

# NEWSLETTER

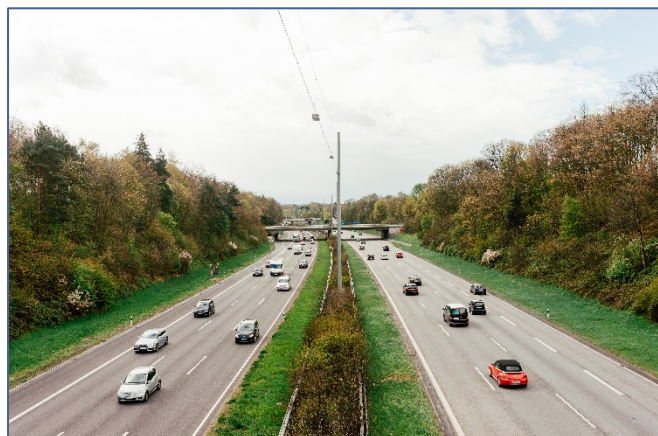
International Regulatory Developments

## TABLE OF CONTENTS

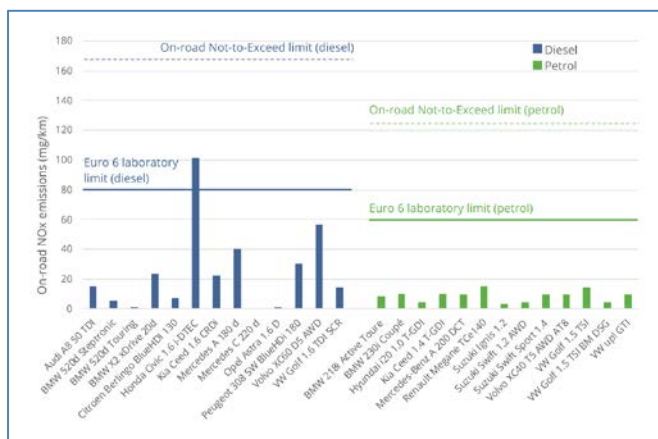
New Data shows Modern Diesel Emissions are Comparable with Petrol.....	2
Diesel Information Hub now available in French.....	2
<b>EUROPE</b> .....	2
Post-2020 CO <sub>2</sub> Standards for Cars and Vans published .....	2
UN Regulation No 96 published in the Official Journal of the EU .....	3
Parliament adopts CO <sub>2</sub> Standards for Heavy-Duty Vehicles.....	3
Parliament adopts Review of Clean Vehicle Directive .....	4
EEA Report on CO <sub>2</sub> Emissions from New Cars and Vans in 2017 .....	5
Commission charges BMW, Daimler and VW with Emission Collusion.....	6
Parliament Question on Conformity Factors and Air Quality Policies .....	6
European Audit of Urban Mobility Funding Effectiveness .....	6
Commission Environmental Implementation Review .....	7
Impact Assessment of the European Green Vehicles Initiative .....	8
Report on State of the Energy Union .....	8
EU Agreement on Future Research and Innovation Programme .....	9
Global Trends to 2030: Challenges and Choices for Europe .....	9
Ultra-Low Emission Zone starts in London.....	10
Call for UK to ban Sale of Diesel Heavy Goods Vehicles by 2040 .....	10
Danish Order on DPF Retrofit for Commercial Vehicles in LEZ .....	10
Report on Air Quality by German National Academy of Science.....	11
German Ordinance to implement EU Alternative Fuels Directive .....	11
Belgian City of Ghent to introduce Low Emission Zone from 2020 .....	11
Estonia sets Specifications for Fuels with a Higher Biofuel Content .....	12
<b>NORTH-AMERICA</b> .....	12
CARB Staff Assessment of Technical Feasibility of Lower NO <sub>x</sub> Standards .....	12
Light-duty Vehicle Efficiency Technologies in the US in 2018 .....	12
CARB announces Settlement with Fiat over Diesel Engine Emission Violations .....	12
<b>ASIA PACIFIC</b> .....	13
Shanghai to implement China 6 Light-duty Standards from 1 July 2019.....	13
High-Emission Vehicles to be restricted from Downtown Seoul .....	13
<b>GENERAL</b> .....	13
Ricardo Report on Real-World Emissions in the London LEZ .....	13
ICCT Report on Worldwide Use of Remote Sensing .....	14
State of Global Air 2019 Report.....	15
Effect of Diesel Fuel Properties on Fuel Economy and Emissions of Three Cars .....	16
<b>RESEARCH SUMMARY</b> .....	16
<b>FORTHCOMING CONFERENCES</b> .....	19

## New Data shows Modern Diesel Emissions are Comparable with Petrol

The AECC's Diesel Information Hub has been complemented with a new article reporting on comparable emission levels from modern diesel and petrol cars.



According to the German mobility organisation ADAC (Allgemeiner Deutscher Automobil Club), modern diesel and petrol cars tested in real-world conditions out-performed regulatory requirements. ADAC actually found that while the NOx emissions limits set out in the latest European legislation (Euro 6 standard) are not yet fuel-neutral and are higher for diesel than for petrol (80 mg/km as opposed to 60 mg/km), most diesel cars tested on the road are nevertheless well below the lower limit for petrol.

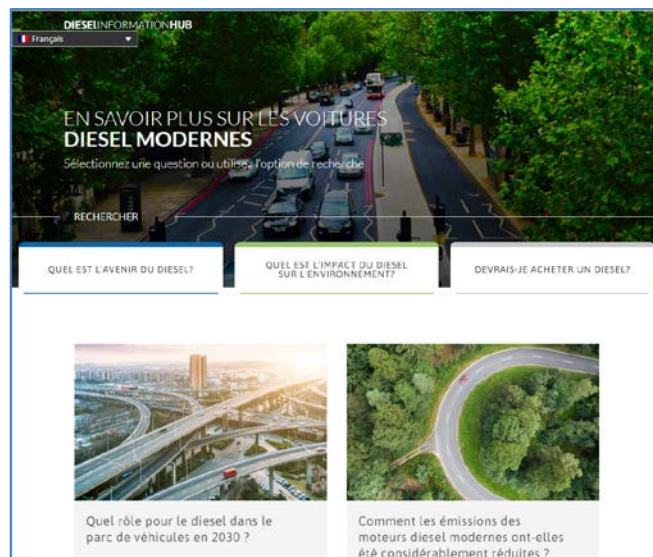


The AECC [Diesel Information Hub](#) is aimed at contributing to the public discourse on the future of mobility and urban air quality by providing clear and concise information on the modern diesel engine.

## Diesel Information Hub now available in French

With the aim to reach out to a broader public in Europe, the AECC-powered Diesel Information Hub is now available also in French.

You can visit it at <https://dieselinformation.aecc.eu/fr>.



## EUROPE

### Post-2020 CO<sub>2</sub> Standards for Cars and Vans published

On 25 April 2019, Regulation (EU) 2019/631 setting CO<sub>2</sub> emissions standards for new cars and light commercial vehicles was published in the Official Journal of the EU.

The publication followed the adoption of the text by the Council of the EU on 15 April 2019.

The Regulation provides a pathway for CO<sub>2</sub> emissions reductions from road transport and contributes to the binding target of at least 40% domestic reduction in economy-wide greenhouse gas emissions by 2030 compared to 1990.

It first confirms the EU fleet-wide targets of 95 g/km of CO<sub>2</sub> for the average emissions of new passenger cars and of 147 g/km CO<sub>2</sub> for the average emission of new light commercial vehicles measured until 31 December 2020 in accordance with Commission Regulation (EC) No 692/2008 together with Implementing Regulation (EU) 2017/1152 and 2017/1153 (NEDC correlation from WLTP measurement), and from 1 January 2021 measured in accordance with the WLTP Regulation (EU) 2017/1151.

Emissions reduction targets for fleets of new passenger cars and light commercial vehicles are then set for 2025 and for 2030, providing a clear and early signal for the automotive industry not to delay the market introduction of energy efficient technologies and zero- and low-emission vehicles.

From 1 January 2025, fleet-wide targets equal to a 15% reduction of the respective targets in 2021 apply to new passenger cars and to new light commercial vehicles.

From 1 January 2030, a fleet-wide target equal to a 37.5% reduction of the 2021 target then applies to new passenger cars while a fleet-wide target equal to a 31% reduction of the target in 2021 applies to light commercial vehicles.

The distribution of the CO<sub>2</sub> reduction among the manufacturers is based on the average mass of their vehicle fleet.

To provide flexibility for the purposes of meeting their targets under this Regulation, manufacturers may agree to form a pool on an open, transparent and non-discriminatory basis. An agreement to form a pool should not exceed five years but can be renewed.

In addition, from 1 January 2025, a zero- and low-emission vehicles' benchmark equal to a 15% share of the respective fleets of new passenger cars and new light commercial vehicles shall apply. From 1 January 2030, the benchmarks become 35% for new passenger cars and 30% for new light commercial vehicles. 'Zero- and low-emission vehicle' is defined as a passenger car or a light commercial vehicle with tailpipe emissions from zero up to 50 g CO<sub>2</sub>/km.

In calculating the average specific emissions of CO<sub>2</sub>, each new Zero- and low-emission vehicle is counted as 2 passenger cars in 2020, 1.67 passenger cars in 2021, 1.33 passenger cars in 2022, and 1 passenger car from 2023. For each manufacturer, this is subject to a cap of 7.5g CO<sub>2</sub>/km each year between 2020 and 2022.

Manufacturers whose average specific CO<sub>2</sub> emissions exceed those permitted will pay an excess emissions premium. The Commission should, in its 2023 review, evaluate the possibility of allocating the amounts of the excess emissions premium to a specific fund or a relevant programme that aims to ensure a just transition towards zero-emission mobility and to support reskilling, up-skilling and other skills training of workers in the automotive sector.

The effectiveness of this Regulation will be reviewed in 2023. In that review, the Commission should also identify a clear pathway for further CO<sub>2</sub> emissions reductions for passenger cars and light commercial vehicles beyond 2030.

A mechanism should be put in place to assess the real-world representativeness of emissions and energy consumption values determined in accordance with the WLTP, by using data from the on-board fuel and/or energy consumption monitoring devices. The Commission should ensure the public availability of this data and assess how it can be used to monitor the gap between laboratory and real-world CO<sub>2</sub> emissions and, where necessary, to prevent this gap from increasing.

Finally, the Commission should no later than 2023 evaluate the possibility of developing a common methodology for

the assessment and the consistent data reporting of the full life-cycle CO<sub>2</sub> emissions of vehicles.

The Regulation will enter into force on 15 May 2019.

Regulation (EU) 2019/631 is at <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R0631&from=EN>.

## UN Regulation No 96 published in the Official Journal of the EU

On 17 April 2019, UN Regulation No 96 on the approval of engines installed in agricultural and forestry tractors and in non-road mobile machinery (NRMM) with regard to their pollutants emissions was published in the Official Journal of the EU.

The text incorporates the 05 series of amendments to UN Regulation No 96 which aligns with the EU Stage V requirements for NRMM engines.

It entered into force on 29 December 2018.

UN Regulation No 96 is at [http://publications.europa.eu/resource/cellar/6fc76889-6109-11e9-b6eb-01aa75ed71a1.0006.01/DOC\\_1](http://publications.europa.eu/resource/cellar/6fc76889-6109-11e9-b6eb-01aa75ed71a1.0006.01/DOC_1).

## Parliament adopts CO<sub>2</sub> Standards for Heavy-Duty Vehicles

On 18 April 2019 the European Parliament approved the first ever EU regulation on CO<sub>2</sub> emissions for trucks and lorries, in an effort to curb rising road transport emissions. The new legislation, informally agreed between MEPs and the Romanian Presidency of the Council in February 2019, was adopted with 474 votes in favour, 47 against and 11 abstentions.

The scope of the regulation covers four categories of large trucks that account for 65-70% of heavy-duty vehicles' CO<sub>2</sub> emissions. The regulation requires CO<sub>2</sub> emissions from these heavy-duty vehicles to be reduced by 30% by 2030, with an intermediate reduction target of 15% by 2025.

Also by 2025, manufacturers will be required to ensure that at least a 2% market share of the sales of new vehicles is made up of zero- and low-emission vehicles, to counteract steadily increasing road traffic emissions, of which around one quarter is accountable to heavy-duty vehicles.

In addition to this, the European Commission will have to propose new post-2030 targets, in 2022, in line with the Paris Agreement.

The Council will now need to formally approve the text before it can enter into force.

The text of the agreement is at [www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P8-TA-2019-0426+0+DOC+PDF+V0//EN](http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P8-TA-2019-0426+0+DOC+PDF+V0//EN).




On 9 April 2019, prior to the plenary vote, the European Parliament released a briefing note on the legislative proposal to set CO<sub>2</sub> emission standards for heavy-duty vehicles.

In May 2018, the Commission proposed a regulation setting the first-ever CO<sub>2</sub> emission performance standards for new heavy-duty vehicles in the EU, as part of the third mobility package. It requires the average CO<sub>2</sub> emissions from new trucks in 2025 to be 15% lower than in 2019. For 2030, the proposal sets an indicative reduction target of at least 30% compared to 2019. Special incentives are provided for zero- and low-emission vehicles.

In the European Parliament, the proposal was referred to the Environment Committee (ENVI), which adopted its report on 18 October 2018. Parliament voted on its report on 14 November 2018. Trilogue negotiations with the Council were then concluded on 18 February 2019 with an agreement that sets a legally binding 30% reduction target for the average fleet emissions of new trucks by 2030.

Proposal for a Regulation of the European Parliament and of the Council setting CO <sub>2</sub> emission performance standards for new heavy-duty vehicles		
Committee responsible:	Environment, Public Health and Food Safety (ENVI)	COM(2018) 284 17.5.2018
Rapporteur:	Bas Eickhout (Greens/EFA, the Netherlands)	2018/0143(COD)
Shadow rapporteurs:	Christofer Fjellner (EPP, Sweden) Damiano Zoffoli (S&D, Italy) John Procter (ECR, United Kingdom) Niils Torvalds (ALDE, Finland) Stefan Eck (GUE/NGL, Germany) Eleonora Evi (EFDD, Italy) Joëlle Mélin (ENF, France)	Ordinary legislative procedure (COD) (Parliament and Council on equal footing – formerly 'co-decision')
Next steps expected:	Final first-reading vote in plenary	



The EP briefing on HDV CO<sub>2</sub> standards is at [www.europarl.europa.eu/RegData/etudes/BRIE/2018/628268/EPRS\\_BRI\(2018\)628268\\_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2018/628268/EPRS_BRI(2018)628268_EN.pdf).

## Parliament adopts Review of Clean Vehicle Directive

On 18 April 2019 the European Parliament approved the agreement reached with the Council to review the Clean Vehicle Directive 2009/33/EC aimed at stimulating the market for zero- and low-emission vehicles by encouraging their use in public procurement.

The European Parliament's plenary meeting approved the agreement with 458 MEPs voting in favour, 107 against and 15 abstentions.

The main objective of the Directive is to increase the market uptake of clean vehicles in public procurement. Moreover, the revision widens the Directive's scope and makes it possible to adopt delegated acts that would adapt the approach to heavy-duty vehicles as well as to clean light-duty ones.

The scope of the Directive includes contracts for the purchase, lease, rent or hire-purchase of road transport vehicles awarded by contracting authorities or contracting entities; public service contracts having as their subject matter the provision of passenger road transport services in excess of a threshold defined by Member States in accordance with Regulation (EC) No 1370/2000 and services contracts to public road transport services, special-purpose passenger services, refuse collection, and postal and parcel delivery services.

The new Directive introduces a definition of clean vehicles and sets minimum targets for their public procurement in each Member State.

Vehicles of category M1, M2 or N1 are categorised as clean provided that their maximum tailpipe emission expressed in g CO<sub>2</sub>/km and real driving pollutant emissions are below a percentage of the applicable emission limits.

Vehicles of category M3, N2 or N3 are categorised as clean should they be using alternative fuels as defined in Directive 2014/94/EU (Alternative Fuels Infrastructure Directive) excluding fuels produced from high indirect land-use change-risk feed stock (ILUC) for which a significant expansion of the production area into land with high-carbon stock is observed.

However, the text specifies that vehicles using liquid biofuels, synthetic and paraffinic fuels, should not be blended with conventional fossil fuels.

Heavy-duty vehicles (HDVs) could be considered as zero-emission vehicle if they emit less than 1 g CO<sub>2</sub>/kWh or less than 1 g CO<sub>2</sub>/km.

The amending Directive also aligns the provisions for the use of low- and zero-emission vehicles in public procurement with the new provisions on CO<sub>2</sub> emission performance of cars and vans for the post-2020 period.

In addition, the text specifies that vehicles which meet the definition of clean vehicle or zero-emission HDV as a result of retrofitting could be counted as clean vehicles or zero-emission HDVs, respectively, for the purpose of compliance with the minimum procurement targets.

The text of the agreement will be now sent to the Council for formal approval. It can then be published in the EU's Official Journal.

The text of the Directive is at [www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P8-TA-2019-0427+0+DOC+PDF+V0//EN](http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P8-TA-2019-0427+0+DOC+PDF+V0//EN).

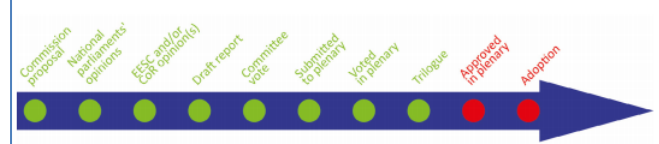
On 10 April 2019, prior to the plenary vote, the European Parliament released a briefing note on the legislative proposal to review the Clean Vehicle Directive 2009/33/EC.

In November 2017, the European Commission proposed a revision of the Directive on the promotion of clean and

energy-efficient road transport vehicles (the so-called Clean Vehicles Directive), after an evaluation showed that the directive had yielded limited results. The proposed revision aims to promote clean mobility solutions in public procurement tenders and thereby raise the demand for, and the further deployment of, clean vehicles. The proposal provides a definition for clean light-duty vehicles based on a combined CO<sub>2</sub> and air-pollutant emissions threshold; for heavy-duty vehicles, it gives a definition based on alternative fuels. The proposal is in line with the European Commission's energy union package, which plans action on the further decarbonisation of road transport in line with the 2030 climate and energy targets.

In the European Parliament, the proposal was referred to the Environment Committee (ENVI), which adopted its report on 10 October 2018. Parliament voted on its report on 25 October 2018. Trilogue negotiations with the Council were then concluded on 11 February 2019.

Proposal for a Directive of the European Parliament and of the Council amending Directive 2009/33/EU on the promotion of clean and energy-efficient road transport vehicles	
COM(2017) 653, 8.11.2017, 2017/0291(COD), Ordinary legislative procedure (COD) (Parliament and Council on equal footing – formerly 'co-decision')	
Committee responsible:	Environment, Public Health and Food Safety (ENVI)
Rapporteur:	Andrzej Grzyb (EPP, Poland)
Shadow rapporteurs:	Seb Dance (S&D, UK); Rupert Matthews (ECR, UK); Jan Huitema (ALDE, the Netherlands); Kateřina Konečná (GUE/NGL, Czech Republic); Keith Taylor (Greens/EFA, UK); Eleonora Evi (EFDD, Italy); Joëlle Mélin (ENF, France)
Next steps expected:	Final first-reading vote in plenary

The diagram shows a horizontal timeline with a large blue arrow pointing right. Above the arrow, various stages are labeled: Commission proposal, National parliaments' opinions, EEC and/or CoR opinions, Draft report, Committee vote, Submitted to plenary, Voted in plenary, Trilogue, Approved in plenary, and Adoption. Each stage is represented by a colored circle on the arrow.

The EP briefing on the Clean Vehicle Directive is at [www.europarl.europa.eu/RegData/etudes/BRIE/2018/614690/EPRS\\_BRI\(2018\)614690\\_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2018/614690/EPRS_BRI(2018)614690_EN.pdf).

## EEA Report on CO<sub>2</sub> Emissions from New Cars and Vans in 2017

On 4 April 2019, the European Environment Agency (EEA) published its report 'Monitoring CO<sub>2</sub> emissions from new passenger cars and new vans in 2017' which confirms the provisional data published by the EEA in April 2018.

The final data show that average CO<sub>2</sub> emissions of a new car sold in the EU rose from 118.1 g/km in 2016 to 118.5 g/km in 2017 (+0.4 g/km). Although this level remains below the current target level of 130 g CO<sub>2</sub>/km, it is well above the 2021 target of 95 g CO<sub>2</sub>/km.

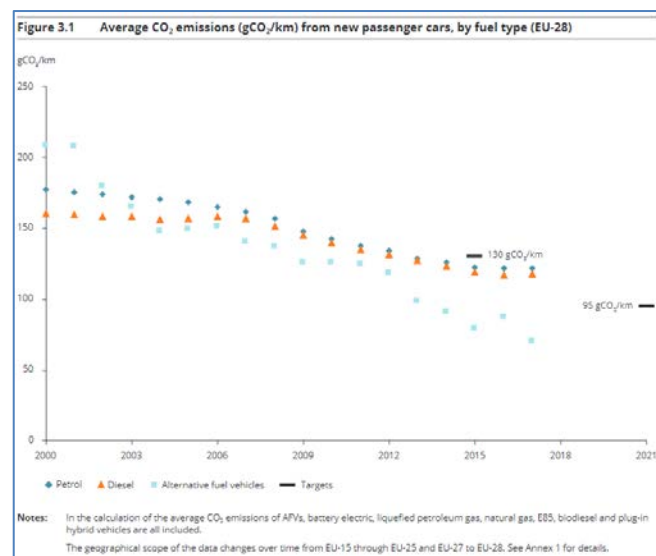
On the contrary, average CO<sub>2</sub> emissions of new light commercial vehicles (vans) dropped by 7.5 g/km between 2016 and 2017. The average new van registered in 2017 emitted 156.1 g CO<sub>2</sub>/km which is 11% below the 2017

target of 175 g/km but still 6% above the 2020 target of 147 g/km.

While all van manufacturers respected their specific emission targets in 2017, three car manufacturers (Automobili Lamborghini, Mazda Motor Corporation and Société des Automobiles Alpine), representing together 1.4 % of all new car sales in 2017, exceeded their specific emission targets for 2017. While certain other manufacturers, if considered individually, would have exceeded their specific emission target, they met their obligations as members of pools or thanks to derogations.

The report also highlights that for the first year since 2009, petrol cars constituted the majority of new registrations in 2017 (almost 53%). The proportion of electrified vehicles (plug-in hybrid and battery electric cars) increased from 1 % in 2016 to 1.5 % in 2017.

New diesel cars, which were on average around 300 kg heavier than new petrol cars, emitted on average 117.9 g CO<sub>2</sub>/km, which is 3.7 g CO<sub>2</sub>/km less than the average petrol car. The average fuel-efficiency of new petrol cars has been constant in 2016 and 2017, whereas the average CO<sub>2</sub> emissions of new diesel cars has increased by 1.1 g/km compared to 2016.



If similar petrol and diesel segments are compared, new conventional petrol cars emitted 10-40 % more than new conventional diesel cars. For diesel cars, only the large-sized segment managed to achieve a small reduction (0.5 g CO<sub>2</sub>/km) in 2017 compared with 2016. For conventional petrol cars, large-sized cars saw a significant reduction in CO<sub>2</sub> emissions of around 6 g/km, and medium/small-sized cars remained rather stable.

Amongst the largest automakers, Toyota had the lowest average CO<sub>2</sub> emissions for new passenger cars registered in 2017 (with 103 g/km). Peugeot and Citroen followed with (105 g/km) and (106 g/km), respectively. As in every

year since vans monitoring commenced, Dacia was the lowest-emitting vans manufacturer (118 g/km in 2017).

The EEA report is at [www.eea.europa.eu/publications/monitoring-co2-emissions-from-new-2](http://www.eea.europa.eu/publications/monitoring-co2-emissions-from-new-2).

## Commission charges BMW, Daimler and VW with Emission Collusion

On 5 April 2019, the European Commission sent Statements of Objections to BMW, Daimler and the Volkswagen group for restricting competition on emission control technologies.

The Commission has informed BMW, Daimler and VW (Volkswagen, Audi, Porsche) of its preliminary view that they have breached EU antitrust rules from 2006 to 2014 by colluding to restrict competition on the development of technology to clean the emissions of petrol and diesel passenger cars.

The Commission's preliminary view is that BMW, Daimler and VW participated in a collusive scheme, in breach of EU competition rules, to limit the development and roll-out of emission cleaning technology for new diesel and petrol passenger cars sold in the European Economic Area (EEA). This collusion is said to have occurred in the framework of the car manufacturers' so-called "circle of five" technical meetings.

In particular, the Commission has concerns regarding Selective Catalytic Reduction (SCR) systems and Gasoline Particulate Filters (GPF). On SCR, the Commission's preliminary view is that the three car makers coordinated their AdBlue<sup>®</sup> dosing strategies, AdBlue<sup>®</sup> tank size and refill ranges between 2006 and 2014 with the common understanding that they thereby limited AdBlue<sup>®</sup> consumption and emissions control effectiveness.

On the GPF, the Commission's preliminary view is that the three car makers coordinated to avoid, or at least to delay, the introduction of GPF in their new (direct injection) gasoline passenger car models between 2009 and 2014, and to remove uncertainty about their future market conduct.

According to the Commission, the car manufacturers' behaviour aimed to restrict competition on innovation for these two emission control technologies and in doing so, denied consumers the opportunity to buy less polluting cars, despite the technology being available to the manufacturers.

Such market behaviour, if confirmed, whilst not entailing price fixing or market sharing, would violate EU competition rules prohibiting cartel agreements to limit or control production, markets or technical development. This investigation is limited to an alleged violation of competition law. It is not about possible breaches of

environmental legislation. The cartel investigation is also separate and distinct from other ongoing investigations, including those by public prosecutors and other authorities into car manufacturers and the use of illegal defeat devices.

Commissioner Margrethe Vestager in charge of competition policy said: "Companies can cooperate in many ways to improve the quality of their products. However, EU competition rules do not allow them to collude on exactly the opposite: not to improve their products, not to compete on quality. We are concerned that this is what happened in this case and that Daimler, VW and BMW may have broken EU competition rules. The three car manufacturers now have the opportunity to respond to our findings."

The Commission statement is at [http://europa.eu/rapid/press-release\\_IP-19-2008\\_en.htm](http://europa.eu/rapid/press-release_IP-19-2008_en.htm).

## Parliament Question on Conformity Factors and Air Quality Policies

On 8 April 2019, MEPs Eleonora Evi (EFDD), Isabella Adinolfi (EFDD), Fabio Massimo Castaldo (EFDD), Ignazio Corrao (EFDD) and Piernicola Pedicini (EFDD) tabled a parliamentary question for written answer on the impact of conformity factors on air quality policies.

MEPs asked the Commission to consider if it is possible to deny the impact of discrepancies between the theoretical and real emission levels of the fleet of vehicles currently on the roads (Euro 1-6 classifications) on measures promoted at regional/local level to limit use of the most polluting vehicles; and to provide information on the proportion of diesel vehicles that has been recalled or withdrawn from the market in Italy and on brands and models of diesel vehicles that are subject to retrofitting measures in Italy.

The Commission has not yet replied to the question.

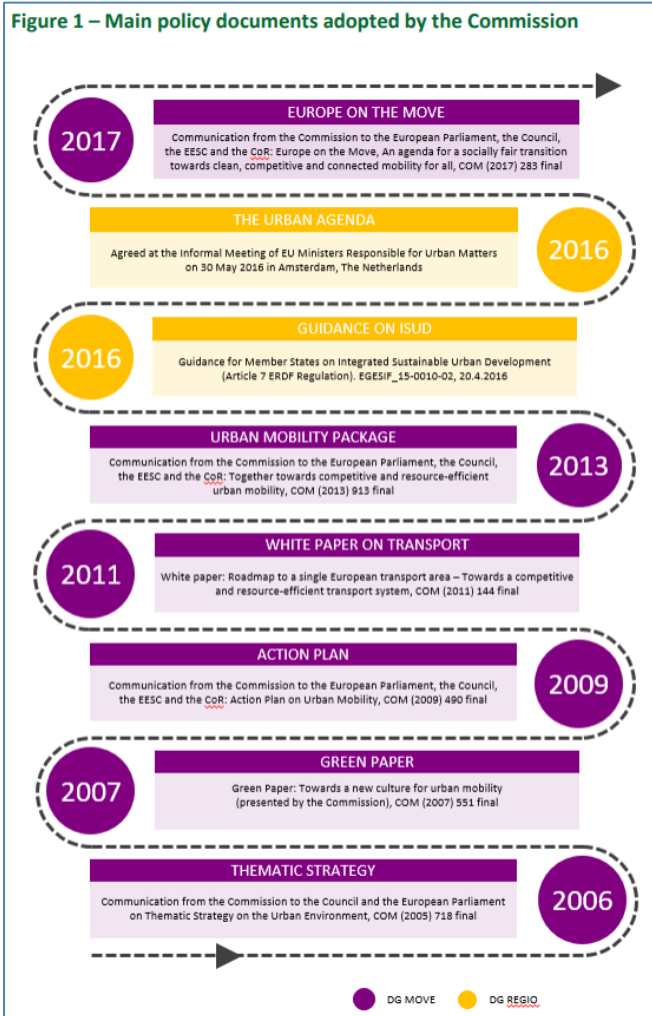
The parliamentary question can be found at [www.europarl.europa.eu/doceo/document/E-8-2019-001713\\_EN.html](http://www.europarl.europa.eu/doceo/document/E-8-2019-001713_EN.html).

## European Audit of Urban Mobility Funding Effectiveness

On 25 April 2019, the European Court of Auditors (ECA) issued an audit preview on urban mobility in the EU.

The ECA is conducting an audit of EU action to improve the mobility of people in cities and densely populated areas. The auditors will examine how the European Commission and Member States use the EU funding available (more than €60 billion available during the 2014-2020 period) to put into action their urban mobility policies and whether the Commission provides effective support to Member States.

The auditors will also assess the progress made in recent years in managing traffic congestion.



The ECA audit preview is at [www.eca.europa.eu/Lists/ECADocuments/AP19\\_07/AP\\_URBAN\\_MOBILITY\\_EN.pdf](http://www.eca.europa.eu/Lists/ECADocuments/AP19_07/AP_URBAN_MOBILITY_EN.pdf).

## Commission Environmental Implementation Review

On 5 April 2019, the European Commission published the second Environmental Implementation Review (EIR), part of its initiative launched in 2016 to improve the implementation of European environmental policy and commonly agreed rules in all EU Member States.

The Review maps out the situation of environmental policies and rules implementation in each EU country and identifies the causes of implementation gaps. It helps to find solutions before problems become urgent and aims to assist national decision-makers by outlining the priorities requiring their attention.

The package includes 28 country reports showing the state of play in the implementation of EU environmental law, as well as opportunities for improvement in each Member State; and a Communication drawing conclusions and defining common trends at EU level, as well as recommendations for improvements to all Member States with key priority actions.

The Review shows that eighteen Member States continue to struggle with high levels of NOx emissions and fifteen countries need to further reduce emissions of particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>). Given the impact of air pollution on health, the Commission has engaged in clean air dialogues with several EU countries, in addition to more targeted enforcement actions.

Since 2017, Member States and the Commission have engaged in a round of dialogues focused on air quality. By the end of 2018, six “Clean Air Dialogues” had been organised to address specific challenges in the Czech Republic, Hungary, Ireland, Luxembourg, Slovakia and Spain. These efforts have been complemented by the organisation of thematic workshops with the support of the European Commission’s TAIEX-EIR Peer2Peer mechanism. In Poland, the LIFE project ‘Małopolska Region’ provides support and advisory services to implement measures tackling severe air pollution in the region.

Regarding climate change, Member States have made good progress in implementing EU climate legislation and the 2020 targets are likely to be met. Nevertheless, efforts in each Member State and at EU level need to be intensified to comply with our international commitments under the Paris Agreement and prevent the worst consequences of climate change.

The Environmental Implementation Review put in place a new tool – the Peer-to-Peer programme – to stimulate environmental authorities from different Member States to learn from each other’s experiences across borders. Since its launch, all Member States were involved in at least one event covering circular economy, air quality, timber regulation, nature and biodiversity, and water quality topics.

The Review also assesses some enabling factors that could drastically improve implementation, such as environmental governance. The Commission calls upon Member States to improve the integration of environmental objectives with other policy goals, to improve the efficiency and effectiveness of public administration, and to be more transparent with environmentally relevant information. There is also scope to further engage regional and local authorities and other stakeholders in tackling the main implementation challenges.



The Environmental Implementation Review is at [http://ec.europa.eu/environment/eir/country-reports/index2\\_en.htm](http://ec.europa.eu/environment/eir/country-reports/index2_en.htm).

A new study on the costs of not implementing EU environmental law was also released on that day.

It indicates that full implementation of EU environmental legislation could save the EU economy between €30 and €80 billion every year in health costs and direct costs to the environment.

Although the methodology is new, the study results in a similar figure to a 2011 study, which produced an estimate of €50 bn/year. While this is not surprising as the progress in implementation of EU law comes against new targets and the environmental pressures are not easy to overcome, this confirms the EIR overall finding that more, steady efforts are needed.

The highest costs are on air quality, then nature, followed by water, waste and industrial emissions.

Policy area	Range estimate	Central estimate
Air	8.7 - 40.4	24.6
Nature and biodiversity	10.5 - 15.7	13.1
Water	4.3 - 14.3	9.3
Waste	3.2 - 4.8	4.0
Chemicals	0 - 0	0
Industrial emissions and major accident hazards	3.0 - 4.4	3.7
Horizontal instruments	-	-
<b>Total</b>	<b>29.7-79.6</b>	<b>54.7</b>

Source: COWI/Eunomia.

The study is at [http://ec.europa.eu/environment/eir/pdf/study\\_costs\\_not\\_implementing\\_env\\_law.pdf](http://ec.europa.eu/environment/eir/pdf/study_costs_not_implementing_env_law.pdf).

## Impact Assessment of the European Green Vehicles Initiative

On 4 April 2019, the Public Private Partnership on the European Green Vehicles Initiative (EGVI) released an impact assessment after a decade of existence.

In 2008, EGVI was set-up to tackle the challenges of mobility and climate and support the European automotive value chain to overcome the consequences of the economic crisis. Over its 10 years duration, the EU has funded 178 projects distributing €886 million to all stakeholders along the value chain: industry players, SMEs, research centres, universities, etc via the EGVI partnership.

Covering many different areas in the field of the improvement of energy efficiency of vehicles, EGVI has improved the performance of many vehicles types and has been a success so far by:

- ▶ Helping achieve CO<sub>2</sub> emission reduction: reduction potential amounts to 34% by 2030 compared to 2015 best in class vehicles, of which 10% thanks to fleet electrification and 24% is due to type improvements at

vehicle level and improvement of traffic conditions which EGVI projects are contributing to

- ▶ Accompanying the growth of automotive R&D spending leading to highly skilled job creation within the EU, including within SMEs & outside of the automotive industry
- ▶ Supporting the European industry to enter and take a leading position in the race of Green Vehicle technologies
- ▶ Fostering new technology developments to help Europe keeps its leadership in automotive innovation and low emission vehicles.

However, several challenges still lay ahead for the EU low-emissions road transport:

- ▶ Technical challenges: the future CO<sub>2</sub> emissions targets are very challenging and can only be achieved by investigating all technical options available, at an acceptable cost level
- ▶ A competitive challenge: several new contenders emerging in comparison to the 2008-2017 period, especially China where the industry weight in GDP has tripled in less than 15 years
- ▶ A research funding challenge: China, USA & Japan invest between €100 million and €1 billion per year in public funded research that needs to be matched by the EU to stay in the global race.

To consolidate its achievements and deliver additional impact in the future Research Framework Programme Horizon Europe, EGVI needs to:

- ▶ Accelerate and support the roll out in serial life of new technologies already developed
- ▶ Push further in-vehicle technology topics, with a specific focus on affordability and manufacturing
- ▶ Move from a tank-to-wheel view to cradle-to-grave and full life cycle thinking on all emissions types
- ▶ Find the right balance between disruptive and incremental innovation projects
- ▶ Expand its scope of research by developing a holistic view of the transportation system, by deepening the links with energy production and by leveraging digital technologies
- ▶ Extend its membership and collaboration to new stakeholders within automotive and outside such as ICT, battery manufacturers, infrastructure and energy producers and distributors.

The EGVI impact assessment is at <https://egvi.eu/wp-content/uploads/2019/04/Impact-Assessment-2019-digital-version-1.pdf>.

## Report on State of the Energy Union

On 9 April 2019, the European Commission published its fourth State of the Energy Union report.



The State of the Energy Union Report highlights and monitors the implementation of this key priority of the Juncker Commission. The report takes stock of the progress made towards building the Energy Union and highlights the issues where further attention is needed. It brings together a series of Commission reports and initiatives related to the Energy Union in an integrated way. The state of the Energy Union report is accompanied by two annexes demonstrating the progress made in renewable energy and energy efficiency.

Greenhouse Gas Emissions		Renewable Energy		Energy Efficiency	
2020	2030	2020	2030	2020	2030
-20%	≥-40%	20%	≥32%	20%	≥32.5%

Climate in EU-funded programmes 2014-2020		Interconnection		CO2 from :		
2020	2030	2020	2030	Cars	Vans	Lorries
20%	25%	10%	15%	-37.5%	-31%	-30%

In parallel, the Commission presented two forward looking communications: on the strategic batteries plan for Europe and on a new institutional framework for the EU energy and climate policy by 2025.

The report and accompanying documents are at [https://ec.europa.eu/commission/publications/4th-state-energy-union\\_en](https://ec.europa.eu/commission/publications/4th-state-energy-union_en).

## EU Agreement on Future Research and Innovation Programme

On 17 April 2019 the European Parliament endorsed the provisional agreement reached by the co-legislators on Horizon Europe, the EU research and innovation programme for the next budget period from 2021 to 2027.

The decision sets out provisions concerning the broad lines of research activities under each cluster of Horizon Europe; areas for possible missions and institutionalised European partnerships; the process for the multiannual strategic planning, to be adopted by the Commission with the early and close involvement of Member States; the establishment by the Commission of the European Innovation Council (EIC); work programmes implementing the specific programme, to be adopted by the Commission; widening participation in research activities funded under Horizon Europe and strengthening the European Research Area.

The agreement excludes horizontal and financial issues which are currently being discussed as part of the negotiations on the EU's next multiannual financial framework (MFF) covering the period 2021 to 2027.

The Climate, Energy and Mobility pillar includes, amongst other things: support to implementation of the EU climate, energy and transport policies, transition to a low-carbon economy and strategies for decarbonisation towards 2050; assessment of deploying renewables and clean energy production technologies; analysis of the EU's energy supply security, including energy infrastructure and energy markets; integrated analysis for development and deployment of electric driving, including the next generation of battery technologies; harmonised test procedures and market surveillance for CO<sub>2</sub> and air pollutant emissions from vehicles, assessment of innovative technologies and analyses of alternative fuels and related infrastructure needs.

The text adopted is at [www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P8-TA-2019-0395+0+DOC+PDF+V0//EN](http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P8-TA-2019-0395+0+DOC+PDF+V0//EN).

## Global Trends to 2030: Challenges and Choices for Europe

On 8 April 2019, the European Strategy and Policy Analysis System (ESPAS) issued its report "Global Trends to 2030: Challenges and Choices for Europe".

ESPAS is an inter-institutional collaboration among the officials of the European Commission, the European Parliament, the Council of the EU, and the European External Action Service, which monitors global trends and offers strategic foresight to EU decision-makers.



**A ROADMAP TO THE FUTURE**

**WELCOME TO 2030 THE MEGA-TRENDS**

- CLIMATE CHANGE** Due to an increase in temperature of 1.5 degrees compared to pre-industrial times, we will incur economic and environmental damage.
- DEMOGRAPHY** Both Europe and Africa face demographic challenges; while we will need to manage an ageing population, our southern neighbours will need to manage a significant youth bulge.
- URBANISATION** Two-thirds of people will live in small to medium-sized cities - where this is not managed properly, it will lead to crime, pollution and violence.
- ECONOMIC GROWTH** China will be the first global economy, and Europe will be second - but our purchasing power per head will be almost four times higher.
- ENERGY CONSUMPTION** Energy consumption will increase globally by 1.7% per year - most of this will take place in rising economies, and therefore contribute to even more emissions.
- CONNECTIVITY** The number of devices connected to the internet will have increased five-fold to 125 billion, and the amount of air passengers will nearly double. Everything humans (in good and bad) will be amplified.
- GEOPOLITICS** The world will exit the unipolar system and enter one comprised of 'influence nodes'.

**ON THE ROAD TO THE FUTURE THE CATALYSTS**

- INTERNATIONAL TRADE** will increase, irrespective of the decisions of the United States.
- FOOD AND WATER** scarcity will not cause wars themselves but where they appear, they indicate that there is a governance issue.
- CONFLICT** will remain territorial and intra-state in the Middle East and Africa, but it will become hybrid and highly-technological in Europe.
- TERRORISM** will continue to be an issue for Europe as recruitment has not ceased and ideological motivation remains.
- As **TECHNOLOGY** leaps forward, machine intelligence will begin to rival human intelligence.
- MIGRATION** to Europe will ebb and flow, but it will not disappear.
- POPULIST PARTIES** will continue to be part of our landscape until key issues are addressed.

**TIME TO DECIDE THE GAME-CHANGERS**

- SAVING THE PLANET:** If we do not keep temperature increases below 1.5 degrees, we risk heading towards extinction later this century.
- IMPROVE AGEING:** If we age better we can mitigate declining birth rates.
- MANAGE NEW TECHNOLOGIES:** If we do not develop a European approach to them, China and the United States will do it without us.
- POSITION EUROPE IN THE WORLD:** If Europe wants to be an influential player in the post-modern world, it will have to change the way it thinks about defence, diplomacy and itself.
- MANAGE CONFLICT:** wars will break out despite our best wishes and efforts, and we will have no choice but to handle them.
- PROTECT DEMOCRACY:** future-proofing measures are necessary if our political systems are to survive.
- ENCOURAGE EQUALITY:** reducing significant differences in income and tackling social exclusion will reduce the potential vote pool for populists and increase societal satisfaction.

The next decade will be defining for the future of Europe and Europe's role in the world. Seismic global power shifts; pressure on liberal democracies; challenges to global governance; the transformation of economic models and the very fabric of societies; new uses and misuses of technology; contrasting demographic patterns; and humanity's growing ecological footprint – the world is well on its way towards a new geopolitical, geo-economic and geo-technological order, the report says. The report

describes mega-trends, the catalysts on the road to the future, and possible game-changers.

The ESPAS report is at [https://ec.europa.eu/epsc/sites/epsc/files/espas\\_report2019.pdf](https://ec.europa.eu/epsc/sites/epsc/files/espas_report2019.pdf).

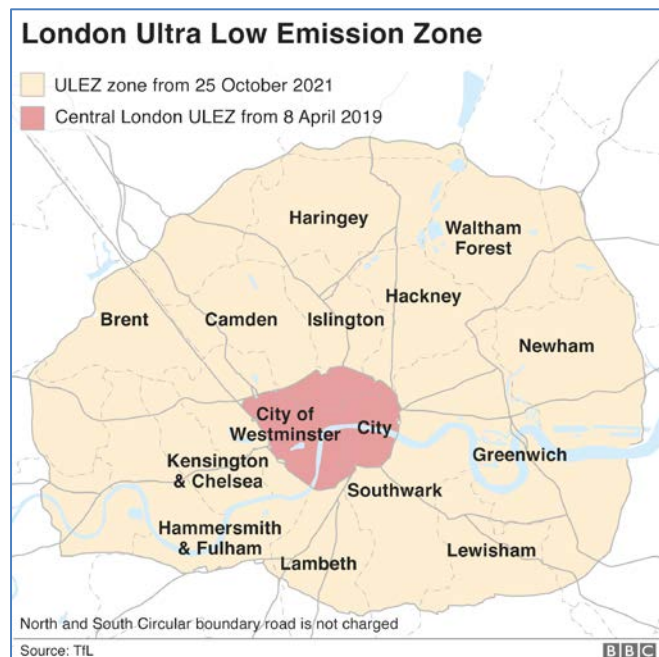
## Ultra-Low Emission Zone starts in London

On 8 April 2019, the Ultra-Low Emission Zone (ULEZ) started in London, UK.

The Central London ULEZ operates in the same area as the current Congestion Charge zone 24 hours a day, seven days a week, 365 days a year. It replaces the T-Charge and operates alongside the Congestion Charge.

Motorists who drive into the zone in a vehicle that does not meet the required emission standard (petrol vehicles that do not meet Euro 4 standards; diesel cars and vans that do not meet Euro 6; motorcycles, mopeds, motorised tricycles and quadricycles that do not meet Euro 3; and lorries, buses and coaches that do not meet Euro VI) must pay a daily charge. There are two ULEZ charge levels: £12.50 a day for cars, vans and motorbikes and £100 a day for lorries, buses and coaches.

In 2021, the ULEZ will expand to a much broader area.



The Mayor of London, Sadiq Khan said: “This is a landmark day for our city. Our toxic air is an invisible killer responsible for one of the biggest national health emergencies of our generation. I simply refuse to be yet another politician who ignores it. The ULEZ is the centrepiece of our plans to clean up London’s air – the boldest plans of any city on the planet, and the eyes of the world are on us. This is also about social justice – people in the most deprived parts of London, who are least likely to own a car, suffer the worst

effects of harmful air pollution. I will not stand by and watch children grow up with under-developed lungs in our city. The ULEZ is a vital step towards helping combat London’s illegal air.”

More info is at <https://tfl.gov.uk/modes/driving/ultra-low-emission-zone>.

## Call for UK to ban Sale of Diesel Heavy Goods Vehicles by 2040

On 17 April 2019, the UK’s National Infrastructure Commission (NIC) released a report calling for the UK government to ban the sale of diesel Heavy Goods Vehicles (HGVs) by 2040, in order to decarbonise the freight sector by 2050.

It says that a clean, low cost freight revolution by 2050 is possible if government and industry work to embrace alternatives to diesel. Battery electric is already emerging as the solution for vans, but the future fuel for HGVs and rail is not yet set.

Government should commit to achieving zero freight emissions by 2050 and identify the infrastructure requirements to support the transition, giving the freight and vehicle industries time to plan and adapt. For rail, this will include further detailed work to identify the optimum overall solution.

To support this, government should, in conjunction with distribution and transmission network operators, prepare detailed assessments of the infrastructure required to enable the uptake of battery electric or hydrogen HGVs, including the refuelling requirements at depots and key rest areas on major freight routes. For battery electric, these assessments should include enhancements to distribution networks alongside alternatives to reinforcement, such as energy storage. For hydrogen, these assessments should cover the production, storage and distribution of hydrogen, including any dependency with the decarbonisation of the heating supply system.

The UK NIC report is at [www.nic.org.uk/wp-content/uploads/Better-Delivery-April-2019.pdf](http://www.nic.org.uk/wp-content/uploads/Better-Delivery-April-2019.pdf).

## Danish Order on DPF Retrofit for Commercial Vehicles in LEZ

On 27 March 2019, Denmark notified the European Commission regarding a draft Order on requirements for lorries, buses and commercial vehicles in environmental zones laid down by municipalities.

Denmark already set in its Environmental Protection Act requirements for the four Danish Low Emission Zones (LEZ). The rules are now being made stricter for lorries and buses, and environmental zone requirements are introduced for commercial vehicles.

The current Order lays down the detailed requirements for retrofitting particulate filters and their approval and registration. Retrofitting a DPF will allow vehicles not complying with the required Euro standard to enter the environmental zones.

The retrofit DPF must at least fulfil the following:

- the DPF exerts a maximum back pressure of 20 kPa at the maximum power of the engine;
- the DPF reduces at least 80% of the particulate emissions, measured in accordance with recognised EU methods;
- the exhaust gas density after the DPF, measured at free acceleration, does not exceed a  $k$  value of  $0.2 \text{ m}^{-1}$ ;
- the DPF is equipped with a backpressure alarm which gives the driver a warning when the backpressure has increased;
- the noise level must not increase; and
- the other regulated emissions must not increase.

More info is at <http://ec.europa.eu/growth/tools-databases/tris/en/index.cfm/search/?trisaction=search.detail&year=2019&num=145&mLang=EN>.

## Report on Air Quality by German National Academy of Science

On 9 April 2019, the National Academy of Sciences Leopoldina in Germany published a report on basics and recommendations on NO<sub>x</sub> and particulate air pollution.

The Academy calls for additional efforts to further reduce the concentration of pollutants in the air, but the focus should be more on particulate matter than on NO<sub>x</sub>.

From short-term or small-scale measures, such as driving bans, no significant air quality improvement is expected. Rather, a nationwide federal strategy for air pollution is required.

The measurements of NO<sub>x</sub> and fine dust are standardised, and the installation of the measuring stations is regulated by law. However, the researchers point out that even small changes to the air quality monitoring stations, which are within legal limits, can already lead to differences in the results. Internationally there are also different installation conditions, which reduces the comparability. Here, the opinion recommends harmonizing the measurement techniques and installation conditions.

In addition, road traffic is just one of the sources of air pollutants. However, it largely contributes to emissions of greenhouse gases (GHG). Germany will only be able to achieve its international obligations to reduce GHG with a sustainable change in traffic, the report emphasizes. This requires the development of further low-emission forms of mobility. A sustainable change in traffic will not only contribute to the reduction of traffic-related burdens but can also advance the economy.

The report (in German) is at

[www.leopoldina.org/uploads/tx\\_leopublication/2019\\_Stellungnahme\\_Saubere\\_Luft\\_Vorabdruck\\_final.pdf](http://www.leopoldina.org/uploads/tx_leopublication/2019_Stellungnahme_Saubere_Luft_Vorabdruck_final.pdf).

## German Ordinance to implement EU Alternative Fuels Directive

On 26 April 2019, Germany notified the European Commission of a draft Ordinance implementing Directive 2014/94/EU on the deployment of alternative fuels infrastructure and amending and adapting other pollution control ordinances.

In order to implement European legal provisions, adjustments to the secondary legislation of the Federal Pollution Control Act are required. To this end, the Ordinance on the properties and labelling of the quality of fuels (10<sup>th</sup> BImSchV) is being revised and the Ordinance on plants for the biological treatment of waste (30<sup>th</sup> BImSchV) is being amended.

This publication concerns automotive fuels and chlorine and bromine compounds that are added to such fuels, fuels used to operate mobile machinery and equipment (including inland waterway vessels), as well as agricultural and forestry tractors and also recreational craft that are not to be found at sea, along with the sulfur content of certain liquid fuels and their labelling, as well as the labelling of vehicles that can use these fuels.

It particularly concerns petrol, diesel, gas oil, marine diesel, biodiesel, ethanol fuel, liquefied petroleum gas, compressed natural gas and biogas as fuel, vegetable oil fuel, hydrogen as fuel and fuel oil.

More info is at <http://ec.europa.eu/growth/tools-databases/tris/en/index.cfm/search/?trisaction=search.detail&year=2019&num=189&mLang=EN>.

## Belgian City of Ghent to introduce Low Emission Zone from 2020

The Belgian City of Ghent is to introduce a Low Emission Zone (LEZ) in its inner-city area from 1 January 2020.

The zone will be controlled by automatic number plate recognition cameras, with Euro 5 and 6 diesel cars being allowed in, while petrol cars from Euro 2 onwards are permitted to enter free of charge. The authorities expect 75% of current cars to fall within these categories.

In addition, Euro 4 diesels may enter the area by paying up to €345 per year. Other, more polluting cars can enter up to eight times a year by paying €35 a time.

The focus is on reducing soot, and the city is offering a scrappage premium of €1000 and €750 for diesel and petrol cars respectively to be scrapped by LEZ residents. Additional subsidies will also be available for electric bikes and public transport.



More details of the scheme can be found at <https://stad.gent/ghent-international/mobility-ghent/low-emission-zone-ghent-2020>.

## Estonia sets Specifications for Fuels with a Higher Biofuel Content

On 24 April 2019, Estonia notified the European Commission of a national regulation to establish environmental requirements for liquid fuels, sustainability criteria for biofuels and liquid biofuels, environmental conformity monitoring and reporting requirements for liquid fuels, and the procedures for reducing greenhouse gas emissions from the usage of biofuels and liquid biofuels.

The new regulation establishes environmental requirements for fuels with a higher biofuel content (E85 and B30), environmental requirements for hydrotreated vegetable oil (HVO) and environmental requirements for alkylate gasoline used in the spark-ignition engines of non-road mobile machinery.

More info is at <http://ec.europa.eu/growth/tools-databases/tris/en/index.cfm/search/?trisaction=search.detail&year=2019&num=185&mlang=EN>.

## NORTH-AMERICA

### CARB Staff Assessment of Technical Feasibility of Lower NOx Standards

On 18 April 2019, the California Air Resources Board (CARB) posted a staff white paper, prepared by the Mobile Source Control Division Mobile Source Regulatory Development Branch staff, on the current assessment of the technical feasibility of lower NOx standards and associated test procedures for 2022 and subsequent model year medium-duty and heavy-duty diesel engines.

The main objective of this white paper is to outline staff's assessment regarding technical feasibility and cost effectiveness of possible NOx reduction programs for 2022 and subsequent model year diesel medium-duty and heavy-duty engines. Although some elements of the Heavy-duty Low NOx Omnibus (meaning "all encompassing" aspects and provisions, not only standards) Rulemaking will affect medium-duty and heavy-duty Otto cycle engines as well, this white paper focuses solely on an assessment for diesel engines. The paper stressed this is strictly CARB staff's current assessment of what is currently considered as technically achievable and cost effective for 2022 and subsequent model years. Nevertheless, this white paper cannot predict with certainty what CARB will ultimately adopt in its Heavy-duty Low NOx Omnibus Rulemaking.

It is the CARB staff's intent that this white paper will help provide clarity in addressing engine manufacturers' concerns and uncertainties with regard to lead time and

potential regulatory requirements impacting their model year 2022 through 2026 products.

The CARB staff white paper is at [www.arb.ca.gov/msprog/hdlownox/white\\_paper\\_04182019a.pdf?utm\\_medium=email&utm\\_source=govdelivery](http://www.arb.ca.gov/msprog/hdlownox/white_paper_04182019a.pdf?utm_medium=email&utm_source=govdelivery).

### Light-duty Vehicle Efficiency Technologies in the US in 2018

On 15 April 2019, the U.S. Department of Energy (DOE)'s Vehicle Technology Office's Fact of the Week said that, of all the emerging light-duty vehicle (LDV) efficiency technologies, gasoline direct injection (GDI) has seen the highest level of adoption among manufacturers, reaching 51% for the 2018 model year.

Eight of the largest manufacturers installed GDI in more than 75% of the vehicles they produced, with several near or at 100%.

Turbocharging and stop/start are two other engine technologies that reached a production share of about 30%, while cylinder deactivation (CD) was at 12%. 36% of the vehicles produced had transmissions with seven or more gears, while 22% were fitted with continuously variable transmissions (CVT).

Gasoline hybrid vehicles accounted for 4%, while plug-in hybrid, all-electric, and fuel cell vehicles had a combined total of 3%.

The DOE fact of the week is at [www.energy.gov/eere/vehicles/articles/fotw-1077-april-15-2019-emerging-fuel-saving-technologies-gasoline-direct](http://www.energy.gov/eere/vehicles/articles/fotw-1077-april-15-2019-emerging-fuel-saving-technologies-gasoline-direct).

### CARB announces Settlement with Fiat over Diesel Engine Emission Violations

On 17 April 2019, the California Air Resources Board (CARB) announced a settlement with Fiat Powertrain Technologies Industrial S.p.A for emissions-related violations affecting nearly 2000 on-road and off-road diesel engines.

The settlement includes a mandatory recall of affected vehicles and \$6.4 million (€5.7 million) in penalties.

The enforcement case began after the company informed CARB in 2015 that it had made unapproved repairs and modifications to CARB-certified on-road engines. The repairs were intended to address an oil leakage problem in MY 2011-2014 engines. Emission-related field fixes must be reviewed and approved by CARB to ensure they do not increase emissions. Fiat failed to inform CARB about the fixes when they were made and also disclosed that it had certified MY 2014-2016 off-road engines using incorrect emissions data. Fiat fully cooperated with CARB's investigation.

As part of its settlement with CARB, Fiat must implement a full, mandatory recall of vehicles equipped with the on-road engines in order to correct the oil leakage issues and provide a one-year warranty for the replaced parts. Fiat must also conduct additional in-use and onboard diagnostic testing on several repaired vehicles containing these engines.

The company will pay \$2 million (€1.8 million) of its \$6.4 million penalty to a Supplemental Environmental Project to install air filtration systems in facilities with sensitive populations, such as schools, senior centres, and hospitals throughout the Bay Area. The remaining \$4.4 million (€3.9 million) will be paid to the Air Pollution Control Fund to support air pollution research and education.

More info is at [ww2.arb.ca.gov/news/flat-pays-64-million-penalty-diesel-emissions-violations](http://ww2.arb.ca.gov/news/flat-pays-64-million-penalty-diesel-emissions-violations)

## ASIA PACIFIC

### Shanghai to implement China 6 Light-duty Standards from 1 July 2019

According to an announcement recently released by the Shanghai municipal government, China's Stage 6 light-duty emission standard will officially come into effect in Shanghai starting 1 July 2019.

The China 6a light-duty standards will begin their national implementation on 1 July 2020. Apart from Shanghai, there were several provinces and cities in China such as Hangzhou, Hainan, Tianjin, Beijing, Guangzhou, Shandong, Chengdu, Hebei and Shaanxi whose local governments have announced plans to formally implement the China 6 standards prior to the official national implementation date.

The China 6 light-duty standards combine best practices from both European and US light-duty regulatory requirements. These standards feature two sets of fuel-neutral emission limits for air and climate pollutants (China 6a and 6b), which will be put into effect across all of China on 1 July 2020 and 2 July 2023, respectively. In addition, the China 6 Standard has its testing basis shifted from the New European Driving Cycle (NEDC) to the more representative and dynamic World Harmonized Light Vehicle Test Cycle (WLTC) and more rigorous World Harmonized Light Vehicle Test procedures (WLTP).

### High-Emission Vehicles to be restricted from Downtown Seoul

On 15 April 2019, the Seoul government in South-Korea announced that high-emission vehicles will be restricted from the centre of the city from July 2019, as part of the municipal government's new policy measures to reduce fine dust pollution in the capital.

Grade 5 emission vehicles, mostly diesel cars, will be barred from entering Seoul's Green Transport Promotion

Zone, a 16.7 km<sup>2</sup> downtown area designated within the Joseon Dynasty fortress walls, the government said.

After a five-month grace period, violators will be fined 250 000 won (€190) from 1 December 2019. The stringent driving restrictions will be applied to the 2.45 million vehicles that are classified by the Ministry of Environment as grade 5 emission cars. At present, about 20 000 to 30 000 grade 5 emission cars are estimated to pass through the zone a day.

The latest policy measures came after the average concentration of harmful ultrafine particles in the air of Seoul reached the highest level since record-keeping began in 2015.

The government of Seoul also said it will cooperate with private businesses to gradually replace about 100 000 delivery motorcycles with eco-friendly electric motorcycles by 2025. Diesel-powered delivery motorcycles are known to emit at least six times more air pollutants than small passenger cars. This year, it aims to distribute 1000 electric motorcycles to franchise and delivery companies.

In addition, the municipal government will replace about 450 diesel-powered village buses with electric buses from next year in cooperation with the central government.

More detail can be found at [www.koreaherald.com/view.php?ud=20190415000705](http://www.koreaherald.com/view.php?ud=20190415000705).

## GENERAL

### Ricardo Report on Real-World Emissions in the London LEZ

On 27 March 2019, Ricardo published a report comparing the distribution of NO<sub>x</sub> emissions based on Euro standard, for cars and Heavy Goods Vehicles (HGVs) operating in London.

The data are taken from Ricardo's database of remote sensing measurements. Ricardo's conclusion regarding diesel cars is that the Euro 6 distribution shows that about three-quarters of these vehicles have emissions that are cleaner than the lowest 25% of the previous Euro 5 standard vehicles. As such, a shift to Euro 6, driven by the implementation of the London Ultra Low Emission Zone (ULEZ), or any other Low Emission Zone (LEZ) or Clean Air Zone (CAZ) policy, clearly has the potential to considerably reduce NO<sub>x</sub> emissions.

What is also very apparent from Figure 1 is that all distributions overlap to some degree (i.e. some pre-Euro 6 vehicles are lower-emitting than some Euro 6 vehicles). From a LEZ perspective, this means that some older, but low emission vehicles, will be barred from entering an LEZ (unless owners pay the charge). This reality has consequences for the optimum design of emissions reduction policies, arguably raising the question as to

whether LEZ schemes based on Euro standards are too blunt an approach to effectively tackle air pollution.

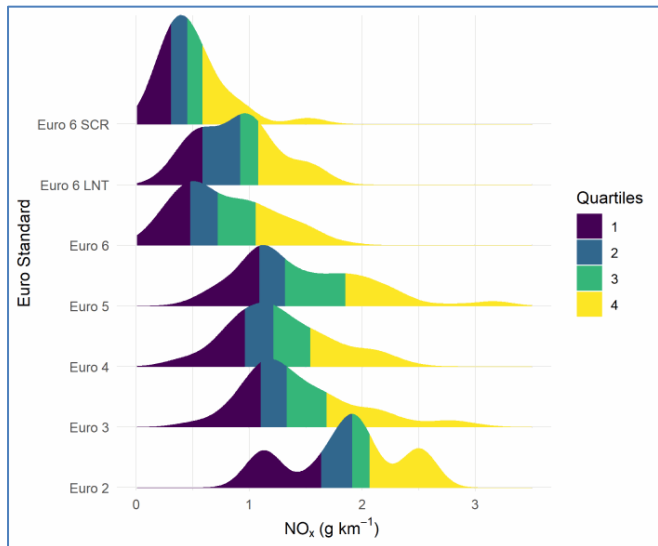


Figure 1. Distribution of NO<sub>x</sub> emissions by Euro standard for diesel passenger cars

The data shows that emissions from SCR-equipped vehicles are about half that of LNT vehicles, although it does not fully reveal the complexity of Euro 6 and the many stages involved (Euro 6b, c, d-temp and d). Therefore, within Euro 6, there is a wide range of emissions performance. Vehicles that have been entering the fleet in the past year or so have considerably lower emissions than early generation Euro 6 vehicles that entered the fleet from 2014. The difference is striking, at least a factor of two overall – and higher for many individual models.

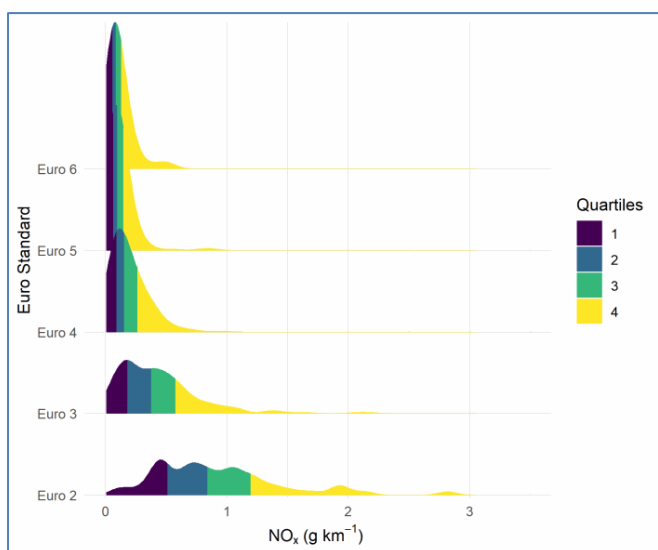


Figure 2. Distribution of NO<sub>x</sub> emissions by Euro standard for petrol passenger cars

The situation for petrol passenger cars differs markedly from diesel cars as shown in Figure 2. NO<sub>x</sub> emissions from petrol passenger cars are generally far lower than those from diesel cars. Euro 5 and Euro 6 petrol vehicles have very low emissions, and Euro 4 and older vehicles exhibit wider distributions and higher emissions along with some indication of vehicle emissions deterioration effects. These older petrol vehicles, while higher emitting than new petrol vehicles, are generally very low emitters compared with diesel vehicles – thus a LEZ based on Euro 4 or newer vehicles seems a very reasonable approach from an emissions evidence perspective.

The situation for heavy goods vehicles (HGVs), shown in Figure 3, is different again. In the case of HGVs, the real-world reduction in NO<sub>x</sub> realised from moving from Euro V to VI is strikingly considerable – shifting the HGV fleet to Euro VI is a clear win.

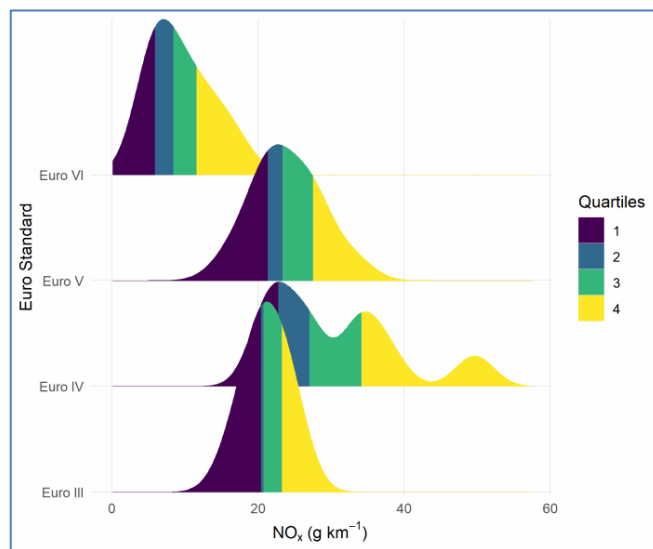


Figure 3. Distribution of NO<sub>x</sub> emissions by Euro standard for HGVs over 12.5 tonnes

This data helps to demonstrate the importance of understanding real-world behaviour and why fleet-weighted average real-world emissions offer a sound basis upon which to develop truly evidence-based, low-emission policy. This also highlights the real-world benefits that are likely to be seen from implementing LEZs and CAZs.

The Ricardo report is at <https://ee.ricardo.com/news/real-world-emissions-in-the-london-ulez>.

## ICCT Report on Worldwide Use of Remote Sensing

On 29 April 2019, the International Council on Clean Transportation (ICCT) published a report on the worldwide use of remote sensing to measure motor vehicle emissions.



According to the ICCT, remote sensing is potentially the best option for fleet emissions monitoring, the development of an emissions factor, the identification of individual high- or low-emitting vehicles, and the screening for groups of high-emitting vehicles for market surveillance.

The development and use of remote vehicle emissions sensing has been growing in recent years. Data has been collected on all continents, with more than one million measurements per year collected in China, the US, Hong Kong, and Korea, and more than one million measurements since 2010 in India. In Europe, data collection activities have been mostly in western countries – with more than a million measurements since 2010 in Spain – and northern countries.



The pollutants measured varied across the different remote sensing testing programs. The large majority measured nitric oxide (NO), hydrocarbons (HC), and carbon dioxide (CO<sub>2</sub>) while more than half the programs measured nitrogen dioxide (NO<sub>2</sub>), carbon monoxide (CO), and some measure of particulates. Most of the applications have focused on research and overall fleet emission trends. In some countries, remote sensing is moving into identification of high-emitting vehicle groups for market surveillance and identification of individual high- and low-emitting vehicles to assist with periodic vehicle emission inspections. The US and China are leaders in remote sensing deployment and are demonstrating how remote sensing can contribute to identification of and enforcement against high-emitting vehicles. Recently there has been a significant increase in the use of and interest in remote sensing in the EU.

There are multiple opportunities to increase the use of remote sensing data, the ICCT said. Countries and regions should ideally explore ways to reduce barriers to remote sensing, such as improving equipment and data analysis, as well as decreasing the cost and addressing other

logistical hurdles. The ICCT recommendations for ways to lower remote sensing barriers include:

- Independent validation of the various technologies available on the market.
- Development of national and international centralized databases on vehicles' registration data, accessible quickly and at low cost while respecting privacy concerns.
- Continued development of technologies that allow unmanned operation while lowering their maintenance cost.
- Extending the scope of measured gases.
- Devising and improving methods to use real-world remote sensing to enhance emission factors used for air quality modelling and other applications.
- Scaling up the amount of remote sensing and number of measurement sites to increase the proportion of the in-use fleet that is regularly measured.

The ICCT report is at [www.theicct.org/sites/default/files/publications/World-wide\\_remote\\_sensing\\_2019\\_4\\_30.pdf](http://www.theicct.org/sites/default/files/publications/World-wide_remote_sensing_2019_4_30.pdf).

## State of Global Air 2019 Report

On 3 April 2019, the Health Effects Institute (HEI) released the annual State of Global Air report which brings into one place the latest information on air quality and health for countries around the globe.

In 2017, 92% of the world's population still lived in areas where PM<sub>2.5</sub> exceeds the World Health Organization (WHO) guideline for healthy air; 54% still lived in areas exceeding the WHO's least-stringent interim target, often by substantial margins. Household burning of solid fuels — coal, wood, charcoal, dung, and other forms of biomass — remains an important source of exposure to particulate matter, especially in low- and middle-income countries in South Asia and sub-Saharan Africa. Ozone concentrations are creeping upward globally, with particularly pronounced growth in rapidly developing countries like China.

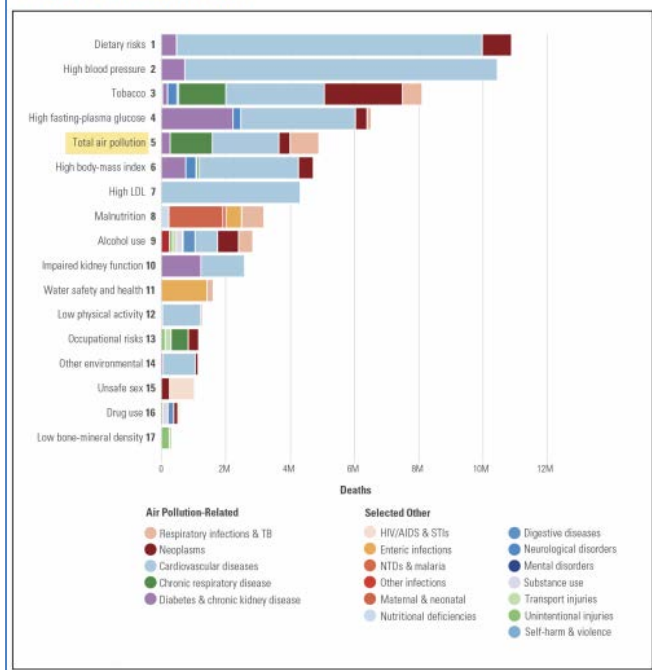
Air pollution is the fifth highest cause of death among all health risks, ranking just below smoking; each year, more people die from air pollution related disease than from road traffic injuries or malaria.

Long-term exposure to outdoor and indoor air pollution contributed to nearly 5 million deaths from stroke, heart attack, diabetes, lung cancer, and chronic lung disease worldwide in 2017. Importantly, aggressive actions on fighting air pollution by China have showed the first signs of progress in reducing exposure, even as South Asian countries – Bangladesh, India, Nepal and Pakistan - led the world as the most polluted region, with over 1.5 million air-pollution related deaths.

Worldwide, air pollution reduced life expectancy by an average of 20 months in 2017, a global impact rivaling that

of smoking. Lost life rises to over 2 years and 6 months for children born in South Asia (Bangladesh, India, Nepal, Pakistan) where air pollution is at its worst.

**Figure 1. Global ranking of risk factors by total number of deaths from all causes for all ages and both sexes in 2017.**



Much work remains to be done to further reduce air pollution and its heavy toll on population health. Even with improvements in air quality, the burden of disease attributable to air pollution continues to rise as populations grow, age, and become more susceptible to the noncommunicable diseases most closely related to air pollution.

The State of Global Air report is at [www.stateofglobalair.org/sites/default/files/soga\\_2019\\_report.pdf](http://www.stateofglobalair.org/sites/default/files/soga_2019_report.pdf).

## Effect of Diesel Fuel Properties on Fuel Economy and Emissions of Three Cars

On 8 April 2019, the European Petroleum Refiners Association, Concawe, published a new report on the effect of diesel fuel properties on the fuel economy and emissions of three passenger cars.

The objective of this project was to assess the effects of varying diesel fuel properties associated with increasing Fatty Acid Methyl Ester (FAME) content on pollutant emissions and fuel consumption of light-duty vehicles. To that aim three passenger cars were tested, each one of them equipped with a different exhaust after-treatment system and complying with different European emissions standards: Euro 4, 5 and 6. Four diesel fuel properties were examined namely density, cetane number, biodiesel

(FAME) content and Polycyclic Aromatic Hydrocarbon (PAH) content.

The study focused on the effect of potentially increasing FAME content in the fuel above the current 7% limit to help meet the original renewable energy directive (RED) obligations. Tests included two driving cycles, the New European Driving Cycle (NEDC) and the Worldwide harmonized Light vehicle Test Cycle (WLTC), as well as a steady-state point for the characterization of particle emissions. Changes were then statistically modelled to look for trends in the data. Some established trends were confirmed but overall the effect of increasingly sophisticated aftertreatment system, vehicle calibration and test cycle clearly dominated over fuel effects for emissions and efficiency in this study where changes in fuel properties were relatively small.

Increasing FAME content for instance had the expected effect of increasing volumetric fuel consumption whereas it had no consistent negative or positive effects on emissions. NOx penalties and PM benefits were only observed in the oldest technology vehicle.

On cetane number, CO<sub>2</sub> benefits were measured with higher cetane number only in the Euro 5 car under NEDC operation, whereas PM and NOx penalties were only measured in the Euro 4 NEDC and a NOx benefit was noted in the Euro 6 vehicle (WLTC only), indicating cetane number effects are vehicle and test cycle dependent. Overall there is no conclusive evidence in this programme that supports the reduction or increase in the current cetane number minimum specification level.

The Concawe report is at [www.concawe.eu/wp-content/uploads/Rpt\\_19-2.pdf](http://www.concawe.eu/wp-content/uploads/Rpt_19-2.pdf).

## RESEARCH SUMMARY

### Effects of Emissions and Pollution

Fine particulate matter exposure during pregnancy and infancy periods and incident asthma, Chau-Ren Jung, et al.; *Journal of Allergy and Clinical Immunology* (in press), doi: 10.1016/j.jaci.2019.03.024.

Hourly associations between exposure to ambient particulate matter and emergency department visits in an urban population of Shenzhen, China, Dieyi Chen, et al.; *Atmospheric Environment* (15 July 2019), Vol. 209, pp. 78-85, doi: 10.1016/j.atmosenv.2019.04.021.

Long-term health impact assessment of total PM<sub>2.5</sub> in Europe during the 1990–2015 period, Giancarlo Ciarelli, et al.; *Atmospheric Environment: X* (in press), doi: 10.1016/j.aeaoa.2019.100032.

Short-term effect of PM<sub>2.5</sub>/O<sub>3</sub> on non-accidental and respiratory deaths in highly polluted area of China, Ruoqian Lei, et al.; *Atmospheric Pollution Research* (in press), doi: 10.1016/j.apr.2019.03.013.

Emerging role of air pollution in autoimmune diseases, Chan-NaZhao, et al.; *Autoimmunity Reviews* (in press), doi: 10.1016/j.autrev.2018.12.010.

Exposure to air pollution during pregnancy and newborn liver function, Akbar Pejhan, et al.; *Chemosphere* (July 2019), Vol. 226, pp. 447-453, doi: [10.1016/j.chemosphere.2019.03.185](https://doi.org/10.1016/j.chemosphere.2019.03.185).

Estimating the acute effects of ambient ozone pollution on the premature rupture of membranes in Xinxiang, China, Jie Song, et al.; *Chemosphere* (July 2019), Vol. 227, pp. 191-197, doi: [10.1016/j.chemosphere.2019.04.062](https://doi.org/10.1016/j.chemosphere.2019.04.062).

A systematic review of cardiovascular responses associated with ambient black carbon and fine particulate matter, E. Kirrane, et al.; *Environment International* (June 2019), Vol. 127, pp. 305-316, doi: [10.1016/j.envint.2019.02.027](https://doi.org/10.1016/j.envint.2019.02.027).

Traffic related air pollution and the burden of childhood asthma in the contiguous United States in 2000 and 2010, Raed Alotaibi, et al.; *Environment International* (in press), doi: [10.1016/j.envint.2019.03.041](https://doi.org/10.1016/j.envint.2019.03.041).

Perturbations of the arginine metabolome following exposures to traffic-related air pollution in a panel of commuters with and without asthma, Donghai Liang, et al.; *Environment International* (June 2019), Vol. 127, pp. 503-513, doi: [10.1016/j.envint.2019.04.003](https://doi.org/10.1016/j.envint.2019.04.003).

Association of ambient air pollutants and birth weight in Ningbo, 2015–2017, Zhen Li, et al.; *Environmental Pollution* (June 2019), Vol. 249, pp. 629-637, doi: [10.1016/j.envpol.2019.03.076](https://doi.org/10.1016/j.envpol.2019.03.076).

Impacts of hazardous metals and PAHs in fine and coarse particles with long-range transports in Taipei City, Chin-Yu Hsu, et al.; *Environmental Pollution* (in press), doi: [10.1016/j.envpol.2019.04.038](https://doi.org/10.1016/j.envpol.2019.04.038).

A time series analysis of the relationship between apparent temperature, air pollutants and ischemic stroke in Madrid, Spain, Dominic Royé, et al.; *Environmental Research* (June 2019), Vol. 173, pp. 349-358, doi: [10.1016/j.envres.2019.03.065](https://doi.org/10.1016/j.envres.2019.03.065).

The Effects of the Environment on Asthma Disease Activity, Margee Louisias, et al.; *Immunology and Allergy Clinics of North America* (May 2019), Vol. 39, pp. 163-175, doi: [10.1016/j.iac.2018.12.005](https://doi.org/10.1016/j.iac.2018.12.005).

NO<sub>2</sub> increases the risk for childhood asthma: a global concern, Rajen Naidoo, et al.; *The Lancet Planetary Health* (April 2019), Vol. 3 (4), pp. e155-e156, doi: [10.1016/S2542-5196\(19\)30059-2](https://doi.org/10.1016/S2542-5196(19)30059-2).

Global, national, and urban burdens of paediatric asthma incidence attributable to ambient NO<sub>2</sub> pollution: estimates from global datasets, Pattanun Achakulwisut, et al.; *The Lancet Planetary Health* (April 2019), Vol. 3 (4), pp. e166-e178, doi: [10.1016/S2542-5196\(19\)30046-4](https://doi.org/10.1016/S2542-5196(19)30046-4).

Effects of air pollution on mitochondrial function, mitochondrial DNA methylation, and mitochondrial peptide expression, Carrie Breton, et al.; *Mitochondrion* (May 2019), Vol. 46, pp. 22-29, doi: [10.1016/j.mito.2019.04.001](https://doi.org/10.1016/j.mito.2019.04.001).

In utero exposure to diesel exhaust is associated with alterations in neonatal cardiomyocyte transcription, DNA methylation and metabolic perturbation, Jamie Goodson, et al.; *Particle and Fibre Toxicology* (2019), Vol. 16:17, doi: [10.1186/s12989-019-0301-9](https://doi.org/10.1186/s12989-019-0301-9).

Particle toxicology and health - where are we?, Michael Riediker, et al.; *Particle and Fibre Toxicology* (2019), Vol. 16:19, doi: [10.1186/s12989-019-0302-8](https://doi.org/10.1186/s12989-019-0302-8).

Ecological determinants of respiratory health: Examining associations between asthma emergency department visits, diesel particulate matter, and public parks and open space in Los Angeles, California, Jason Douglas, et al.; *Preventive Medicine Reports* (June 2019), Vol. 14, p. 100855, doi: [10.1016/j.pmedr.2019.100855](https://doi.org/10.1016/j.pmedr.2019.100855).

Fine-scale damage estimates of particulate matter air pollution reveal opportunities for location-specific mitigation of emissions Andrew Goodkind, et al.; *Proceedings of the National Academy of Sciences of the USA* (30 April 2019), Vol. 116 (18), pp. 8775-8780, doi: [10.1073/pnas.1816102116](https://doi.org/10.1073/pnas.1816102116).

Ambient air pollution exposure and risk of depression: A systematic review and meta-analysis of observational studies, Ying Zeng, et al.; *Psychiatry Research* (June 2019), Vol. 276, pp. 69-78, doi: [10.1016/j.psychres.2019.04.019](https://doi.org/10.1016/j.psychres.2019.04.019).

Maternal exposure to gaseous ambient air pollutants increases the risk of preterm birth in the Pearl River Delta, China 2014–2017, Pi Guo, et al.; *Science of The Total Environment* (June 2019), Vol. 671, pp. 959-970, doi: [10.1016/j.scitotenv.2019.03.375](https://doi.org/10.1016/j.scitotenv.2019.03.375).

Estimating the health impact of air pollution in Scotland, and the resulting benefits of reducing concentrations in city centres, Duncan Lee, et al.; *Spatial and Spatio-temporal Epidemiology* (June 2019), Vol. 29, pp. 85-96, doi: [10.1016/j.sste.2019.02.003](https://doi.org/10.1016/j.sste.2019.02.003).

Bayesian modeling for spatially misaligned health and air pollution data through the INLA-SPDE approach, Michela Cameletti, et al.; *Spatial Statistics* (June 2019), Vol. 31, p. 100353, doi: [10.1016/j.spasta.2019.04.001](https://doi.org/10.1016/j.spasta.2019.04.001).

Environmental and health impacts due to the violation of Brazilian emissions control program standards in Sao Paulo Metropolitan Area, Luciana Leirião, et al.; *Transportation Research Part D: Transport and Environment* (May 2019), Vol. 70, pp. 70-76, doi: [10.1016/j.trd.2019.03.006](https://doi.org/10.1016/j.trd.2019.03.006).

## Air Quality, Sources and Exposure

Satellite-based prediction of daily SO<sub>2</sub> exposure across China using a high-quality random forest-spatiotemporal Kriging (RF-STK) model for health risk assessment, Rui Li, et al.; *Atmospheric Environment* (July 2019), Vol. 208, pp. 10-19, doi: [10.1016/j.atmosenv.2019.03.029](https://doi.org/10.1016/j.atmosenv.2019.03.029).

Air quality impacts from the electrification of light-duty passenger vehicles in the United States, Jordan Schnell, et al.; *Atmospheric Environment* (1 July 2019), Vol. 208, pp. 95-102, doi: [10.1016/j.atmosenv.2019.04.003](https://doi.org/10.1016/j.atmosenv.2019.04.003).

Changes in United States deposition of nitrogen and sulfur compounds over five decades from 1970 to 2020, Uarporn Nopmongcol, et al.; *Atmospheric Environment* (15 July 2019), Vol. 209, pp. 144-151, doi: [10.1016/j.atmosenv.2019.04.018](https://doi.org/10.1016/j.atmosenv.2019.04.018).

Past and future trends of vehicle emissions in Tianjin, China, from 2000 to 2030, Shida Sun, et al.; *Atmospheric Environment* (15 July 2019), Vol. 209, pp. 182-191, doi: [10.1016/j.atmosenv.2019.04.016](https://doi.org/10.1016/j.atmosenv.2019.04.016).

Spatial trends and sources of PM<sub>2.5</sub> organic carbon volatility fractions (OC<sub>x</sub>) across the Los Angeles Basin, Ehsan Soleimanian, et al.; *Atmospheric Environment* (15 July 2019), Vol. 209, pp. 201-211, doi: [10.1016/j.atmosenv.2019.04.027](https://doi.org/10.1016/j.atmosenv.2019.04.027).

Particulate matter bound polycyclic aromatic hydrocarbons: Toxicity and health risk assessment of exposed inhabitants, Ritwika Roy, et al.; *Atmospheric Environment* (1 August 2019), Vol. 210, pp. 47-57, doi: [10.1016/j.atmosenv.2019.04.034](https://doi.org/10.1016/j.atmosenv.2019.04.034).

Calibration of low-cost NO<sub>2</sub> sensors in an urban air quality network, Veravan Zoest, et al.; *Atmospheric Environment* (1 August 2019), Vol. 210, pp. 66-75, doi: [10.1016/j.atmosenv.2019.04.048](https://doi.org/10.1016/j.atmosenv.2019.04.048).

New method for evaluating winter air quality: PM<sub>2.5</sub> assessment using Community Multi-Scale Air Quality Modeling (CMAQ) in Xi'an, Xiaochun Yang, et al.; *Atmospheric Environment* (in press), doi: [10.1016/j.atmosenv.2019.04.019](https://doi.org/10.1016/j.atmosenv.2019.04.019).



China's black carbon emission from fossil fuel consumption in 2015, 2020, and 2030, Yan Lu, et al.; *Atmospheric Environment* (in press), doi: [10.1016/j.atmosenv.2019.04.032](https://doi.org/10.1016/j.atmosenv.2019.04.032).

Structuring an Integrated Air Quality Monitoring Network in Large Urban Areas – Discussing the Purpose, Criteria and Deployment Strategy, Said Munir, et al.; *Atmospheric Environment: X* (April 2019), Vol. 2, p. 100027, doi: [10.1016/j.aeaoa.2019.100027](https://doi.org/10.1016/j.aeaoa.2019.100027).

A trend analysis approach for air quality network data, Polly Lang, et al.; *Atmospheric Environment: X* (April 2019), Vol. 2, p. 100030, doi: [10.1016/j.aeaoa.2019.100030](https://doi.org/10.1016/j.aeaoa.2019.100030).

Impact assessment of vehicular exhaust emissions by microscale simulation using automatic traffic flow measurements, Grazia Ghermandi, et al.; *Atmospheric Pollution Research* (in press), doi: [10.1016/j.apr.2019.04.004](https://doi.org/10.1016/j.apr.2019.04.004).

Commuter exposure to particulate matters in four common transportation modes in Nanjing, Jialei Shen and Zhi Gao; *Building and Environment* (June 2019), Vol. 156, pp. 156-170, doi: [10.1016/j.buildenv.2019.04.018](https://doi.org/10.1016/j.buildenv.2019.04.018).

Assessment of PM<sub>2.5</sub> and PAH content in PM<sub>2.5</sub> emitted from mobile source gasoline-fueled vehicles in concomitant with the vehicle model and mileages, Yuan-Chung Lin, et al.; *Chemosphere* (July 2019), Vol. 226, pp. 502-508, doi: [10.1016/j.chemosphere.2019.03.137](https://doi.org/10.1016/j.chemosphere.2019.03.137).

Development of a fleet emissions control (FEC) framework for passenger cars, Saniul Alamab and Aonghus McNabola; *Journal of Cleaner Production* (20 July 2019), Vol. 226, pp. 482-492, doi: [10.1016/j.jclepro.2019.04.094](https://doi.org/10.1016/j.jclepro.2019.04.094).

Impact on Reduction of Pollutant Emissions from Passenger Cars when Replacing Euro 4 with Euro 6d Diesel Engines Considering the Altitude Influence, José Serrano, et al.; *Energies* (2019), Vol. 12 (7), p. 1278, doi: [10.3390/en12071278](https://doi.org/10.3390/en12071278).

Forecasting short-term peak concentrations from a network of air quality instruments measuring PM<sub>2.5</sub> using boosted gradient machine models, Georgia Miskell, et al.; *Journal of Environmental Management* (July 2019), Vol. 242, pp. 56-64, doi: [10.1016/j.jenvman.2019.04.010](https://doi.org/10.1016/j.jenvman.2019.04.010).

Exposure to air pollution inside electric and diesel-powered passenger trains, Maria Andersen, et al.; *Environ. Sci. Technol.* (2019), Vol. 53 (8), pp. 4579-4587, doi: [10.1021/acs.est.8b06980](https://doi.org/10.1021/acs.est.8b06980).

Study of Brake Wear Particle Emissions: Impact of Braking and Cruising Conditions, Ferdinand Heinrich Farwick zum Hagen, et al.; *Environ. Sci. Technol.* (in press), doi: [10.1021/acs.est.8b07142](https://doi.org/10.1021/acs.est.8b07142).

Comparison of model estimates from an intra-city land use regression model with a national satellite-LUR and a regional Bayesian Maximum Entropy model, in estimating NO<sub>2</sub> for a birth cohort in Sydney, Australia, Christine Cowie, et al.; *Environmental Research* (July 2019), Vol. 174, pp. 24-34, doi: [10.1016/j.envres.2019.03.068](https://doi.org/10.1016/j.envres.2019.03.068).

Cost-Benefit Analysis and Air Quality Related Health Impacts: A European Perspective, Mike Holland; *Reference Module in Earth Systems and Environmental Sciences* (2019), doi: [10.1016/B978-0-12-409548-9.10649-9](https://doi.org/10.1016/B978-0-12-409548-9.10649-9).

Sources of humic-like substances (HULIS) in PM<sub>2.5</sub> in Beijing: Receptor modeling approach, Xinghua Li, et al.; *Science of The Total Environment* (June 2019), Vol. 671, pp. 765-775, doi: [10.1016/j.scitotenv.2019.03.333](https://doi.org/10.1016/j.scitotenv.2019.03.333).

Estimating contributions of vehicular emissions to PM<sub>2.5</sub> in a roadside environment: A multiple approach study, Yee Wong, et al.; *Science of*

*The Total Environment* (July 2019), Vol. 672, pp. 776-788, doi: [10.1016/j.scitotenv.2019.03.463](https://doi.org/10.1016/j.scitotenv.2019.03.463).

Is Active Travel a Breath of Fresh Air? Examining Children's Exposure to Air Pollution During the School Commute, Jason Gilliland, et al.; *Spatial and Spatio-temporal Epidemiology* (June 2019), Vol. 29, pp. 51-57, doi: [10.1016/j.sste.2019.02.004](https://doi.org/10.1016/j.sste.2019.02.004).

Impact of route choice and period of the day on cyclists' exposure to black carbon in London, Rotterdam and São Paulo, Veronika Brand, et al.; *Journal of Transport Geography* (April 2019), Vol. 76, pp. 153-165, doi: [10.1016/j.jtrangeo.2019.03.007](https://doi.org/10.1016/j.jtrangeo.2019.03.007).

Energy consumption and pollutant exposure estimation for cyclist routes in urban areas, Diego Giménez-Gaydou, et al.; *Transportation Research Part D: Transport and Environment* (July 2019), Vol. 72, pp. 1-16, doi: [10.1016/j.trd.2019.04.005](https://doi.org/10.1016/j.trd.2019.04.005).

## Emissions Measurements and Modelling

Using a new Mobile Atmospheric Chamber (MACH) to investigate the formation of secondary aerosols from mobile sources: The case of gasoline direct injection vehicles, Diep Vu, et al.; *Journal of Aerosol Science* (July 2019), Vol. 133, pp. 1-11, doi: [10.1016/j.jaerosci.2019.03.009](https://doi.org/10.1016/j.jaerosci.2019.03.009).

Computational fluid dynamics simulation of reactive fine particulate matter in a street canyon, Minjoong Kim, et al.; *Atmospheric Environment* (15 July 2019), Vol. 209, pp. 54-66, doi: [10.1016/j.atmosenv.2019.04.013](https://doi.org/10.1016/j.atmosenv.2019.04.013).

Numerical investigation of airflow patterns and pollutant dispersions induced by a fleet of vehicles inside road tunnels using dynamic mesh Part II: Pollutant dispersion and exposure levels, Xiaocheng Song and Yu Zhao; *Atmospheric Environment* (in press), doi: [10.1016/j.atmosenv.2019.04.028](https://doi.org/10.1016/j.atmosenv.2019.04.028).

Optimization of the parallel and mild hybrid vehicle platforms operating under conventional and advanced combustion modes, Jesús Benajes, et al.; *Energy Conversion and Management* (June 2019), Vol. 190, pp. 73-90, doi: [10.1016/j.enconman.2019.04.010](https://doi.org/10.1016/j.enconman.2019.04.010).

Particle emissions of Euro VI, EEV and retrofitted EEV city buses in real traffic, Anssi Järvinen, et al.; *Environmental Pollution* (July 2019), Vol. 250, pp. 708-716, doi: [10.1016/j.envpol.2019.04.033](https://doi.org/10.1016/j.envpol.2019.04.033).

On-Board Sensor-Based NO<sub>x</sub> Emissions from Heavy-Duty Diesel Vehicles, Yi Tan, et al.; *Environ. Sci. Technol.* (in press), doi: [10.1021/acs.est.8b07048](https://doi.org/10.1021/acs.est.8b07048).

Comparison of real-world vehicle fuel use and tailpipe emissions for gasoline-ethanol fuel blends, Weichang Yuan, et al.; *Fuel* (August 2019), Vol. 249, pp. 352-364, doi: [10.1016/j.fuel.2019.03.115](https://doi.org/10.1016/j.fuel.2019.03.115).

Experimental study of engine performance and emissions for hydrogen diesel dual fuel engine with exhaust gas recirculation, Sartha kNag, et al.; *International Journal of Hydrogen Energy* (3 May 2019), Vol. 44 (23), pp. 12163-12175, doi: [10.1016/j.ijhydene.2019.03.120](https://doi.org/10.1016/j.ijhydene.2019.03.120).

Influences of engine faults on pollutant emission, Marius Toma, et al.; *Procedia Manufacturing* (2019), Vol. 32, pp. 529-536, doi: [10.1016/j.promfg.2019.02.249](https://doi.org/10.1016/j.promfg.2019.02.249).

When diesel NO<sub>x</sub> aftertreatment systems meet advanced biofuels, J. Hernández, et al.; *Results in Engineering* (June 2019), Vol. 2, p. 100009, doi: [10.1016/j.rineng.2019.100009](https://doi.org/10.1016/j.rineng.2019.100009).

A phenomenological model for particle number and size distributions of a diesel engine with a diesel oxidation catalyst, Pi-qiang Tan, et al.; *Science of The Total Environment* (July 2019), Vol. 672, pp. 536-550, doi: [10.1016/j.scitotenv.2019.03.476](https://doi.org/10.1016/j.scitotenv.2019.03.476).

Evaluation of technological solutions for compliance of environmental legislation in light-duty passenger: A numerical and experimental approach, A. Taborda, et al.; *Transportation Research Part D: Transport and Environment* (May 2019), Vol. 70, pp. 135-146, doi: [10.1016/j.trd.2019.04.004](https://doi.org/10.1016/j.trd.2019.04.004).

On-highway vehicle emission factors, and spatial patterns, based on mobile monitoring and absolute principal component score, Yifan Wen, et al.; *Science of The Total Environment* (1 August 2019), Vol. 676, pp. 242-251, doi: [10.1016/j.scitotenv.2019.04.185](https://doi.org/10.1016/j.scitotenv.2019.04.185).

## Emissions Control, Catalysis, Filtration

Cu<sub>x</sub>Ce<sub>1-x</sub>O<sub>2</sub> nanoflakes with improved catalytic activity and thermal stability for diesel soot combustion, Bing Cui, et al.; *Applied Catalysis A: General* (May 2019), Vol. 578, pp. 20-29, doi: [10.1016/j.apcata.2019.03.025](https://doi.org/10.1016/j.apcata.2019.03.025).

Oxidation of C<sub>3</sub>H<sub>8</sub>, iso-C<sub>5</sub>H<sub>12</sub> and C<sub>3</sub>H<sub>6</sub> under near-stoichiometric and fuel-lean conditions over aged Pt-Pd/Al<sub>2</sub>O<sub>3</sub> catalysts with different Pt:Pd ratios, Jonghyun Kim, et al.; *Applied Catalysis B: Environmental* (15 August 2019), Vol. 251, pp. 283-294, doi: [10.1016/j.apcatb.2019.04.001](https://doi.org/10.1016/j.apcatb.2019.04.001).

Catalytic decomposition of N<sub>2</sub>O on supported Rh catalysts, Yuejin Li, et al.; *Catalysis Today* (in press), doi: [10.1016/j.cattod.2019.04.063](https://doi.org/10.1016/j.cattod.2019.04.063).

Abatement of various types of VOCs by adsorption/catalytic oxidation: A review, Cuiting Yang, et al.; *Chemical Engineering Journal* (August 2019), Vol. 370, pp. 1128-1153, doi: [10.1016/j.cej.2019.03.232](https://doi.org/10.1016/j.cej.2019.03.232).

Development of a 2D Model of a SCR Catalyst on a DPF, V.R. Chundru, et al.; *Emiss. Control Sci. Technol.* (June 2019), Vol. 5 (2), pp. 133-171, doi: [10.1007/s40825-019-00115-4](https://doi.org/10.1007/s40825-019-00115-4).

Comparison of NO<sub>x</sub> Adsorption/Desorption Behaviors over Pd/CeO<sub>2</sub> and Pd/SSZ-13 as Passive NO<sub>x</sub> Adsorbers for Cold Start Application, Yongwoo Kim, et al.; *Emiss. Control Sci. Technol.* (June 2019), Vol. 5 (2), pp. 172-182, doi: [10.1007/s40825-019-00119-0](https://doi.org/10.1007/s40825-019-00119-0).

Aftertreatment Protocols for Catalyst Characterization and Performance Evaluation: Low-Temperature Oxidation, Storage, Three-Way, and NH<sub>3</sub>-SCR Catalyst Test Protocols, *Emiss. Control Sci.*

*Technol.* (June 2019), Vol. 5 (2), pp. 183-214, doi: [10.1007/s40825-019-00120-7](https://doi.org/10.1007/s40825-019-00120-7).

Oxidative Reactivity of Particulate Samples from Different Diesel Combustion Systems and Its Relation to Structural and Spectral Characteristics of Soot, Alexandra Zygogianni, et al.; *Emiss. Control Sci. Technol.* (in press), doi: [10.1007/s40825-019-00118-1](https://doi.org/10.1007/s40825-019-00118-1).

Tuning Pt-CeO<sub>2</sub> interactions by high-temperature vapor-phase synthesis for improved reducibility of lattice oxygen, Xavier Pereira-Hernández, et al.; *Nature Communications* (2019), Vol. 10: 1358, doi: [10.1038/s41467-019-09308-5](https://doi.org/10.1038/s41467-019-09308-5).

## Transport, Climate Change & Emissions

A life-cycle assessment of battery electric and internal combustion engine vehicles: A case in Hebei Province, China, Sainan Shi, et al.; *Journal of Cleaner Production* (10 July 2019), Vol. 225, pp. 606-618, doi: [10.1016/j.jclepro.2019.04.301](https://doi.org/10.1016/j.jclepro.2019.04.301).

Environmental impacts and behavioral drivers of decarbonization for transportation through electric vehicles, Pouria Ahmadi; *Journal of Cleaner Production* (10 July 2019), Vol. 225, pp. 1209-1219, doi: [10.1016/j.jclepro.2019.03.334](https://doi.org/10.1016/j.jclepro.2019.03.334).

Life cycle greenhouse gas emissions of Electric Vehicles in China: Combining the vehicle cycle and fuel cycle, Qinyu Qiao, et al.; *Energy* (June 2019), Vol. 177, pp. 222-233, doi: [10.1016/j.energy.2019.04.080](https://doi.org/10.1016/j.energy.2019.04.080).

Development of Fuel/Engine Systems – The Way Forward to Sustainable Transport, Gautam Kalghatgi; *Engineering* (in press), doi: [10.1016/j.eng.2019.01.009](https://doi.org/10.1016/j.eng.2019.01.009).

What technology enabled services impact business models in the automotive industry? An exploratory study, Alexia Athanasopoulou, et al.; *Futures* (May 2019), Vol. 109, pp. 73-83, doi: [10.1016/j.futures.2019.04.001](https://doi.org/10.1016/j.futures.2019.04.001).

Alternative-fuel-vehicle policy interactions increase U.S. greenhouse gas emissions, Alan Jenn, et al.; *Transportation Research Part A: Policy and Practice* (June 2019), Vol. 124, pp. 396-407, doi: [10.1016/j.tra.2019.04.003](https://doi.org/10.1016/j.tra.2019.04.003).

## FORTHCOMING CONFERENCES

### Fuel Science – From Production to Propulsion

13-15 May 2019, Aachen, Germany

[www.fuelcenter.rwth-aachen.de/cms/Fuelcenter/Austausch/Aktuelle-Veranstaltungen/~soxh/7th-International-Conference/?lidz=1](http://www.fuelcenter.rwth-aachen.de/cms/Fuelcenter/Austausch/Aktuelle-Veranstaltungen/~soxh/7th-International-Conference/?lidz=1)

Topics to be addressed during the conference include synthetic, alternative fuels by utilization of regenerative electricity and CO<sub>2</sub>; system perspective & sustainable value chains; impact of renewable fuels on environment, economics, and society; catalytic synthesis and conversion of biomass-based streams in combination with other renewable resources to platform molecules and fuels; combustion process and exhaust gas aftertreatment optimization of renewable fuels; and mixture formation and ignition process of renewable fuels.

### International VDI Conference: Electrified Off-Highway Machines

14-15 May 2019, Düsseldorf, Germany

[www.vdi-wissensforum.de/en/event/electrified-off-highway-machines/](http://www.vdi-wissensforum.de/en/event/electrified-off-highway-machines/)

The conference will focus on developments on electrified powertrains and battery technology specifically used in off-highway machines, and their implications on safety, standardization, maintenance and life cycle cost.

### Ultrafine Particles – Air Quality and Climate

15-16 May 2019, Brussels, Belgium

[www.ufp.efca.net](http://www.ufp.efca.net)

*International Symposium of the European Federation of Clean Air and Environmental Protection Associations (EFCA).*

## 23<sup>rd</sup> International Transport and Air Pollution (TAP) Conference

15-17 May 2019, Thessaloniki, Greece

[www.tapconference.org](http://www.tapconference.org)

*The theme of TAP2019 is 2020-2030: Transport in critical transition. Indeed, this decade will determine whether transport systems will succeed in moving ahead, fulfilling their sustainability targets.*

## EU Green Week High-Level Summit

15-17 May 2019, Brussels, Belgium

[https://ec.europa.eu/info/events/eu-green-week-2019\\_en](https://ec.europa.eu/info/events/eu-green-week-2019_en)

*The 2019 EU Green Week will be focusing on the implementation of EU environmental legislation, highlighting the benefit of EU environmental policies and showing their benefits for citizens.*

## 40<sup>th</sup> International Vienna Motor Symposium

16-17 May 2019, Vienna, Austria

<https://wiener-motorensymposium.at>

**AECC, IPA and IAV will present a joint paper on “Integrated Diesel System Achieving Ultra-Low Urban NOx Emissions on the Road”**

## International Conference on Calibration Methods and Automotive Data Analytics

21-22 May 2019, Berlin, Germany

[www.iav.com/termine/tagungen/international-calibration-conference](http://www.iav.com/termine/tagungen/international-calibration-conference)

## The Path towards Euro 7 Conference

21-23 May 2019, Stuttgart, Germany

[www.euro7conference.com](http://www.euro7conference.com)

*The conference is organized by the publishers of Engine Technology International magazine and will bring together leading experts to present exclusive papers about the numerous technologies and engineering solutions that exist to help gasoline and even diesel engines meet possible future emission targets.*

## 10<sup>th</sup> AVL International Commercial Powertrain Conference

22-23 May 2019, Graz, Austria

[www.avl.com/icpc](http://www.avl.com/icpc)

*The conference will tackle the challenges that the commercial vehicle industry is facing globally. How will emission legislation, trend for electrification and digitalization affect the powertrains of the future?*

## 2<sup>nd</sup> Asia-Pacific Diesel Engine and Emission Summit 2019

23-24 May 2019, Bangkok, Thailand

[www.borscon.com/2019apde/en/index.asp](http://www.borscon.com/2019apde/en/index.asp)

*The conference will discuss emission standards and technology roadmaps of Asia-Pacific countries, emission technologies, and the future of the diesel engine.*

## 10<sup>th</sup> Emission Control

4-5 June 2019, Dresden, Germany

<http://wordpress.emission-control-dresden.de>

**AECC will give a presentation on “Low NOx emissions with modern diesel cars”**

## Integer Emissions Summit & AdBlue<sup>®</sup> Forum Asia Pacific

5-6 June 2019, Tokyo, Japan

[www.integer-research.com/conferences/ies-apac-2019](http://www.integer-research.com/conferences/ies-apac-2019)

## 31<sup>st</sup> International AVL Conference “Engine & Environment”

6-7 June 2019, Graz, Austria

[www.avl.com/engine-environment](http://www.avl.com/engine-environment)

*The conference will focus on three thematic blocks: production, storage, transport/distribution of energy carriers; energy storage media in the vehicle; and the main focus will be laid on the consequences for the powertrain portfolio.*

## SIA Paris 2019 Power Train & Electronics

12-13 June 2019, Port-Marly, France

[www.sia.fr/evenements/136-sia-power-train-electronics-2019](http://www.sia.fr/evenements/136-sia-power-train-electronics-2019)

*To support the automotive industry in the transition towards ever more environmentally friendly mobility, a new automotive event in France named SIA power train & Electronics broadens the scope of the Powertrain Conference to include electric traction technologies, along with internal combustion engines (ICE), low carbon fuels, and transmissions.*

## 8<sup>th</sup> International Congress on Combustion Engines

17-18 June 2019, Krakow, Poland

[www.congress.ptnss.pl](http://www.congress.ptnss.pl)

*The main topics of the congress include fuel injection systems and mixture formation; combustion processes control in SI and CI engines; engine thermal loading and utilization of heat released; alternative fuels; emission measurements and aftertreatment; alternative sources of power; engine testing, durability, reliability and diagnostics; modelling and optimization of engine processes; and global trends in engine technology.*

## ETH Conference on Combustion Generated Nanoparticles

18-20 June 2019, Zurich, Switzerland

[www.nanoparticles.ch](http://www.nanoparticles.ch)

*The conference serves as an interdisciplinary platform for expert discussions on all aspects of nanoparticles, freshly emitted from various sources, aged in ambient air, technical mitigation aspects, impact of particles on health, environment and climate and particle legislation.*

## Integer Emissions Summit & AdBlue® Forum Europe

25-27 June 2019, Munich, Germany

[www.integer-research.com/conferences/ies-europe-2019](http://www.integer-research.com/conferences/ies-europe-2019)

**AECC will give a presentation on “Low NOx emissions with modern diesel cars” and will chair a session on “future technology choices”**

## India & ASEAN Diesel Powertrain Summit

26-28 June 2019, Chennai, India

[www.fiveoit.com/iadp](http://www.fiveoit.com/iadp)

*India & ASEAN Diesel Powertrain Summit 2019 is dedicated to providing the next 5-10 years of policy direction and supporting technological innovations as well as exploiting the market opportunities in India and ASEAN countries.*

## Combustion Aerosol Conference & Cambridge Particle Meeting 2019

26-28 June 2019, Cambridge, UK

<https://aerosol-soc.com/events/combustion-conference-2019>

*The conference focuses on the fundamentals of particle formation, combustors and engine technology, emissions and emissions measurements and regulation and regulated emissions.*

## 15<sup>th</sup> International CTI Conference SCR Systems

1-2 July 2019, Stuttgart, Germany

[http://cti.euroforum.de/en/events/scr\\_systems\\_2019](http://cti.euroforum.de/en/events/scr_systems_2019)

*The conference topics include low temperature SCR, innovative vanadium-based catalysts, news of SCR on filter, thermal management of exhaust gas aftertreatment, future powertrain concepts, and RDE- compliant exhaust systems.*

## 5<sup>th</sup> International FEV Conference Diesel Powertrain 3.0

2-3 July 2019, Rouen, France

[www.fev.com/coming-up/fev-conferences/fev-conference-diesel-powertrains-30/introduction.html](http://www.fev.com/coming-up/fev-conferences/fev-conference-diesel-powertrains-30/introduction.html)

*The conference will highlight that the modern Diesel engine still represents a favourable platform for a highly-valuable future propulsion system unit even under changing regulatory boundary conditions and an altering market environment.*

**AECC will give a keynote presentation on “Consistent low NOx emissions on the road: Reality with modern Diesel vehicles”**



## SAE Powertrains, Fuels and Lubricants

26-29 August 2019, Kyoto, Japan  
[www.pfl2019.jp](http://www.pfl2019.jp)

## 14<sup>th</sup> International Conference on Engines & Vehicles

15-19 September 2019, Capri, Italy  
[www.sae-na.it](http://www.sae-na.it)

*Topics of the conference include engine modelling and diagnostics; engine combustion; new engines, components, actuators and sensors; hybrid and electric powertrains and eco-CAV; fuels and lubricants; and exhaust aftertreatment and emissions.*

## IAQM Routes to Clean Air

16-17 September 2019, London, UK  
<https://iaqm.co.uk/event/rtca19/>

*The Institute of Air Quality Management (IAQM) presents Routes to Clean Air 2019, where air quality, public health and transport professionals share their experiences of improving traffic emissions. Speakers will discuss a range of topical issues offering their insight into the steps required to improve air quality, including best practice examples and practical challenges faced during implementation.*

## 3<sup>rd</sup> Annual Real Driving Emissions Forum

24-25 September 2019, Berlin, Germany  
[www.rde-realdrivingemissions.com](http://www.rde-realdrivingemissions.com)

*The Forum will showcase the forefront practices and approaches towards RDE and Energy Consumption reduction, compliance with recent update of the legislation on RDE, main automotive technology trends based on cost-and-energy-efficient solutions.*

## 28<sup>th</sup> Aachen Colloquium Automobile and Engine Technology

7-9 October 2019, Aachen, Germany  
[www.aachener-kolloquium.de](http://www.aachener-kolloquium.de)

*The congress provides a wide range of technical presentations addressing current challenges of the vehicle and engine industry.*

**AECC and IAV will present a joint paper on “Contribution of light-duty diesel mild-Hybrid electric Vehicle and novel exhaust aftertreatment systems in the context of future post Euro 6 RDE and CO<sub>2</sub> requirements”**

## European Transport Conference

9-11 October 2019, Dublin, Ireland  
[www.aetransport.org](http://www.aetransport.org)

*The conference attracts transport practitioners and researchers from all over Europe where they can find in-depth presentations on policy issues, best practice and research findings across the broad spectrum of transport.*

## 13<sup>th</sup> Conference on Gaseous Fuel Powered Vehicles

22-23 October 2019, Stuttgart, Germany  
<https://fkfs-veranstaltungen.de/3/conference-on-gaseous-fuel-powered-vehicles>

## 3<sup>rd</sup> International FEV Conference Zero CO<sub>2</sub> Mobility

7-8 November 2019, Aachen, Germany  
[www.fev.com/coming-up/fev-conferences/fev-conference-zero-co2-mobility/introduction.html](http://www.fev.com/coming-up/fev-conferences/fev-conference-zero-co2-mobility/introduction.html)

**Deadline for abstract: 31 May 2019**

## Integer Emissions Summit USA

12-13 November 2019, Indianapolis, USA  
[www.integer-research.com/conferences/ies-usa-2019/](http://www.integer-research.com/conferences/ies-usa-2019/)

## POLIS Annual Conference

27-28 November 2019, Brussels, Belgium  
[www.polisnetwork.eu/2019conference](http://www.polisnetwork.eu/2019conference)

*Europe's leading event on sustainable urban mobility in cities and regions*

**Deadline for abstract: 19 May 2019**

## EU Clean Air Forum

28-29 November 2019, Bratislava, Slovakia

[https://ec.europa.eu/info/events/eu-clean-air-forum-2019-nov-28\\_en](https://ec.europa.eu/info/events/eu-clean-air-forum-2019-nov-28_en)

*The European Commission is organizing the 2<sup>nd</sup> Clean Air Forum in close collaboration with the Ministry of Environment of the Slovak Republic. It will focus on three themes: air quality and energy; air quality and agriculture; and clean air funding mechanisms.*

## Internal Combustion Engines and Powertrain Systems for Future Transport

11-12 December 2019, West Midlands, UK

<http://events.imeche.org/ViewEvent?code=CON6849>

The 2019 conference will provide a forum for IC engine, fuels and powertrain experts to look closely at developments in powertrain technology required to meet the demands of the low carbon economy

## SAE World Congress Experience (WCX)

21-23 April 2020, Detroit, USA

Info will be at [www.sae.org/attend/wcx](http://www.sae.org/attend/wcx)

## TRA2020

27-30 April 2020, Helsinki, Finland

<https://traconference.eu/>

*TRA, The Transport Research Arena is the biggest European Research and Technology Conference on transport and mobility. In 2020 TRA is themed "Rethinking transport - towards clean and inclusive mobility" and brings together the experts from around the world to discuss the newest innovations and the future of mobility and transport.*

## SAE Powertrains, Fuels and Lubricants

22-24 September 2020, Krakow, Poland

Info will be at [www.sae.org/pfl](http://www.sae.org/pfl)

**Call for abstracts opens in August 2019**

**Deadline for abstract: 18 February 2020**

## SAE Heavy-Duty Diesel Emissions Control Symposium

13-14 October 2020, Gothenburg, Sweden