JRC DIONE fleet Model – Air & Sea Extension

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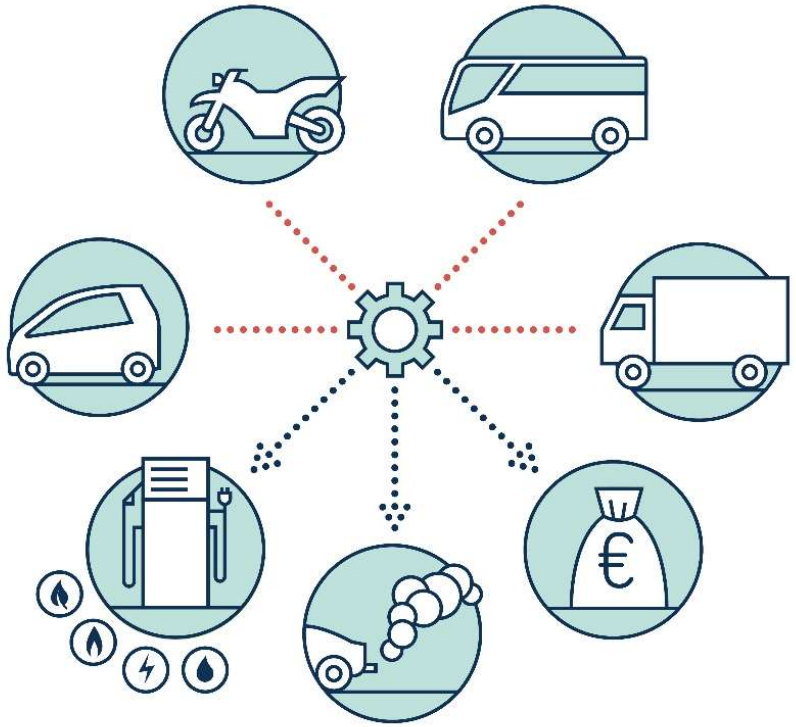
European Commission

DIONE



The JRC DIONE model and its two branches

- "DIONE cost": Calculation of CO_2 emission reduction costs for road vehicles from the perspective of users, manufacturers and society

- **"DIONE fleet":** Calculation of CO_2 and air pollutant emissions for road vehicle fleets up to 2050

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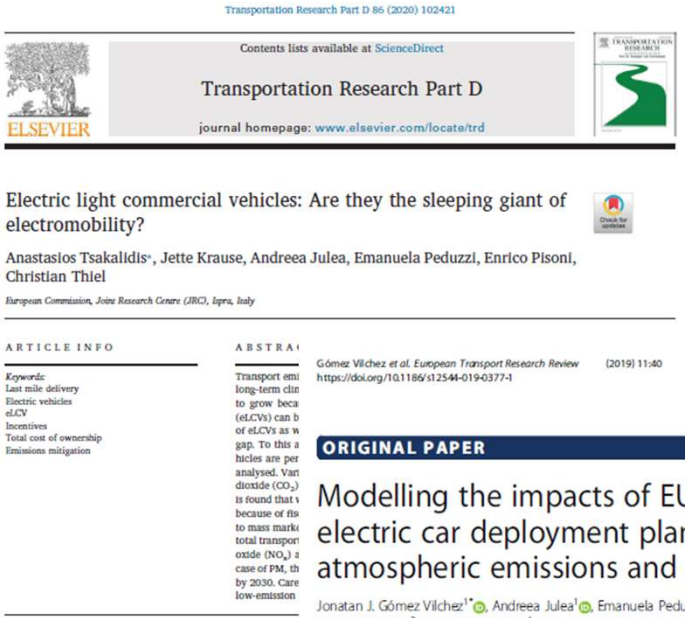
DIONE fleet – what, why, how?

- What:
  - Development of fleet scenarios & Calculation of energy consumption, CO_2 and air pollutant emissions for road vehicle fleet scenarios until 2050
- Why:
  - Assessing the impact of fleet scenarios for policy support, scientific studies
- How:
  - Calibrated baseline and what-if fleet scenarios, or input from other models (e.g., JRC Potencia, PTTMAM)
  - Energy consumption and emissions calculation based on EMEP EEA guidebook / COPERT; emission factors for additional powertrains/segments

DIONE fleet study contributions - Road



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Electric light commercial vehicles: Are they the sleeping giant of electromobility?

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ARTICLE INFO

Keywords:
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Electric vehicles
eLCV
Incentives
Total cost of ownership
Emissions mitigation

ABSTRA

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Gómez Vilchez et al. European Transport Research Review (2019) 11:40
https://doi.org/10.1186/s12544-019-0377-1

European Transport Research Review

ORIGINAL PAPER Open Access

Modelling the impacts of EU countries' electric car deployment plans on atmospheric emissions and concentrations

Jonatan J. Gómez Vilchez[1*], Andreea Julea[1], Emanuela Peduzzi[1], Enrico Pisoni[1], Jette Krause[1], Pelopidas Siskos[2] and Christian Thiel[1]

Abstract

The purpose of this work is to quantify key environmental impacts of electric vehicles deployment in the European Union. This is achieved by soft-linking three models (PRIMES-TREMOVE, DIONE and SHERPA) to explore a base and an alternative scenario. The alternative scenario draws on the assessment of the national policy frameworks for alternative fuels infrastructure requested by the Directive (2014/94/EU). Five environmental indicators are examined: tailpipe CO_2, NO_x and $PM_{2.5}$ emissions as well as NO_2 and $PM_{2.5}$ urban background concentrations. By 2030, car travel activity is simulated to generate ca. 425 $MtCO_2$/year in the EU28 under the alternative scenario. Compared to the base scenario, electric vehicles contribute to a 3% reduction in tailpipe CO_2 emissions. Only two countries attain CO_2 emission reductions greater than 10% in the model. The need for a higher level of policy ambition towards the deployment of less polluting vehicles in Europe is highlighted as a conclusion.

Keywords: Electro-mobility, Scenario analysis, Greenhouse gas emissions, Urban background air pollution, Passenger road transport

energies

MDPI

Article

Assessing the Impacts of Electric Vehicle Recharging Infrastructure Deployment Efforts in the European Union

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Economy-wide impacts of road transport electrification in the EU

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ARTICLE INFO

Keywords:
Economic modelling
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Road transport
Climate mitigation
Employment

ABSTRACT

While electrification of road transport is a key component of decarbonisation, the implications for the broader economy and related jobs remain underexplored. We quantify these impacts in the EU in a global Computable General Equilibrium (CGE) model, combining techno-economic assumptions about electric vehicles with deployment scenarios derived by energy models. We augment input-output tables underlying the JRC-GEM-E3 model with an explicit representation of vehicle manufacturing and upgrade the modelling of vehicle purchase and operation. Our findings illustrate that greater road transport electrification reduces the overall costs of climate mitigation, primarily driven by lower fuel costs for electric vehicles and a faster decline of battery costs. Transport electrification alters supply-chains and leads to structural shifts in employment from traditional vehicle manufacturing towards battery production, electricity supply and related investments. Finally, we expand the set of labour market indicators to cover skills and occupations, to refine the socio-economic assessments of climate policy.

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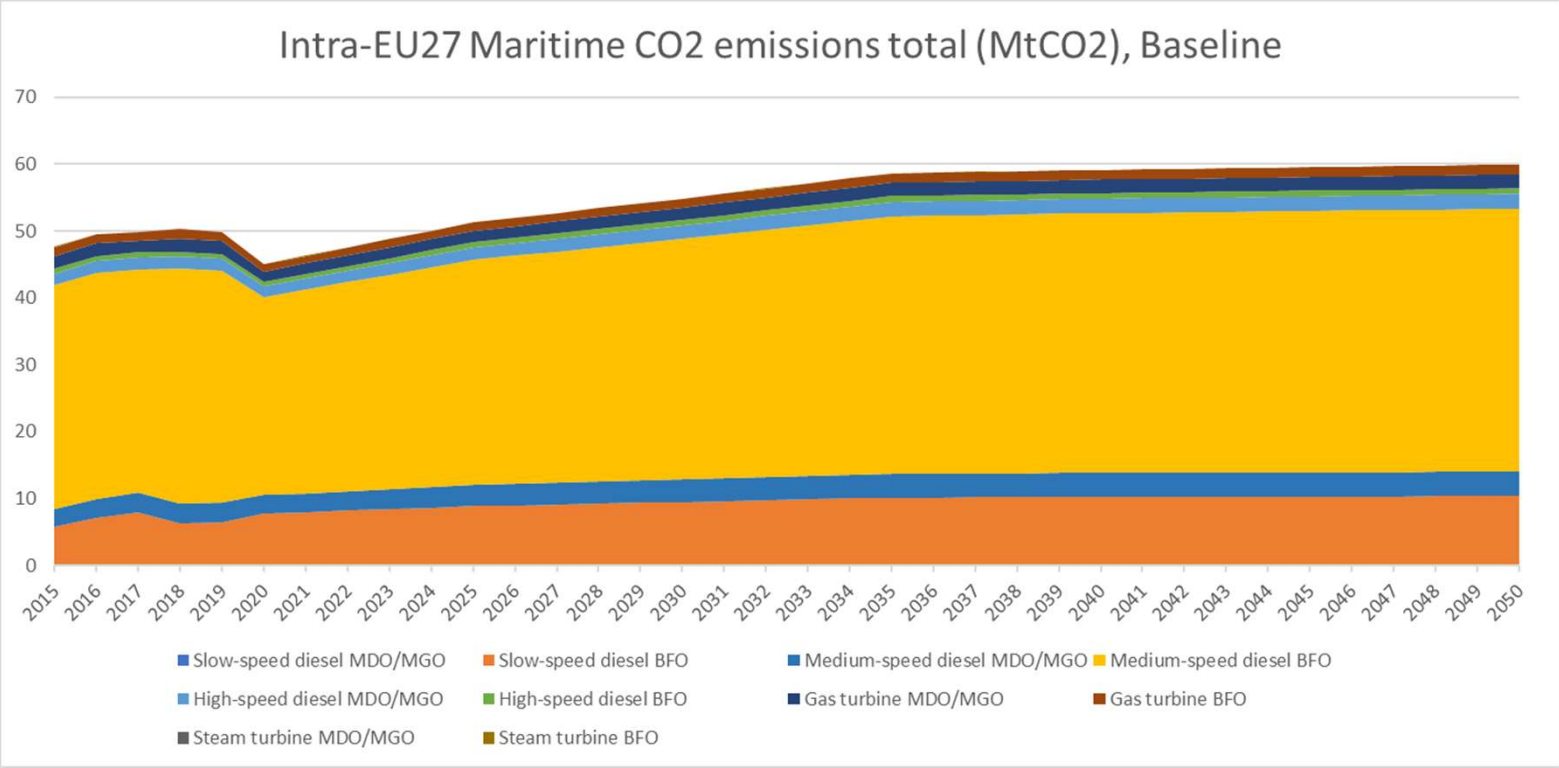
DIONE Air & Sea Extension – What & Why

- First step to extend JRC capabilities in transport emission calculation to maritime and aviation modes
- Gain an overview of available datasets and their suitability
- Identify and evaluate emission calculation methods
- Develop a prototype computational tool
- Study carried out by a contractor in 2022/23

DIONE Air & Sea Extension - State

- EMEP/EEA Guidebook Tier 2 and 3 methods have been implemented
- Datasets for Tier 2 available from public sources (Eurostat and UNFCCC National inventory data)
- EU REF20 compatible baselines for aviation and maritime have been developed (Tier 2)
- Emission calculation for a wide range of GHGs and pollutants
- Tier 3 data not presently available to JRC; costly and needing processing

Exemplary Results



Baseline CO_2 Emissions from Intra-EU27 Maritime Transport by Vessel Type

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Model Coverage and Resolution

- Emissions:
  - maritime greenhouse gas emissions (CO_2, CH_4, N_2O) as well as pollutants (NO_x, CO, non-methane volatile organic compounds (NMVOCs), SO_2, particulate matter (PM2.5, PM10), BC, heavy metals)
  - Aviation greenhouse gases (CO_2, CH_4, N_2O, compounds containing fluorine atoms), H_2O vapour, NO_x, CO, SO_x, NMVOCs, PM, etc.
- Geographical: EU27 member states and total; national, intra-EU, international
- Temporal: Up to 2050
- Technical: State-of-art engines and fuels, option to add custom aircraft/vessels
- Trip phase differentiation:
  - Aviation: Landing & Take-off (LTO) / Climb, Cruise, Descent (CCD)
  - Maritime: hoteling, manoeuvring, cruise

Thank you! Questions?

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