The European Commission's
science and knowledge service

Joint Research Centre

Research Activity Overview

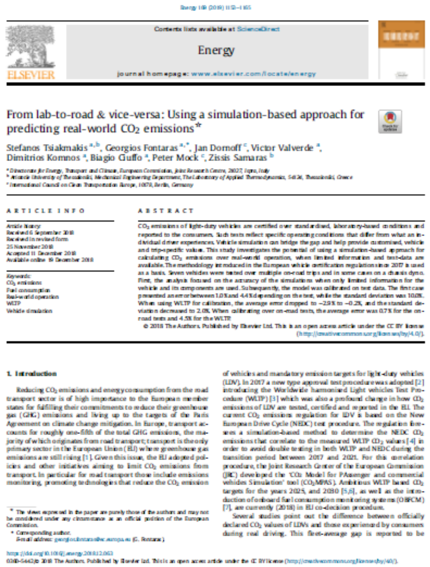
Georgios Fontaras

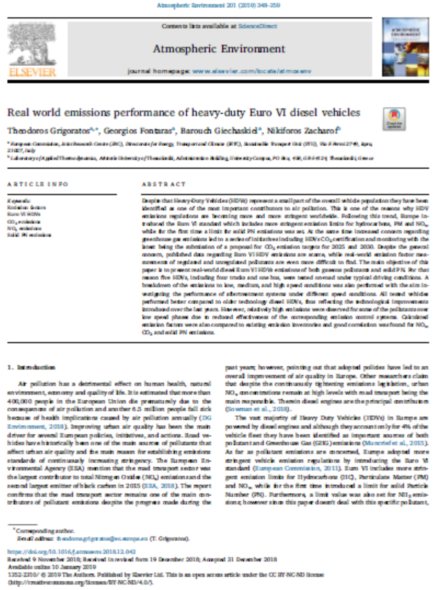
European Commission

Vehicle emissions & market surveillance

Performed numerous tests on different vehicle types as part of regular JRC activity, specific policy support, and market surveillancel

Numerous publications on emissions related issues

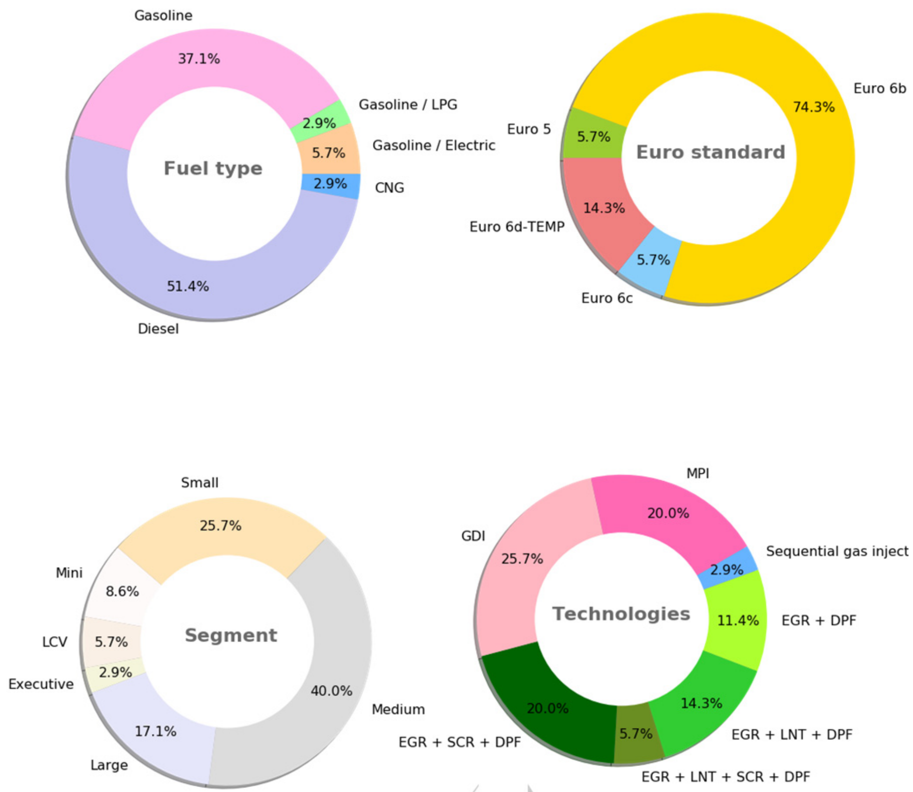




Market Surveillance

- MS pilot 2017 & 2018; 35 vehicles tested
- Multiple types of Tests

Type of Test	*Objectives*
NEDC Cold	Vehicle emissions compliance under standard conditions
NEDC Hot	Emissions performance with hot engine, to check for a potential timer or vehicle conditioning triggering AES[4]
NEDC w/o preconditioning Cold	Emissions performance on a cold started NEDC driving cycle without pre-conditioning of the vehicle, to check for the potential vehicle conditioning triggering AES
NEDC Repeated Hot	Emissions performance with hot engine (without turning off the engine between the two tests), to check for a potential timer or distance windows triggering AES
Modified NEDC Cold +10% Speed	Vehicle emissions on a modified NEDC driving cycle, to check for a potential speed or distance windows triggering AES
Modified NEDC Cold -10% Speed	Vehicle emissions on a modified NEDC driving cycle, to check for a potential speed window triggering AES
NEDC hot with additional engine loads (A/C and lights)	Emissions performance with hot engine and additional engine loads (A/C and lights), to check for a potential use of vehicle systems triggering AES
NEDC +10°C Cold	Emissions performance at low ambient temperature, to check for a potential thermal window triggering AES
NEDC +30°C Cold	Emissions performance at high ambient temperature (higher than 30°C[5]), to check for a potential thermal window triggering AES
WLTC Cold	Emissions performance on cold started WLTC to check for a potential timer, vehicle conditioning, as well as speed or distance windows triggering AES.
WLTC Hot	Emissions performance on hot started WLTC to check for a potential timer, vehicle conditioning, as well as speed or distance windows triggering AES.
RDE	Emissions performance on road, to check for ECS functioning under uncontrolled conditions, beyond the NEDC conditions



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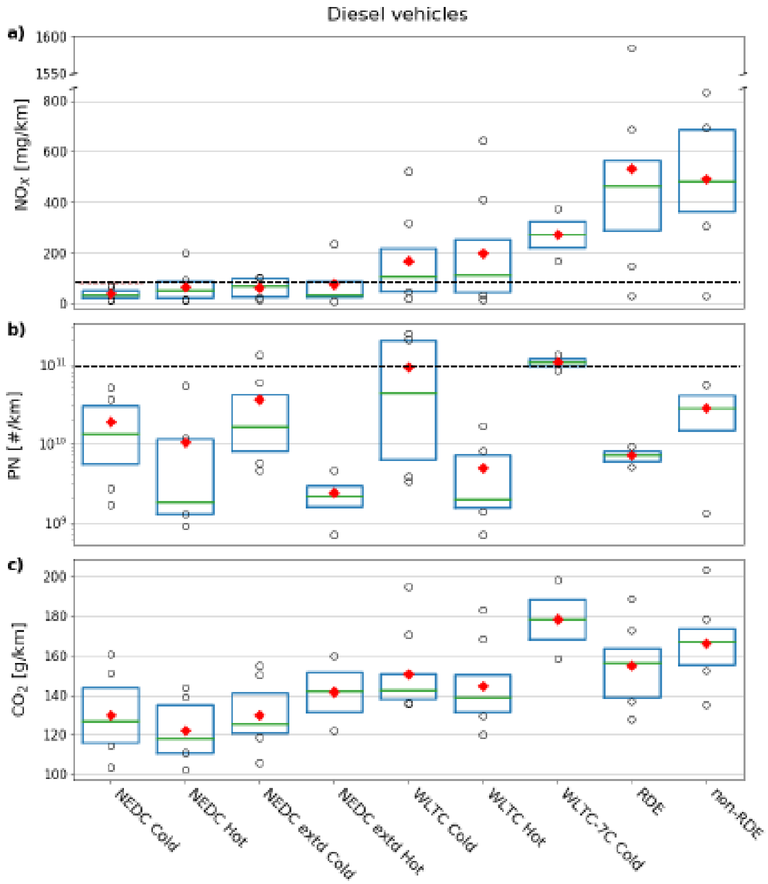
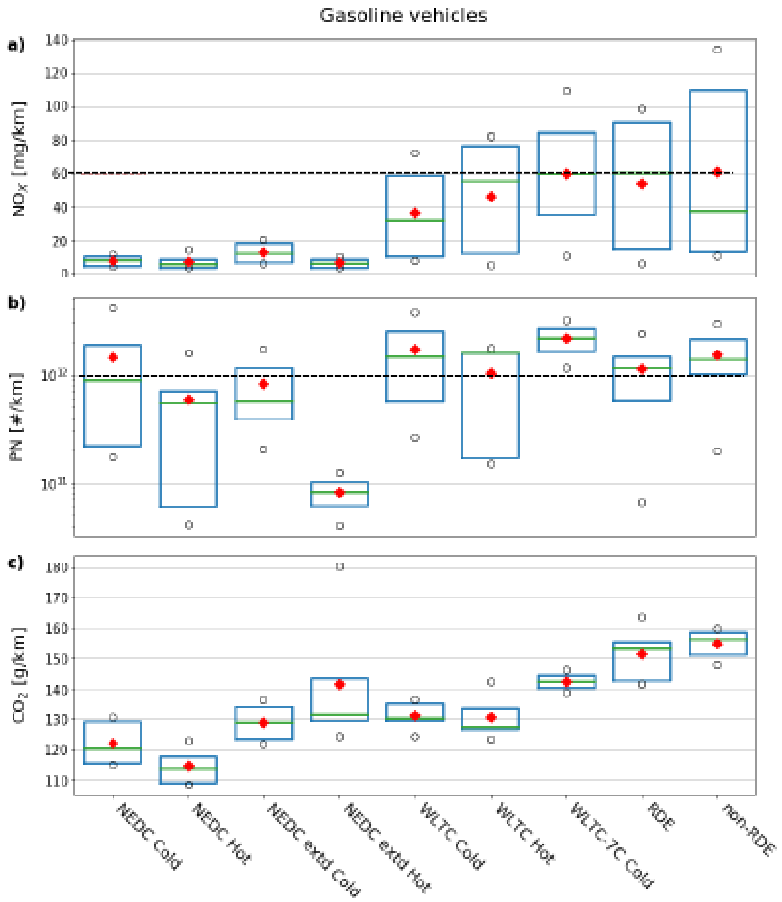
Emission factors from LDVs – Diesel vehs.

- Results suggest downward trends – exceedances appeared under certain conditions
- EFs from the EEA inventory guidebook provide accurate estimates
- Could benefit from on-road tests within and outside RDE boundaries particularly for post Euro 6b technology.



Emission factors from LDVs – Gasoline vehs.

- Results show compliance over most conditions
- GDI high PN emissions
- EFs from the EEA inventory guidebook provide accurate estimates
- CO_2 emissions comparable to those of diesel vehicles



Emission factors from HDVs

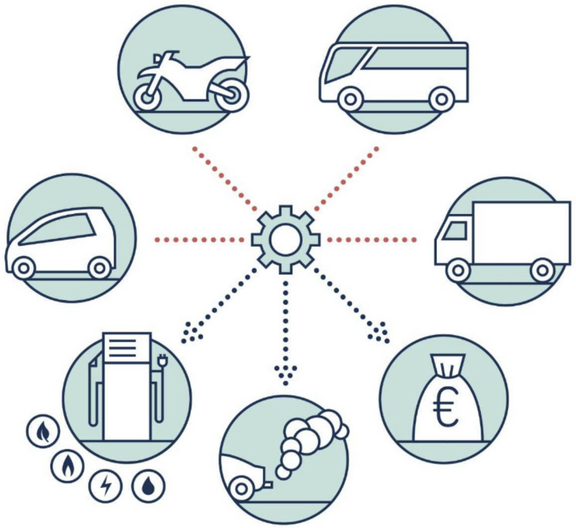
Overall and breakdown to different speed classes emissions of all examined vehicles.

	CO2 [g/kWh]	CO [g/kWh]	NOx [g/kWh]	THC [g/kWh]	PN [#/kWh]	CO2 [g/km]	CO [g/km]	NOx [g/km]	THC [g/km]	PN [#/km]
Vehicle #1	**621.8 ± 4.8**	**1.02 ± 0.33**	**0.16 ± 0.05**	**0.11 ± 0.02**	**5.6 ± 1.0E+10**	**750.1 ± 14.6**	**1.22 ± 0.37**	**0.19 ± 0.06**	**0.14 ± 0.03**	**6.8 ± 1.3E+10**
Low Speed	691.3 ± 22.0	1.37 ± 0.43	0.80 ± 0.20	0.14 ± 0.03	8.5 ± 7.8E+10	2414.9 ± 105.9	4.73 ± 1.34	2.78 ± 0.54	0.50 ± 0.10	3.1 ± 3.0E+11
Medium Speed	565.9 ± 3.3	0.95 ± 0.32	0.15 ± 0.05	0.10 ± 0.02	3.0 ± 0.4E+10	909.8 ± 26.5	1.52 ± 0.51	0.26 ± 0.07	0.16 ± 0.04	4.9 ± 0.7E+10
High Speed	635.7 ± 9.1	1.00 ± 0.32	0.08 ± 0.04	0.11 ± 0.02	6.0 ± 0.8E+10	646.2 ± 20.5	1.01 ± 0.29	0.08 ± 0.03	0.11 ± 0.02	6.1 ± 1.1E+10
Vehicle #2	**643.4 ± 0.8**	**0.75 ± 0.17**	**0.28 ± 0.07**	**0.07 ± 0.01**	**n/a**	**554.5 ± 6.5**	**0.65 ± 0.14**	**0.24 ± 0.06**	**0.06 ± 0.01**	**n/a**
Low Speed	804.6 ± 27.2	1.17 ± 0.17	0.69 ± 0.17	0.10 ± 0.01	n/a	1325.1 ± 22.5	1.92 ± 0.22	1.13 ± 0.22	0.17 ± 0.02	n/a
Medium Speed	646.8 ± 11.8	0.79 ± 0.19	0.50 ± 0.11	0.08 ± 0.01	n/a	548.2 ± 4.5	0.67 ± 0.15	0.43 ± 0.10	0.07 ± 0.01	n/a
High Speed	631.2 ± 3.1	0.72 ± 0.17	0.21 ± 0.05	0.07 ± 0.01	n/a	528.4 ± 9.6	0.60 ± 0.13	0.17 ± 0.04	0.06 ± 0.01	n/a
Vehicle #3	**662.0 ± 1.8**	**0.80 ± 0.08**	**0.78 ± 0.13**	**0.11 ± 0.01**	**6.5 ± 0.4E+10**	**831.8 ± 15.9**	**1.01 ± 0.13**	**0.98 ± 0.17**	**0.13 ± 0.01**	**8.1 ± 0.4E+10**
Low Speed	1108.6 ± 86.0	1.90 ± 0.15	2.58 ± 0.21	0.25 ± 0.05	1.2 ± 0.7E+11	2856.0 ± 261.4	4.88 ± 0.44	6.64 ± 0.21	0.63 ± 0.11	3.0 ± 1.4E+11
Medium Speed	669.9 ± 3.7	0.83 ± 0.09	0.93 ± 0.10	0.10 ± 0.02	3.5 ± 0.1E+10	956.5 ± 12.4	1.18 ± 0.10	1.33 ± 0.12	0.14 ± 0.03	5.0 ± 0.0E+10
High Speed	642.0 ± 3.5	0.75 ± 0.08	0.67 ± 0.12	0.10 ± 0.00	6.9 ± 0.8E+10	769.4 ± 15.6	0.90 ± 0.12	0.80 ± 0.16	0.12 ± 0.00	8.2 ± 0.8E+10
Vehicle #4	**621.3 ± 2.0**	**0.76 ± 0.21**	**0.09 ± 0.01**	**0.10 ± 0.03**	**n/a**	**749.4 ± 6.8**	**0.92 ± 0.26**	**0.10 ± 0.01**	**0.12 ± 0.03**	**n/a**
Low Speed	729.3 ± 9.2	1.25 ± 0.33	0.10 ± 0.00	0.13 ± 0.03	n/a	2637.7 ± 123.5	4.55 ± 1.47	0.37 ± 0.02	0.45 ± 0.10	n/a
Medium Speed	596.3 ± 7.0	0.91 ± 0.20	0.13 ± 0.02	0.10 ± 0.03	n/a	917.9 ± 58.2	1.40 ± 0.38	0.20 ± 0.04	0.16 ± 0.03	n/a
High Speed	619.2 ± 1.5	0.67 ± 0.20	0.07 ± 0.01	0.10 ± 0.02	n/a	657.0 ± 7.7	0.71 ± 0.20	0.07 ± 0.02	0.10 ± 0.03	n/a
Vehicle #5	**708.4 ± 12.0**	**1.09 ± 0.40**	**0.37 ± 0.06**	**0.17 ± 0.01**	**n/a**	**689.5 ± 12.5**	**1.06 ± 0.37**	**0.36 ± 0.05**	**0.17 ± 0.01**	**n/a**
Low Speed	981.6 ± 17.8	2.08 ± 0.64	2.05 ± 0.34	0.29 ± 0.02	n/a	2184.3 ± 119.8	4.59 ± 1.24	4.59 ± 1.09	0.65 ± 0.06	n/a
Medium Speed	661.3 ± 26.8	1.18 ± 0.40	0.33 ± 0.09	0.16 ± 0.01	n/a	766.5 ± 33.8	1.35 ± 0.41	0.39 ± 0.12	0.19 ± 0.01	n/a
High Speed	698.7 ± 11.1	0.99 ± 0.38	0.24 ± 0.08	0.16 ± 0.02	n/a	622.6 ± 10.4	0.88 ± 0.33	0.22 ± 0.07	0.15 ± 0.01	n/a

-Results in-line with emission inventories regarding NOx and particle number

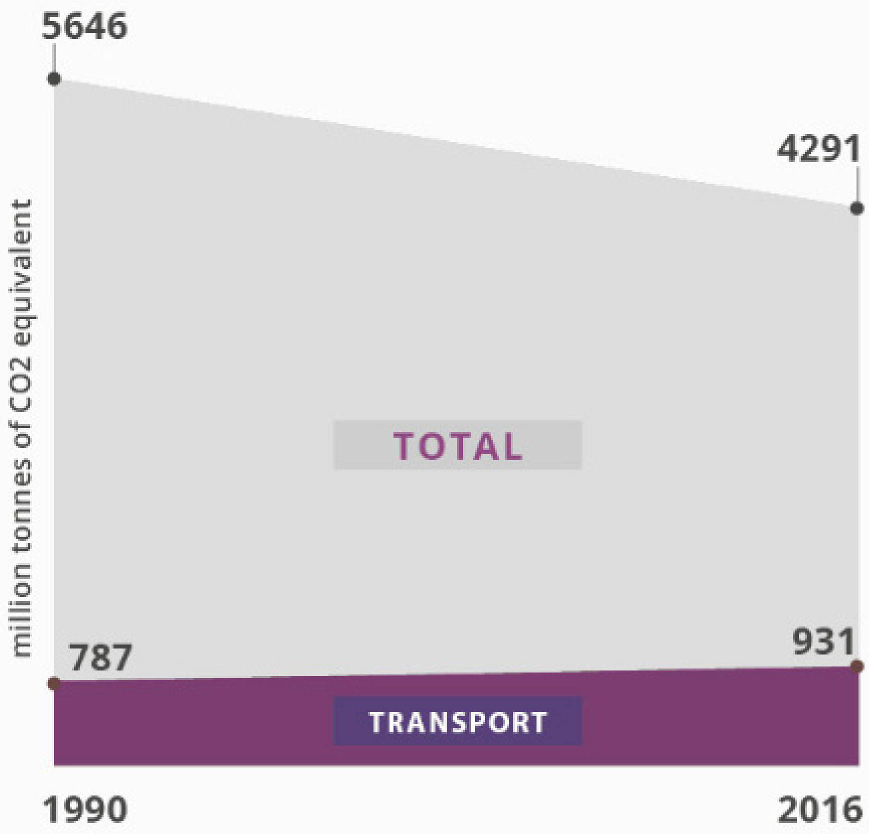
-CO_2 emissions tend to be underestimated although loading plays a crucial role

-Issues identified with HC and CO but not considered important



CO_2 emissions & energy consumption

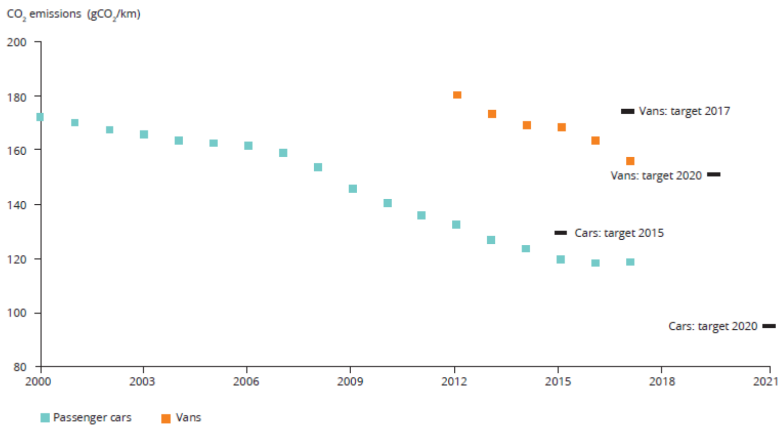
GREENHOUSE GAS EMISSIONS IN THE EU



94% of the **transport** greenhouse gas emissions are caused by **road transport**

CO_2 & Greenhouse gas emissions post 2020

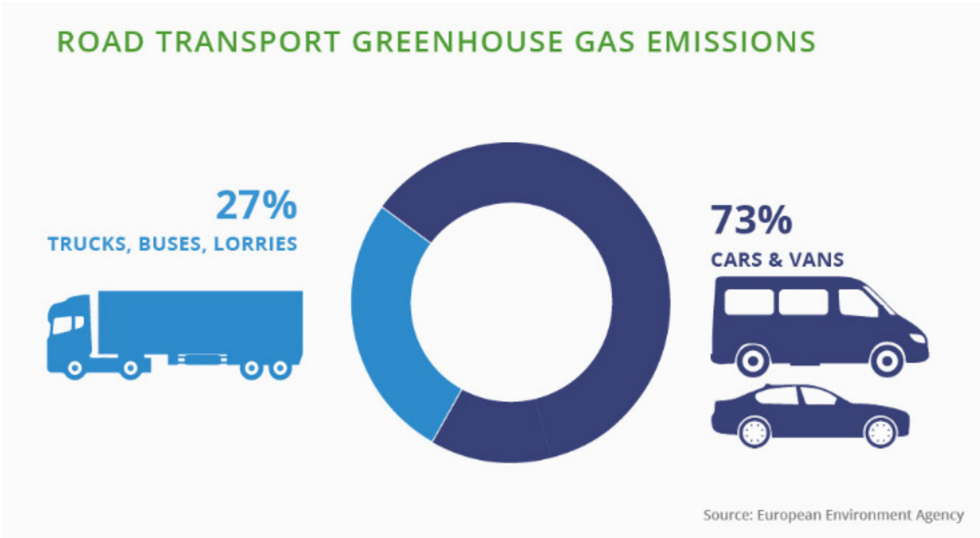
- GhG emissions and CO_2 will become a (very) hot topic in the years to come
- Recent data reported suggest a slowing down of CO_2 reduction rates
  - **New cycle**
  - **Stricter emissions control**
  - **Diesel share reduction**
- Additional efforts to be put on monitoring & reporting, accurate real world CO_2 estimations, conformity & compliance
- Necessity for new instruments for incentivizing CO_2 reductions, acceleration of technology uptake, and support of on-going efforts & investment at vehicle, infrastructure, and mobility level
- Interesting how OEMs & Institutions will react in the years to come



2019 – a pivotal year for vehicle CO_2 emissions

- Dec. 18 CO_2 emission targets for new LDVs
- Cars targets: 15% in 2025 and 37.5% in 2030, both relative to a 2021 baseline (WLTP)
- N1 vehicles: a 15% target for 2025 and a 31% target for 2030 (WLTP)

- Feb. 19, CO_2 standards for HDVs introduced for the first time in EU
- Reduce the average CO_2 emissions from the highest-emitting HDV segments by 15% in 2025 and by 30% in 2030
- Reduction relative to a baseline determined from 2019 and 2020 data
- VECTO used for certifying CO_2 emissions



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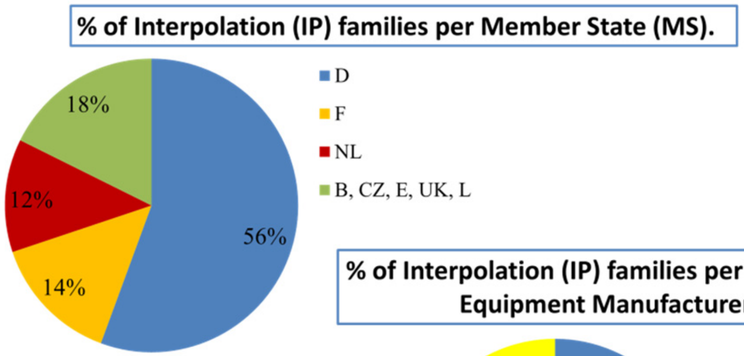
LDV post 2020 targets framework

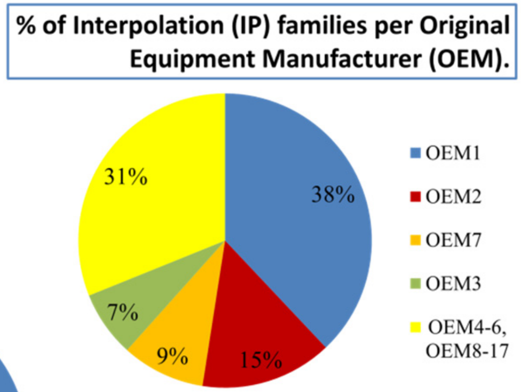
- **zero-emission vehicles** such as BEV or fuel cell vehicles
- **low-emission vehicles,** emissions of less than 50 g CO_2 per km
- **market surveillance mechanisms** for maintaining a reliable and trustworthy system
- **collection, publication, and monitoring of** real world fuel consumption data
- Compulsory standardised 'fuel consumption measurement devices‶ in new vehicles as of 2019 (**OBFCM**)
- **in-service conformity checks** will be introduced combined with correction mechanisms so that deviations are taken into account during the **compliance assessment**.

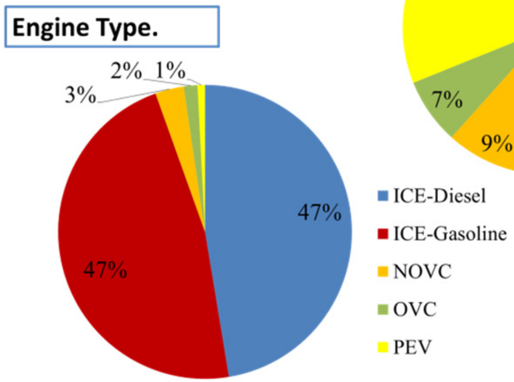
HDV CO_2 targets framework

- **Zero** and **low emissions** vehicles
- Series of **incentives** to accelerate technology uptake
- Collect, publish and monitor **real-world fuel consumption data**
- Introduce in-service **conformity tests** and mandate the reporting of deviations and the introduction of a correction mechanism
- Apply **financial penalties** in case of non-compliance with the CO_2 targets
- In 2022, the scope will be extended to include **other vehicle types** such as smaller lorries, buses, coaches and trailers

JRC TA data collection and analysis project







Average (median, standard deviation) WLTP/NEDC CO_2 ratio for different vehicle technologies.

Engine Type	Vehicle HIGH (H)	Vehicle LOW (L)
ICE-Diesel	1.27 (1.26, ±0.07)	1.18 (1.18, ±0.05)
ICE-Gasoline	1.19 (1.17, ±0.09)	1.14 (1.14, ±0.07)
HEV	1.18 (1.21, ±0.07)	1.08 (1.06, ±0.13)
PHEV-CS	1.25 (1.24, ±0.10)	1.19 (1.16, ±0.10)
PHEV-Weight. Comb.	1.09 (1.25, ±0.37)	0.98 (1.09, ±0.35)

TRIMIS: Background

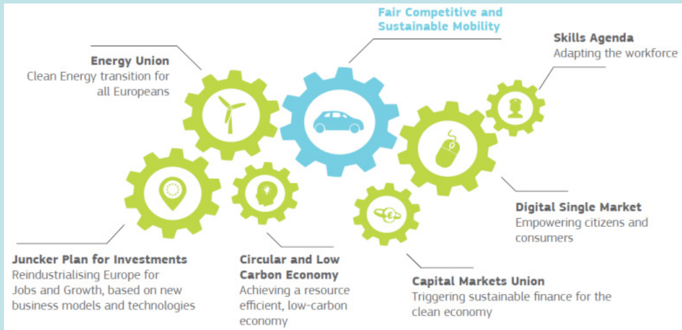
Transport Research and Innovation Monitoring and Information System (TRIMIS):

The analytical support tool for the establishment and implementation of the ***Strategic Transport Research and Innovation Agenda (STRIA)***

STRIA was adopted by the EC in the May 2017 "Europe on the move" Package

Main objectives:

- Mapping ***technology trends and R&I capacities*** in transport
- Monitoring progress against targets set for ***all transport sectors***
- Ensuring that ***STRIA roadmaps*** are implemented, monitored and updated



TRIMIS: Web-portal

Launched in September 2017

https://trimis.ec.europa.eu

- **Established Transport R&I portal** – ca. 1400 unique weekly visits
- **Transport R&I Database -** continuous update: ca. 7200 Projects and Programmes
- **Announcements** and **Events Calendar**

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Policy support – Reporting on R&I

10 Science for Policy and Technical reports published by Apr. 2019

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Other features

Monthly TRIMIS Newsletter

- Highlights, projects, events

Bi-monthly TRIMIS Digest

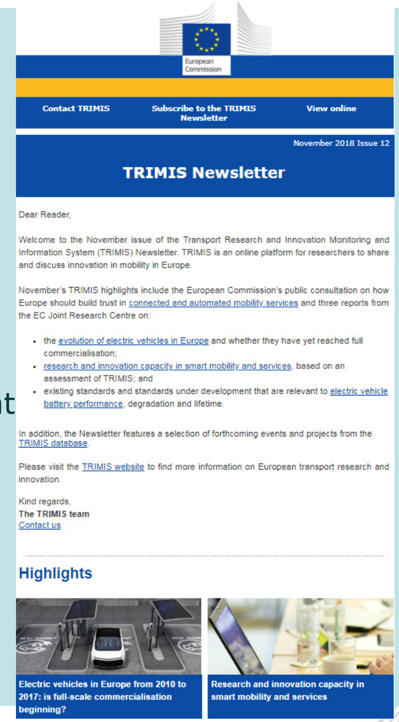
- Provides reviews of scientific research on selected topics

Database:

- Further expand with additional projects and programmes
- Towards a relational database, new links: MS, non-EU, pat

Content update:

- Update country profiles
- MS projects and programmes



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November 2018 Issue 12

TRIMIS Newsletter

Dear Reader,

Welcome to the November issue of the Transport Research and Innovation Monitoring and Information System (TRIMIS) Newsletter. TRIMIS is an online platform for researchers to share and discuss innovation in mobility in Europe.

November's TRIMIS highlights include the European Commission's public consultation on how Europe should build trust in connected and automated mobility services and three reports from the EC Joint Research Centre on:

- the evolution of electric vehicles in Europe and whether they have yet reached full commercialisation;
- research and innovation capacity in smart mobility and services, based on an assessment of TRIMIS; and
- existing standards and standards under development that are relevant to electric vehicle battery performance, degradation and lifetime.

In addition, the Newsletter features a selection of forthcoming events and projects from the TRIMIS database.

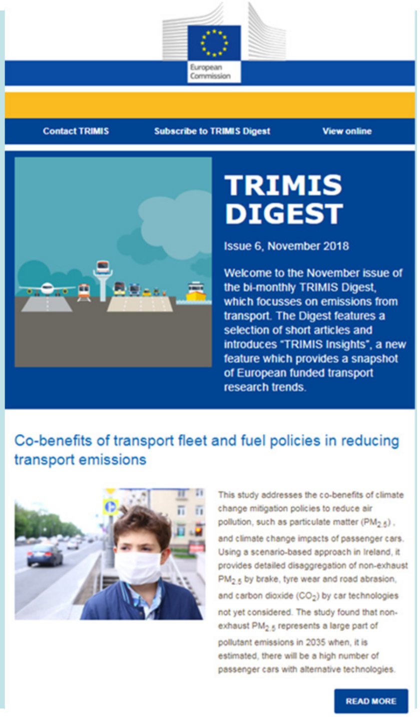
Please visit the TRIMIS website to find more information on European transport research and innovation.

Kind regards,
The TRIMIS team
Contact us

Highlights

Electric vehicles in Europe from 2010 to 2017: is full-scale commercialisation beginning?

Research and innovation capacity in smart mobility and services



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TRIMIS DIGEST

Issue 6, November 2018

Welcome to the November issue of the bi-monthly TRIMIS Digest, which focusses on emissions from transport. The Digest features a selection of short articles and introduces "TRIMIS Insights", a new feature which provides a snapshot of European funded transport research trends.

Co-benefits of transport fleet and fuel policies in reducing transport emissions

This study addresses the co-benefits of climate change mitigation policies to reduce air pollution, such as particulate matter ($PM_{2.5}$), and climate change impacts of passenger cars. Using a scenario-based approach in Ireland, it provides detailed disaggregation of non-exhaust $PM_{2.5}$ by brake, tyre wear and road abrasion, and carbon dioxide (CO_2) by car technologies not yet considered. The study found that non-exhaust $PM_{2.5}$ represents a large part of pollutant emissions in 2035 when, it is estimated, there will be a high number of passenger cars with alternative technologies.

READ MORE

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Thank you for the attention!

https://trimis.ec.europa.eu/

EU-TRIMIS@ec.europa.eu

LinkedIn: **Transport Research and Innovation Monitoring and Information System (TRIMIS)**

European Commission

Thank you for your attention!

georgios.fontaras@ec.europa.eu

Special Thanks to Victor Valverde and Tasos Tsakalidis for their contributions

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