher than those in the current truck fleet for PM and carbon dioxide on a well-to-wheel basis. These results also show that tighter emission controls on the railway system are required to match the environmental benefits that would be achieved by using China VI trucks.

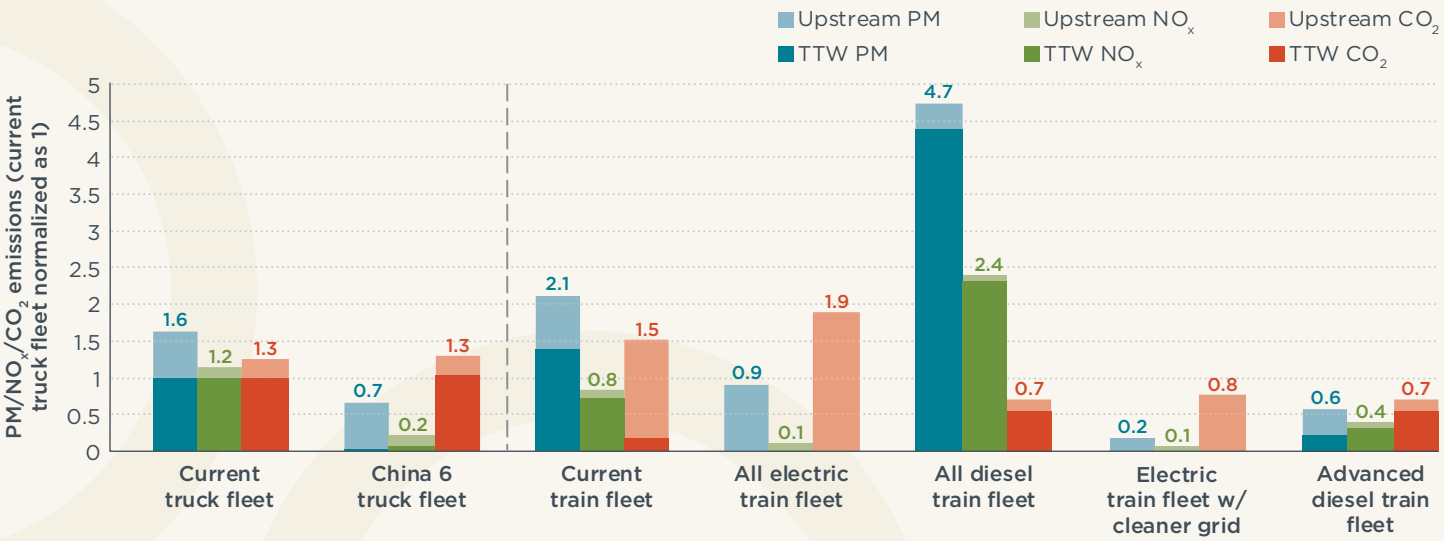

Figure: Well-to-wheel PM, NO_x, and CO_2 emission comparison across scenarios. (Source: *Environmental impacts of modal shift to rail in Tangshan*, https://theicct.org/publications/environmental-impacts-modal-shift-rail-tangshan)

"Through deals with mines and other industry players, China has secured the minerals and key materials for battery production for at least the next five years, said He Hui, senior researcher on China's new energy policy at The International Council on Clean Transportation. She noted that there is relatively more cross-border collaboration among manufacturers in the electric vehicle industry so far, and that the future of the industry going forward will rely more on making batteries cheap enough so that consumers will want to switch over to electric cars.

https://www.cnbc.com/2020/10/23/chinas-electric-car-strategys-implications-for-us-energy-security.html
China considers electric vehicles a pathway towards economic development and global competitiveness for its auto industry. Today, it is the world's largest producer and market for electric vehicles. https://thehill.com/opinion/energy-environment/511367-biden-has-an-ambitious-climate-plan-but-it-needs-to-do-much-more

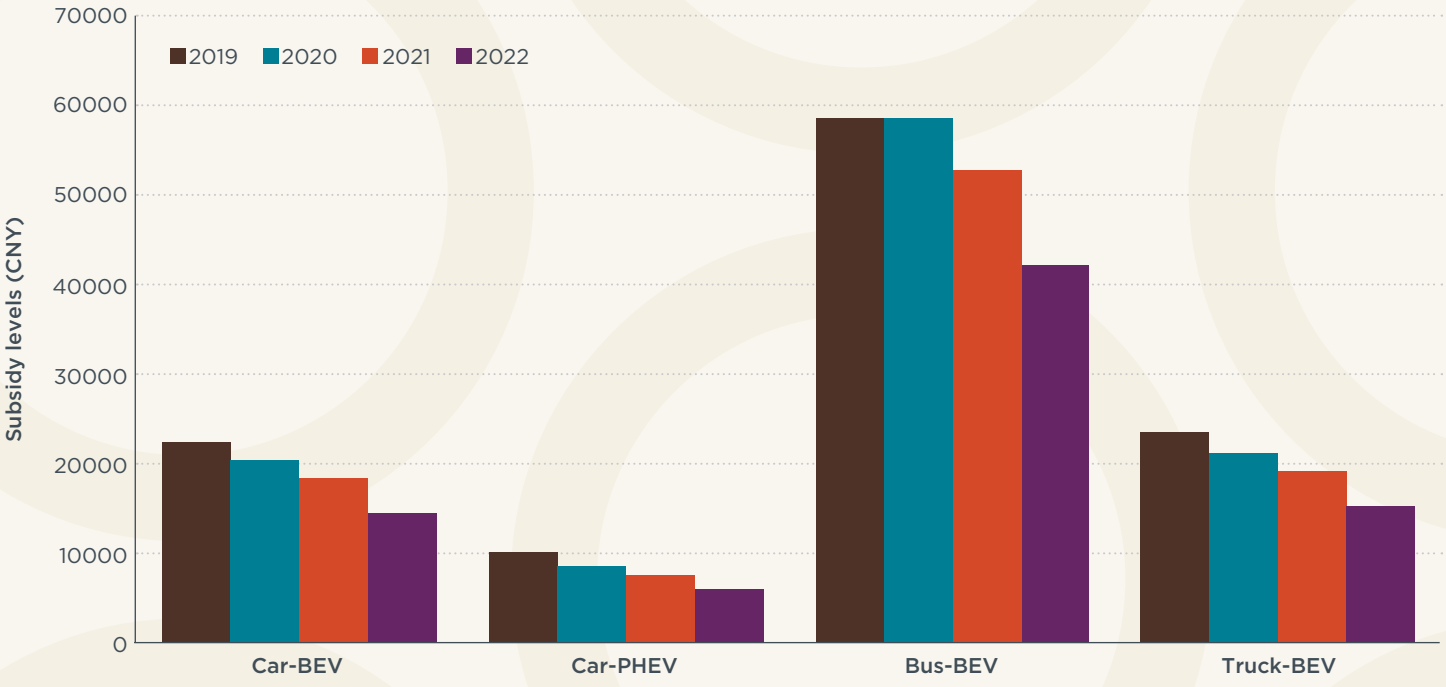

Figure: Comparison of subsidies for typical BEVs and PHEVs in China.
(Source: *China announced 2020–2022 subsidies for new energy vehicles*, https://theicct.org/publications/china-2020-22-subsidies-new-energy-vehicles-jul2020)

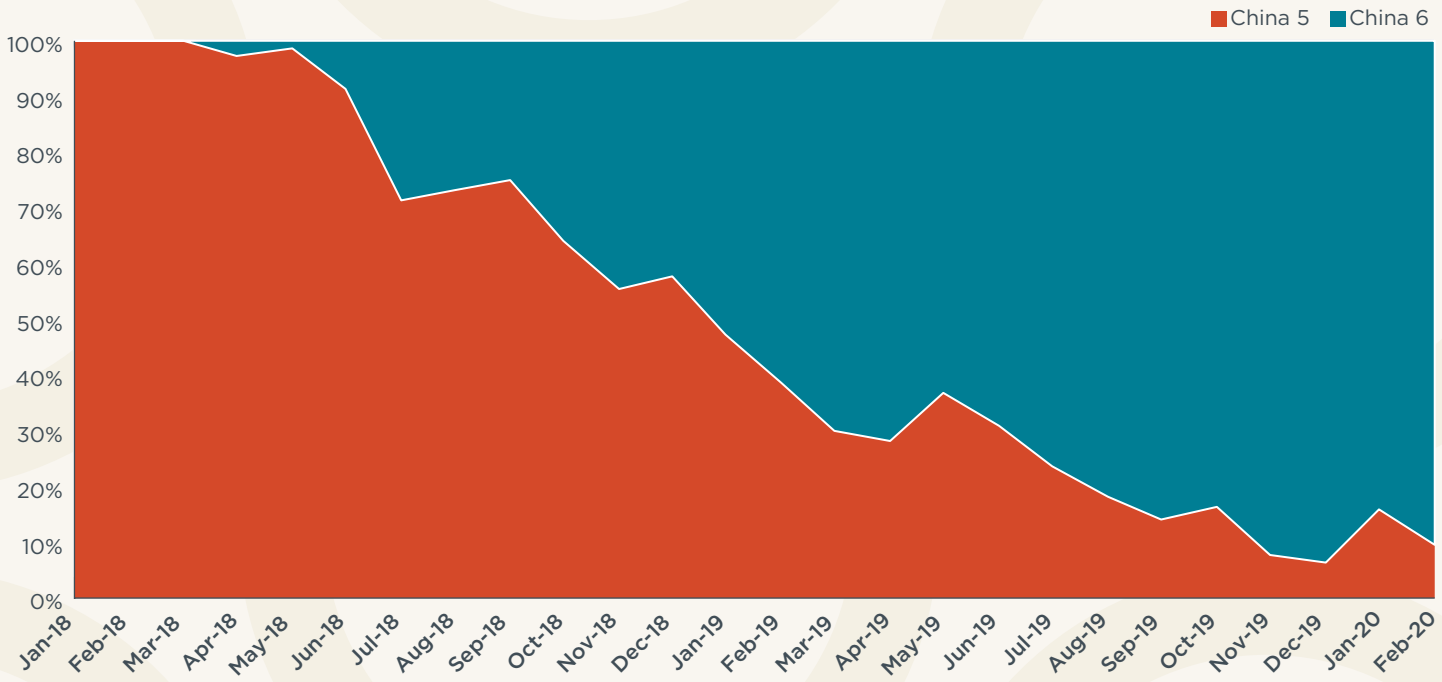

Figure: Share of new passenger car model types by emission standard in China from January 2018 to February 2020. (Source: *Why China should not postpone implementation of the China 6 emission standard for new cars*, https://theicct.org/publications/China6-position-brief-202004)

PUBLICATIONS OF NOTE

Technology roadmap and costs for fuel efficiency increase and CO_2 reduction from Chinese new passenger cars in 2030 (white paper) https://theicct.org/publications/china-costcurves-oct2020

Why China should not postpone implementation of the China 6 emission standard for new cars (position brief) https://theicct.org/publications/China6-position-brief-202004

Motor vehicle diesel fuel quality compliance and enforcement in China: A look at the status quo and international best practices (working paper) https://theicct.org/publications/motor-vehicle-diesel-fuel-quality-china-03.2020

INDIA

Air pollution, particularly in the form of particulate matter, is a serious challenge in India, and transportation is a significant contributor to the nation's air quality problems. Of the Indian vehicle fleet, two-wheelers are by far the largest segment, but they are not currently subject to fuel efficiency standards. To assist in crafting effective fuel economy regulations, ICCT researchers undertook a baseline assessment of the two-wheeler fleet and analyzed the fleet characteristics and fuel consumption. The results showed a wide range of fuel consumption levels for two-wheeler models with similar weight and power, indicating a potential for technology improvements in less-efficient models. In addition, because the top ten best-selling two-wheeler models accounted for 55% of the market, efficiency technology improvements in popular two-wheeler models would produce a noticeable reduction in the fleet average fuel consumption.

Fuel consumption of new passenger cars in India

India's first fuel economy standards for passenger vehicles took effect in fiscal year 2017–18 and are scheduled to become more stringent in FY 2022–23. ICCT researchers evaluated the performance of new vehicles sold in FY 2018–19 against the current and future standards and considered the impact of flexibility mechanisms on manufacturers' compliance. They found that

manufacturers have already made significant progress toward compliance with India's FY 2022–23 standards and will need to reduce CO2 emissions/ fuel consumption by only 9.8% in the next four years, or about 2.55% annually. Given this, policymakers should start to develop significantly more stringent post-FY 2022–23 standards.

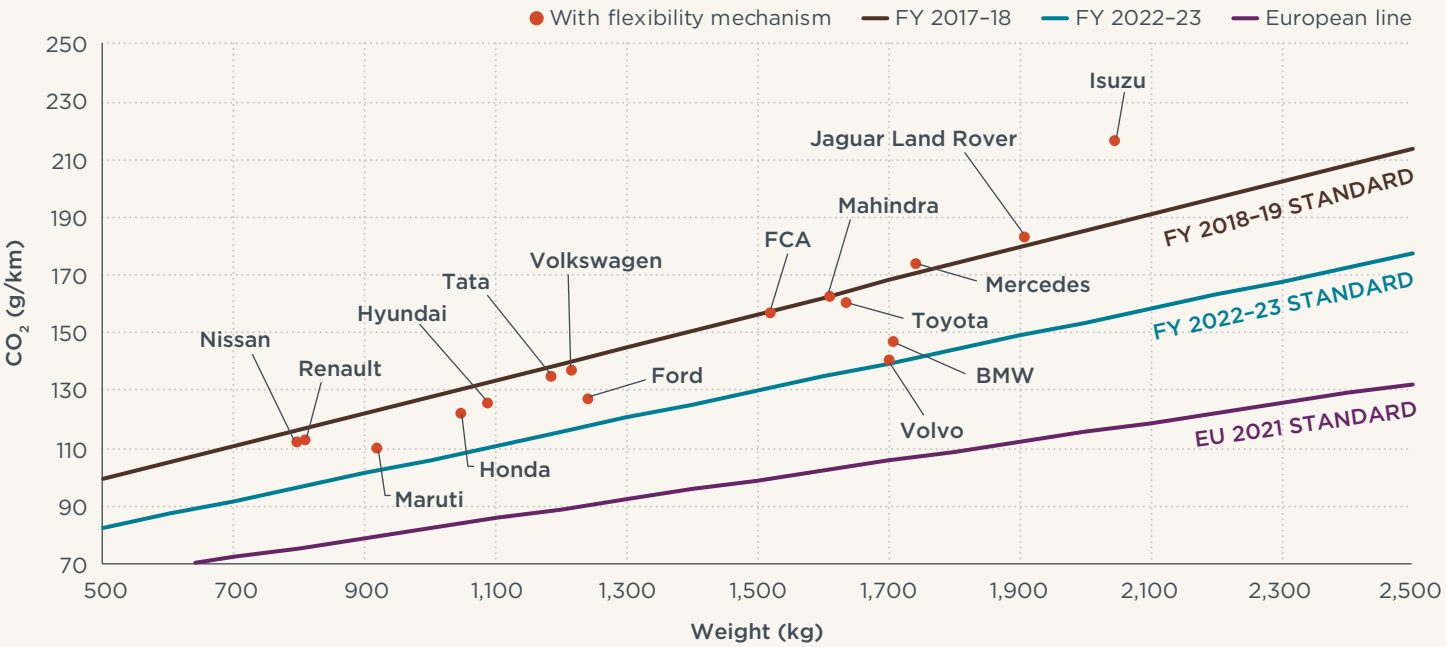

Figure: CO_2 performance of corporate groups of vehicles sold in India in FY 2018–19 with flexibility mechanisms. (Source: *Fuel consumption of new passenger cars in India: Manufacturers' performance in fiscal year 2018–19*, https://theicct.org/publications/fuel-consumption-pv-india-052020)

"The rickshaw, the vehicle of the poor, is where electrification began in India," says Anup Bandivadekar, India lead with the International Council on Clean Transportation in San Francisco. "What's happening in India is unique," he adds, "but at the same time what happens here will tell us the tale of what may happen in other emerging markets in the world." India, he explains, won't try to follow other more advanced, richer economies that are dominated by cars, "but it might show the path to other developing countries."

"Delhi's inventive answer to the electric car," *BBC News*, https://www.bbc.com/future/article/20200304-the-electric-vehicles-cutting-delhis-air-pollution-problem

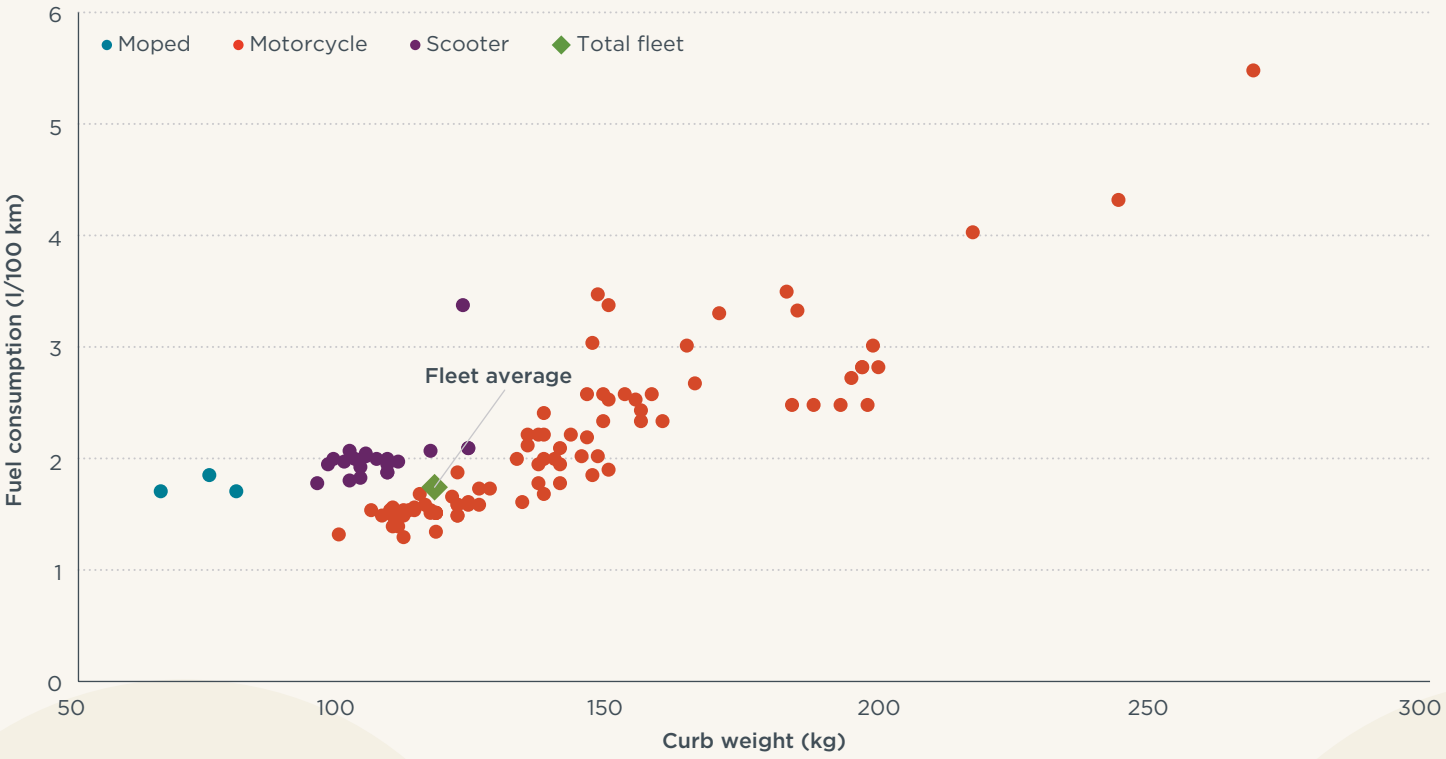

Figure: Average fuel consumption as a function of curb weight of different two-wheeler types sold in FY 2017–18 in India. (Source:

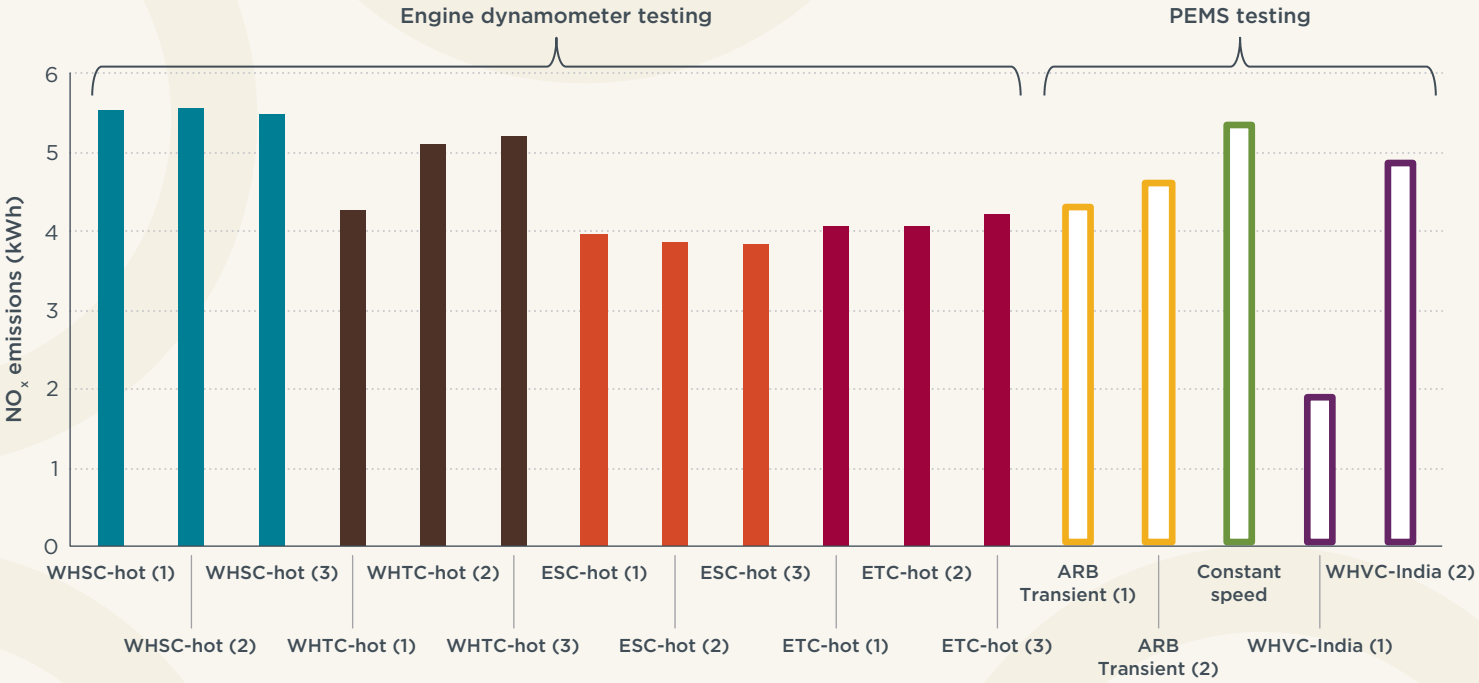

Figure: Engine and chassis dynamometer NO_x emissions of a commercial bus over various testing cycles. (Source: *Testing the pollutant emissions and fuel efficiency of a commercial bus in India*, https://theicct.org/publications/testing-fuel-efficiency-buses-india-jun2020)

PUBLICATIONS OF NOTE

Gasoline and diesel fuel quality survey for India: Part 1 (working paper
https://theicct.org/publications/gasoline-diesel-fuel-quality-survey-india-part-1-jul2020

Testing the pollutant emissions and fuel efficiency of a commercial bus in India (working paper)
https://theicct.org/publications/testing-fuel-efficiency-buses-india-jun2020

New two-wheeler vehicle fleet in India for fiscal year 2017–18 (working paper)
https://theicct.org/publications/new-two-wheeler-fleet-india-2017-18

ASIA

As economic development in many countries in Asia increases, so does the increased use of motorized transport. Vehicles are a major contributor to poor air quality in these countries, which can be more susceptible to the impacts of climate change. Implementing measures to reduce transport emissions in this region is vital.

Indonesia has the world's fourth highest mortality rate due to air pollution and a rapidly growing vehicle market. ICCT research evaluated the costs and benefits of advanced vehicle emission and fuel quality standards in the country. The results showed that implementing Euro 6/VI standards and stronger fuel standards limiting sulfur content would reduce the societal damages of 2050 emissions by approximately 60% compared to today's standards. This translates to net societal benefits of approximately $81 billion from 2020 to 2050.

Cellulosic ethanol in Indonesia using palm residues

Indonesia's palm industry produces enormous volumes of palm biomass residues that could be used to produce sustainable cellulosic ethanol. ICCT researchers estimating the cost of establishing and supporting the development of the cellulosic ethanol industry found that if Indonesia were to build a total of 30 commercial facilities over the next 10 years, the country could replace 4% of its gasoline consumption at a relatively low cost compared to other countries. Developing a domestic cellulosic industry could bring multiple benefits to Indonesia including reduced oil imports and greater greenhouse gas savings than first-generation biofuels.

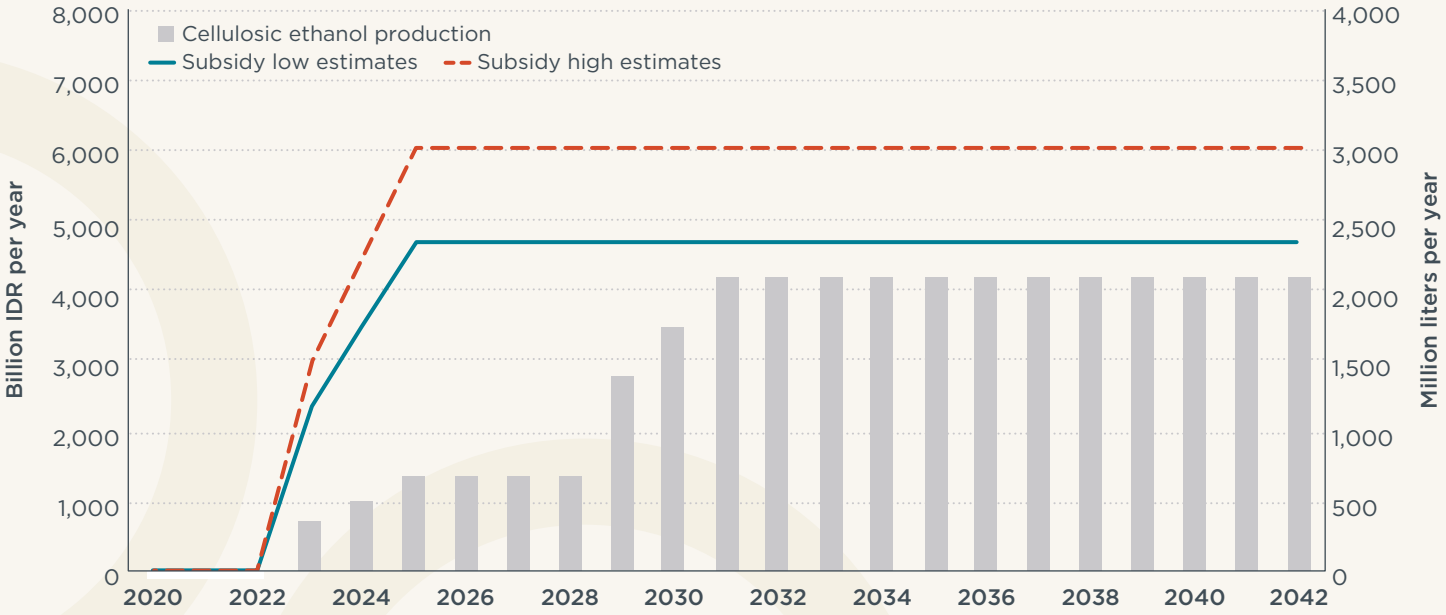

Figure: Annual subsidy needed to support the establishment of a cellulosic industry (left axis) and the total quantity of cellulosic ethanol that could be produced each year (right axis).
(Source: *Techno-economic analysis of cellulosic ethanol in Indonesia using palm residues*, https://theicct.org/publications/techno-economic-cellulosic-ethanol-2020)

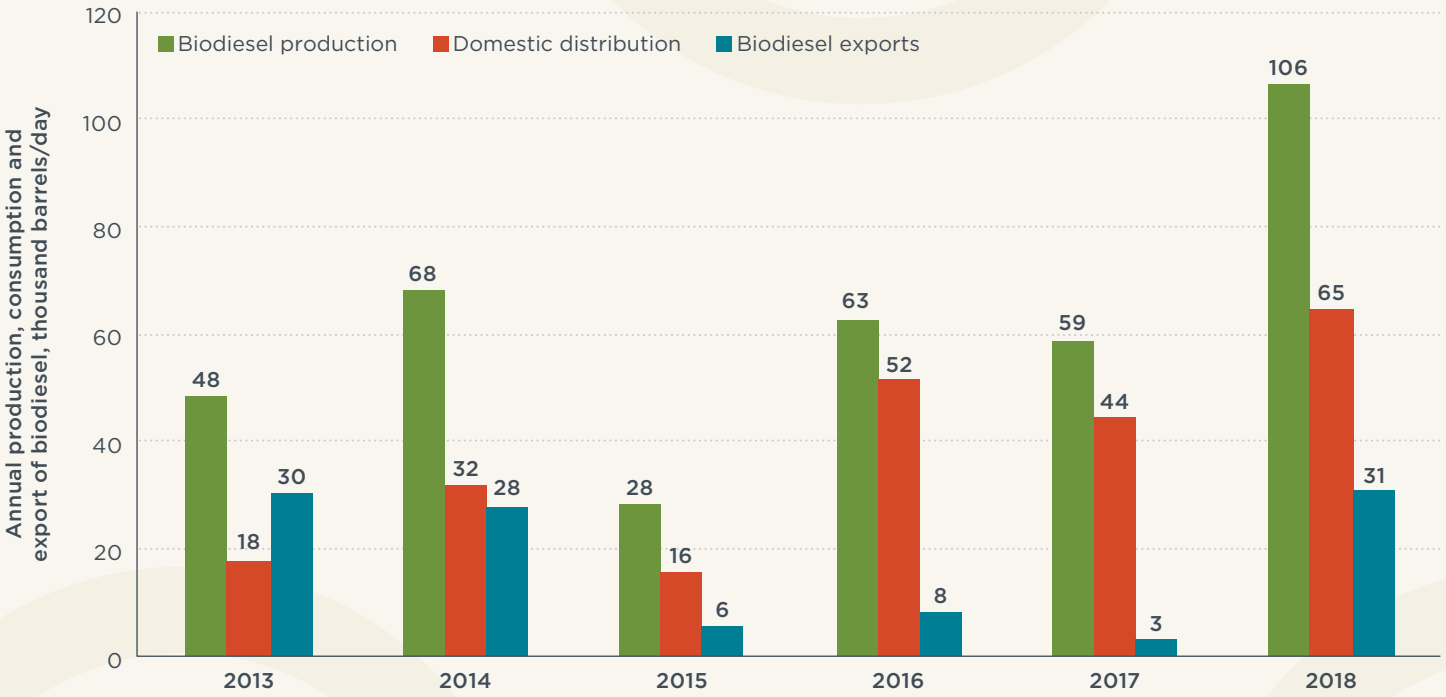

Figure: Production, domestic distribution, and export of biodiesel in Indonesia from 2013 to 2018. (Source: *A review of motor vehicle fuel demand and supply in Indonesia*, https://theicct.org/publications/indonesia-fuel-demand-supply-sept2020)

"Based on research by The International Council on Clean Transportation (ICCT), Indonesia has the potential for cooking oil to reach 157 million liters from restaurants, hotels and schools in urban areas. This amount is equivalent to 3% of biodiesel production in Indonesia per year. ICCT even estimates that the potential for used cooking oil collected from urban households could be more, reaching 1,638 million liters or the equivalent of 32% of biodiesel production in the country."

"Potential of Biodiesel Raw Material from Used Cooking Oil," *Databoks*, https://databoks.katadata.co.id/datapublish/2020/04/21/potensi-bahan-baku-biodiesel-dari-minyak-goreng-bekas

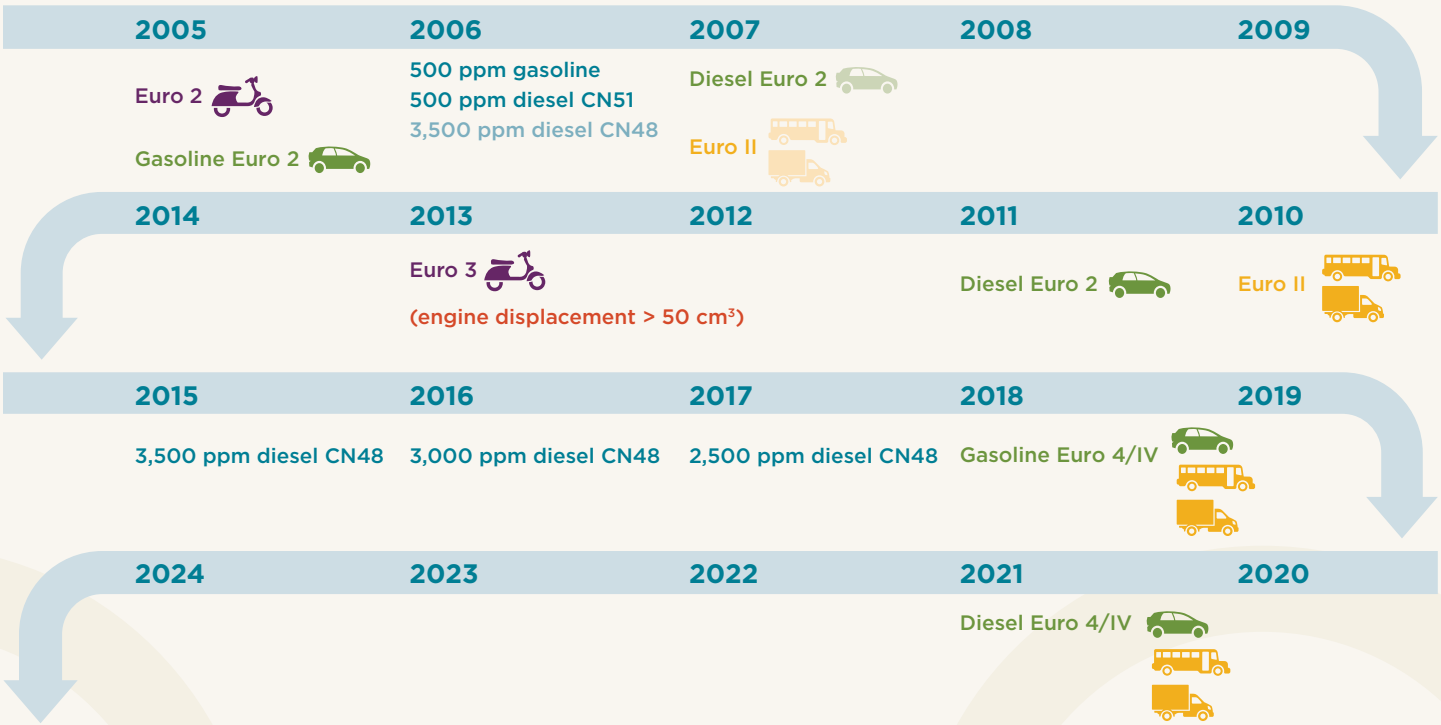

Figure: Timeline of Indonesia new vehicle emission standards and fuel sulfur content requirement. (Source: *Soot-free road transport in Indonesia: A cost-benefit analysis and implications for fuel policy*, https://theicct.org/publications/soot-free-road-transport-indonesia-cost-benefit-analysis)

PUBLICATIONS OF NOTE

The retail fuels market in Indonesia (working paper)
https://theicct.org/publications/retail-fuels-indonesia-oct2020

A review of motor vehicle fuel demand and supply in Indonesia (working paper)
https://theicct.org/publications/indonesia-fuel-demand-supply-sept2020

GLOBAL

Emissions from aviation and marine transport are a global concern. In aviation, despite improvements in aircraft efficiency, increased demand has led to higher overall emissions. In mid-2020, the U.S. Environmental Protection Agency proposed the first U.S. emissions standards for commercial aircraft which are in line with those set by the International Civil Aviation Organization. Researchers at the ICCT advised that the ICAO standards, which will take effect in 2028, lag existing efforts of manufacturers by more than 10 years. Moreover, these standards need to be tightened to promote innovation and adoption of fuel burn technology beyond business as usual.

In February 2020, delegates with the International Maritime Organization (IMO)'s Pollution Prevention and Response Sub-Committee agreed on draft text of a ban on the use and carriage for use of heavy fuel oil (HFO) in the Arctic. However, while the ban would apply as of July 2024, exemptions and waivers allow some ships to use HFO until July 2029. Marine researchers at the ICCT assessed the impacts of these exemptions and waivers and found that the proposed ban would have eliminated only 30% of HFO carriage and 16% of HFO use in 2019, and this would have reduced black carbon emissions by only 5%. Moreover, as ship travel in the Arctic increases, the effectiveness of the ban would be further eroded.

CO_2 emissions from commercial aviationAviation researchers at ICCT undertook a global carbon dioxide emissions inventory for three years of commercial aviation. While results show that global passenger operations are becoming more fuel-efficient, this is not happening fast enough to offset traffic growth. Commercial traffic has increased nearly four times faster than fuel efficiency improvement, and passenger aircraft CO_2 emissions increased 33% between 2013 and 2019. Additionally, the large share of emissions from premium seating suggests that carbon pricing for aviation could be improved and made more equitable by reflecting the emissions increase from passengers in first class and business class.

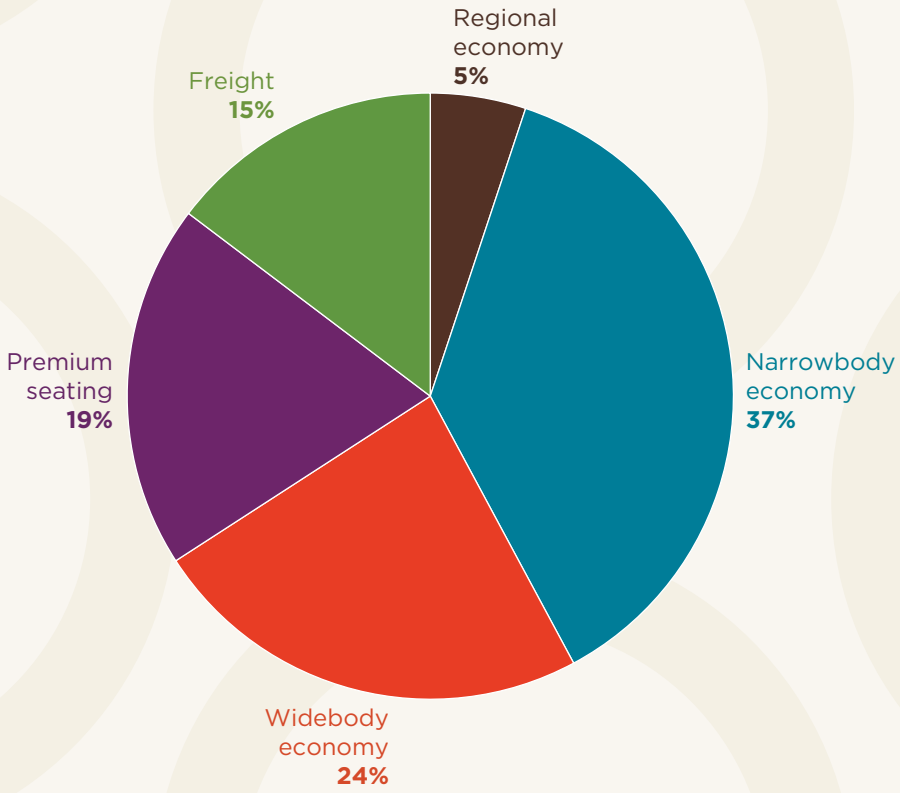

Figure: CO_2 emissions by operations and aircraft seating class, 2019 (Source: *CO_2 emissions from commercial aviation: 2013, 2018, and 2019*, https://theicct.org/publications/co2-emissions-commercial-aviation-2020)

"The IMO's proposed HFO ban is nothing of the sort. As written, it bans less than one-third of HFO carried and less than one-sixth of HFO used by ships in the Arctic," explains Dr. Bryan Comer, senior marine researcher at the International Council on Clean Transportation.

"Proposed Arctic Heavy Fuel Oil Ban Ineffective New Study Warns," *High North News*, https://www.highnorthnews.com/en/proposed-arctic-heavy-fuel-oil-ban-ineffective-new-study-warns

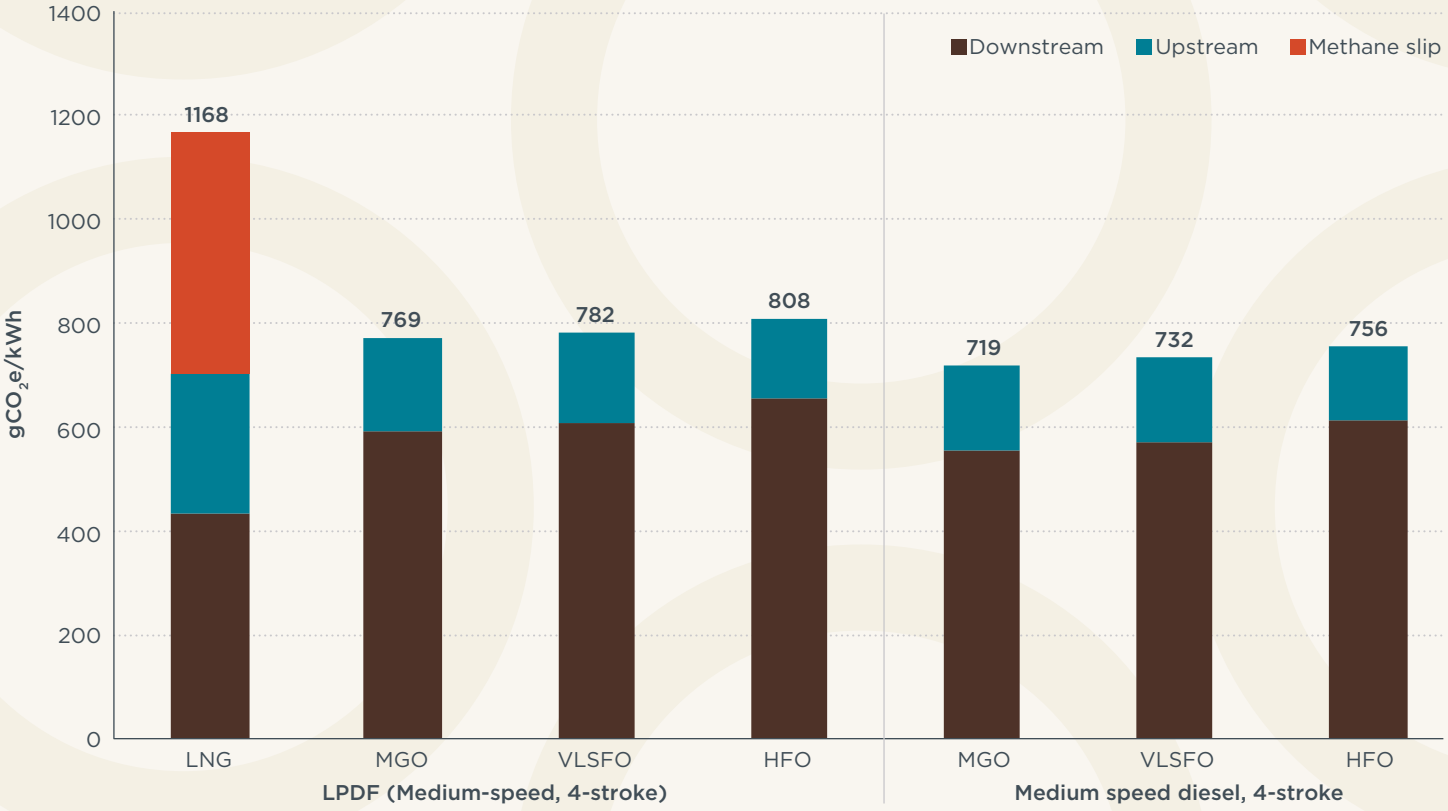

Figure: Life-cycle GHG emissions by fuel type for engines suitable for cruise ships, 20-year GWP
(Source: The climate implications of using LNG as a marine fuel, https://theicct.org/publications/climate-impacts-LNG-marine-fuel-2020*)*

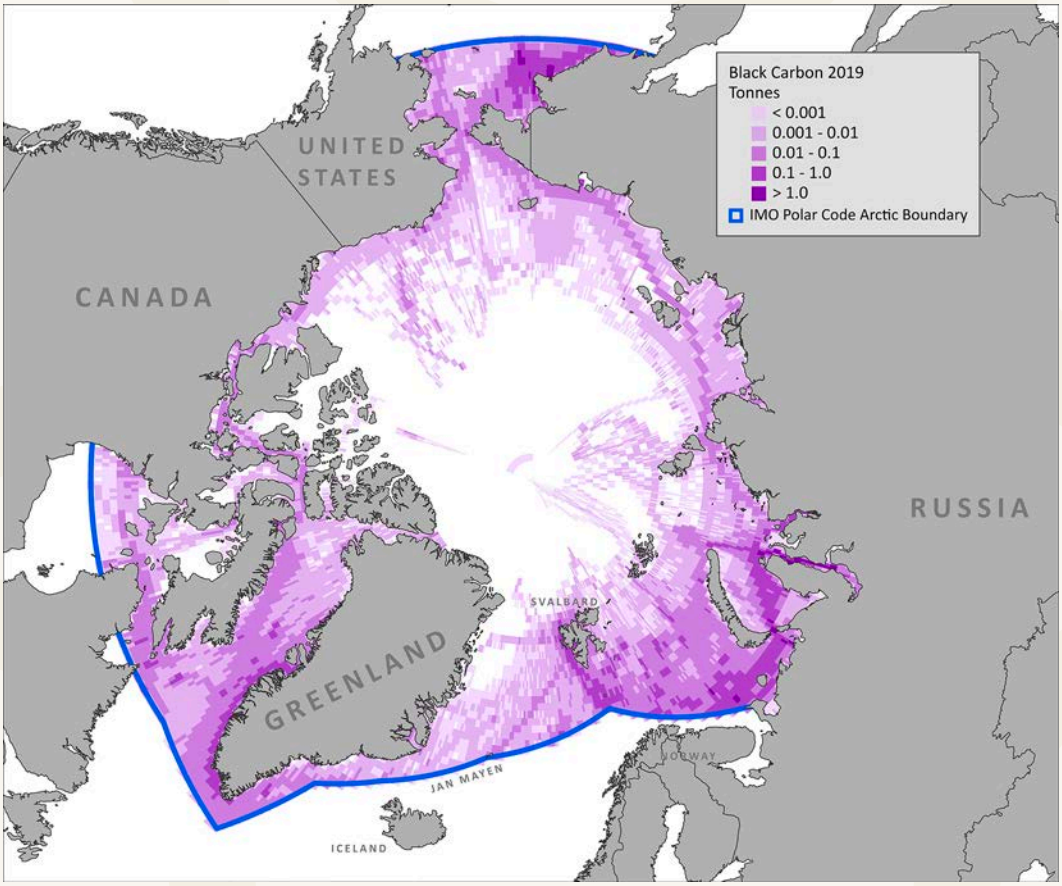

Figure: Black carbon emissions from Arctic shipping (all fuels) in 2019.
(Source: The International Maritime Organization's proposed Arctic heavy fuel oil ban: Likely implications and opportunities for improvement, https://theicct.org/publications/analysis-HFO-ban-IMO-2020*)*

PUBLICATIONS OF NOTE:

Air emissions and water pollution discharges from ships with scrubbers (consulting report) https://theicct.org/publications/air-water-pollution-scrubbers-2020

Liquid hydrogen refueling infrastructure to support a zero-emission U.S.–China container shipping corridor (working paper) https://theicct.org/publications/ZEV-port-infrastructure-hydrogen-2020

The International Maritime Organization's proposed Arctic heavy fuel oil ban: Likely implications and opportunities for improvement (white paper)

SUPPORTERS

The ICCT produces rigorous, fair, independent research and analysis to inform public policy and advance progress toward a cleaner global transportation system. We work under grants and contracts from numerous organizations in the private, public, and nonprofit sectors. Our work would not be possible without the vital contributions of a growing core group of funders whose generous support provides the foundation for all our efforts. Our recent top funders include:

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Children's Investment Fund Foundation

ClimateWorks Foundation

European Climate Foundation

European Commission

FIA Foundation

Heising-Simons Foundation

Norwegian Agency for Development Cooperation (NORAD)

P4G

Packard Foundation

Pisces Foundation

Rockefeller Brothers Fund

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Umweltbundesamt (Federal Environmental Agency, Germany)

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