

› **DUTCH EMISSION FACTORS AND RESEARCH AGENDA**
NORBERT LIGTERINK, ERMES 11-10-2022

› **TNO MEASUREMENTS, ANALYSES, AND EMISSION FACTORS**

TNO PROGRAM FROM 2021 ONWARDS*

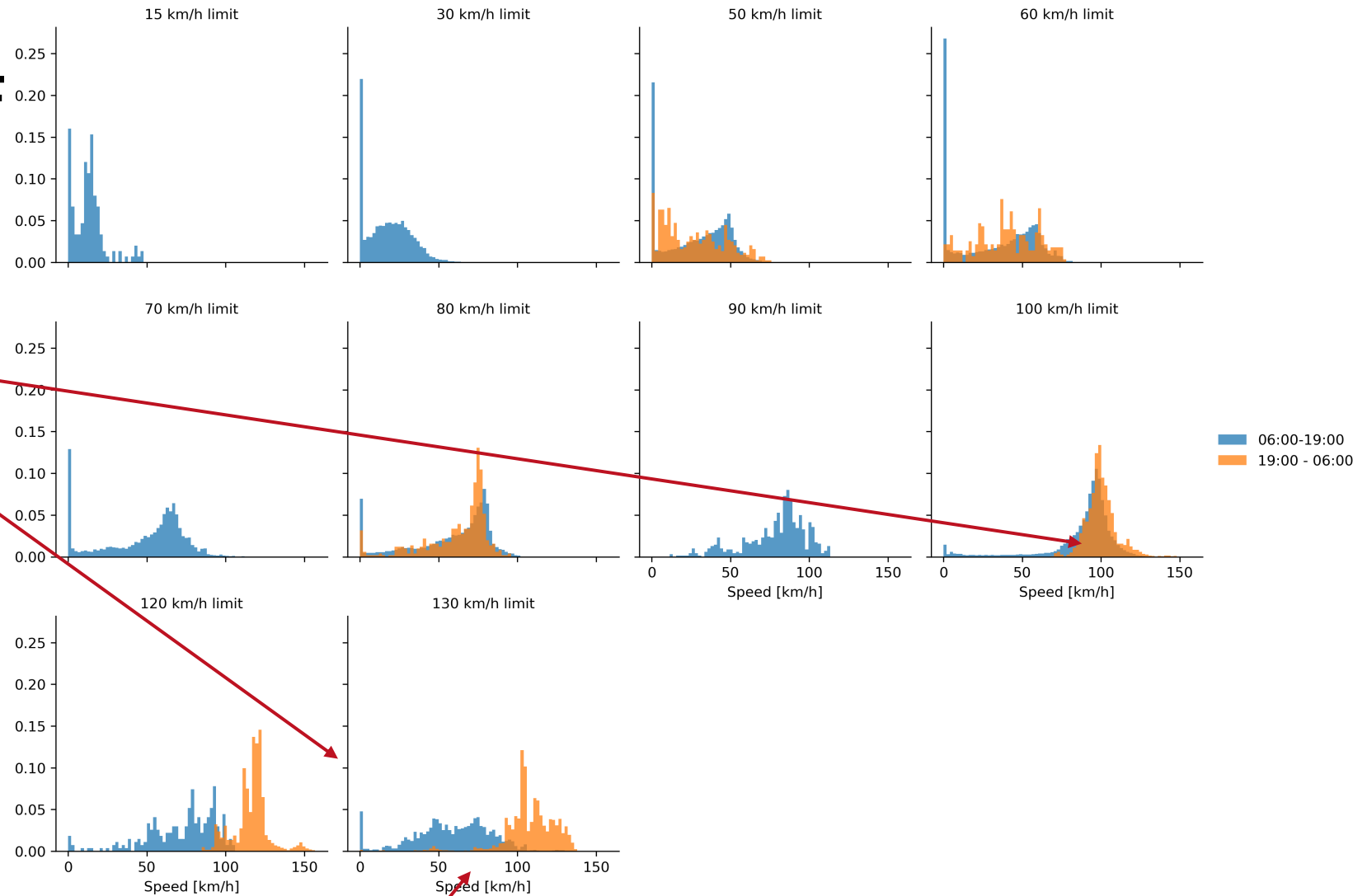
- › Driving behaviour revisited after new speed limits and enforcement
- › Cold start emissions separated out and activity data collected
- › Elevated NO_x and NH₃ of petrol cars Euro-4..6, on-road testing
- › Euro-6d diesel vehicles very clean
- › Monitoring of Non-Road Mobile Machines and Inland Shipping
- › Refocus on particle emissions, incl. brake wear, toxicity, etc.
- › Lifetime emission performance, improved PTI, tampering
- › European projects: CLOVE (Euro-7), DIAS, uCARE, CARES

*underlined items discussed below

CHASE CAR CAMPAIGN

COMPLEX SYSTEM OF DAY/NIGHT SPEED LIMITS

- › Very similar behaviour on 100 km/h roads day vs night
- › Very little (relative to time) congestion on 100 km/h roads
- › High speed peak on 120 km/h roads
 - › This can be extrapolated to account for type of car and how often they occur in the fleet
- › 130 km/h roads shows peak around 100 km/h

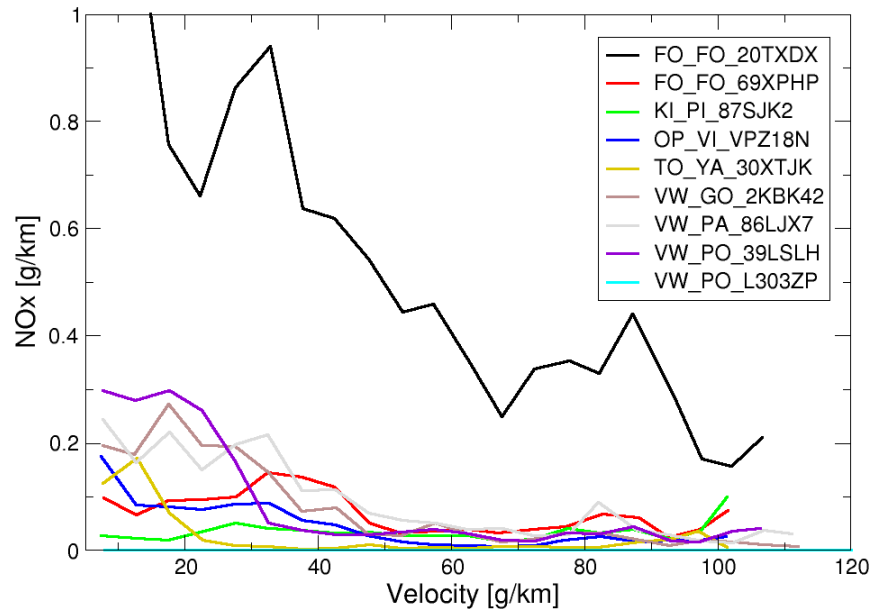


Note 120 + 130 km/h during the day: e.g. klaverblad/interchange/on- & off-ramps

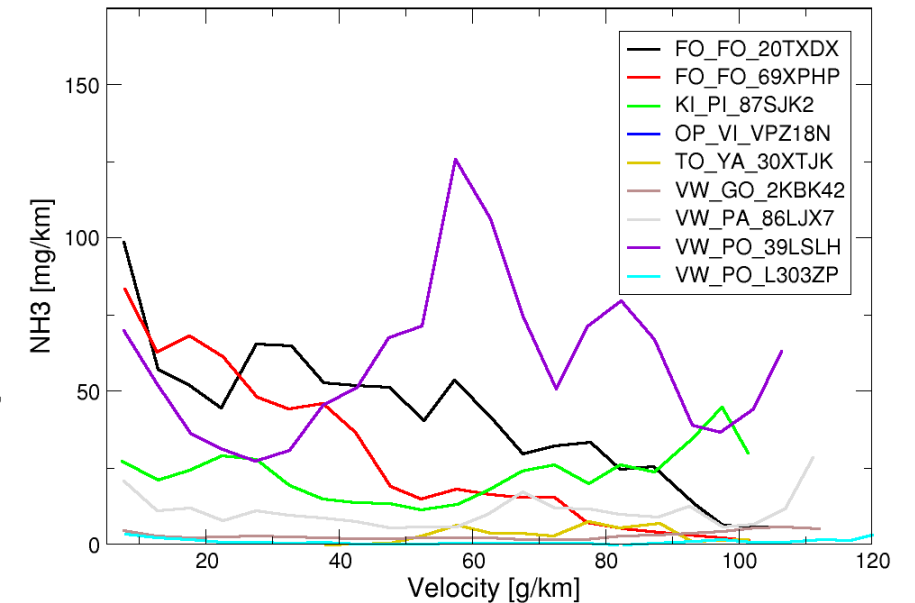
› OLDER PETROL CARS, SPECIAL ATTENTION FOR NH3

FUNCTIONING OF THREE-WAY CATALYST AFTER 100,000 KM

- › Both NOx and NH3 seem linked to substandard performance of the TWC, i.e., they are correlated.
- › NOx is more related to specific vehicles, i.e., outliers (about 1 in 6), while NH3 is more generic.
- › Emission factors NH3 for Euro-4 to Euro-6: urban: 21 mg/km, rural: 18 mg/km, motorway: 15 mg/km, mainly higher NH3 emissions with higher dynamics.



Representative testing,
covering all Dutch
traffic conditions

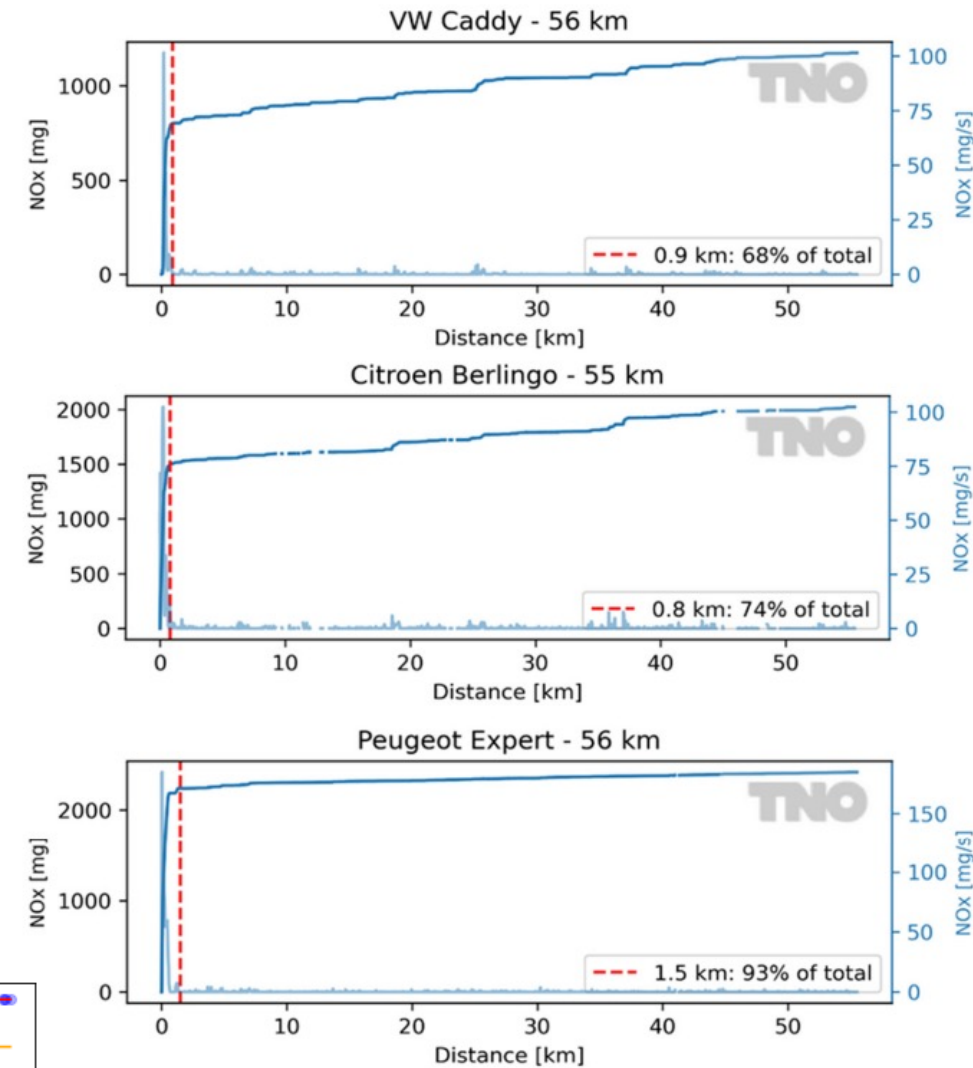
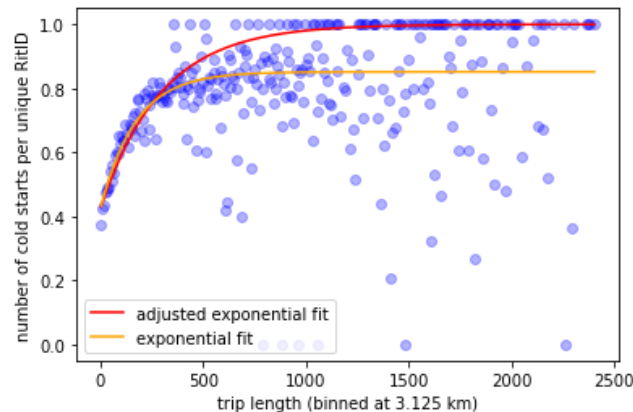


› COLD START EMISSIONS

WKS EMISSION FACTORS IN [G/START]

- › All modern vehicle have catalysts, and cold start emissions will be more than half of all emissions in a few years time.
- › Revisit older material on cold start emissions for Euro-1..5
- › Methodology to extract cold start emissions from on-road data
- › Cold start set at: > 2 hour engine-off: using Statistics Netherlands trip data
- › $\# \text{ cold_starts}_{LD} = 600 * \text{ann_mileage} / (\text{ann_mileage} + 5000)$
- › $\# \text{ cold_starts}_{HD} = 250 * \text{ann_mileage} / (\text{ann_mileage} + 5000)$
- › Locations: 62% homes, 31% businesses, 7% public parking
- › To be used in national models.

Not all trips are a cold start trip: function of trip length



Euro-6d diesel NOx emissions,
over a 56 km trip: 68%-93%
during cold start

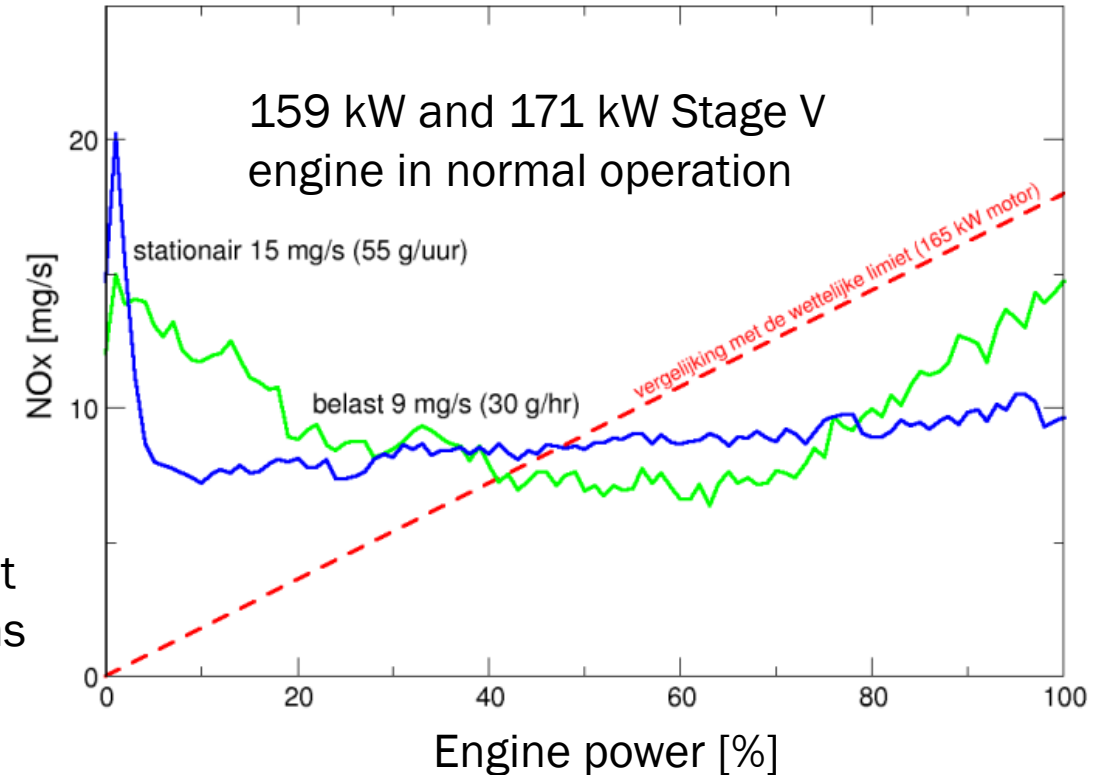
› EUTROPHICATION AT THE DUTCH HIGHEST COURT

NEW PROJECTS NEAR NATURE RESERVE AREAS ARE BLOCKED

- › Building projects require non-road mobile machines (NRMM), so they get special attention
- › Stage-V machines (56-560 kW) seem to emit a constant NO_x in mg/s, irrespective of power demand
- › Low power demand main cause of high NO_x
- › Using < 56 kW and > 560 kW engines to avoid SCR



Different measurement and monitoring systems developed to screen, test, and monitor NRMM in normal use. Assisting operators with reporting and mitigation measures.



Key usage parameters: running hours, litres of fuel, and litres of AdBlue

TNO REPORTS 2021-2022

- › › [Aspecten van fijnstof in uitlaatgas voor luchtkwaliteit en gezondheid | TNO Publications](#) (Dutch)
- › [Dutch In-service Emissions Measurement Programme for Light-Duty Vehicles 2021 and status of in-vehicle NOx monitoring | TNO Publications](#)
- › [Analysis of the emission performance of the vehicles tested for the Green Vehicle Index \(GVI\) project | TNO Publications](#)
- › [Aanpak van hoge NOx emissies van oudere benzineauto's | TNO Publications / Approaches for detecting high NOx emissions of aged petrol cars during the periodic technical inspection | TNO Publications](#) (NL/UK)
- › [Real-world fuel consumption and electricity consumption of passenger cars and light commercial vehicles - 2021 | TNO Publications](#)
- › [Dutch In-service Emissions Measurement and Monitoring programme for Heavy-Duty vehicles 2021 | TNO Publications](#)
- › [Dutch In-service emissions testing programme for heavy-duty vehicles 2019-2020 | TNO Publications](#)
- › [Real-world emissions of non-road mobile machinery | TNO Publications](#)
- › [Eindrapport data onderzoek mobiele machines in Nederland | TNO Publications](#) (Dutch)
- › [Trends in energy efficiency of conventional petrol and diesel passenger cars | TNO Publications](#)
- › [TNO emissiefactoren 2021 voor AERIUS 2021 | TNO Publications](#) (Dutch)
- › [AUB \(AdBlue verbruik, Uren, en Brandstofverbruik\) | TNO Publications](#) (Dutch)
- › [Emissiefactoren wegverkeer | TNO Publications](#) (Dutch)
- › [Model M1 | TNO Publications](#) (MILE21 real world fuel consumption)
- › [MaVe Action Emission Monitoring and Periodic Inspection of Mobile Machines | TNO Publications](#)

See also:

[Alle emissiegegevens op één plek | Emissieregistratie Project uCARE - Project ucare \(project-ucare.eu\)](#)
<https://dias-project.com/>