

German Environment Agency

**Towards clean vehicles – the future of the
internal combustion engine**

What has changed after Dieselgate?

Dr. Martin Lange

Section I 3.2 / Pollution Abatement and Energy Saving in Transport

Scientific Policy Advisor

Agenda

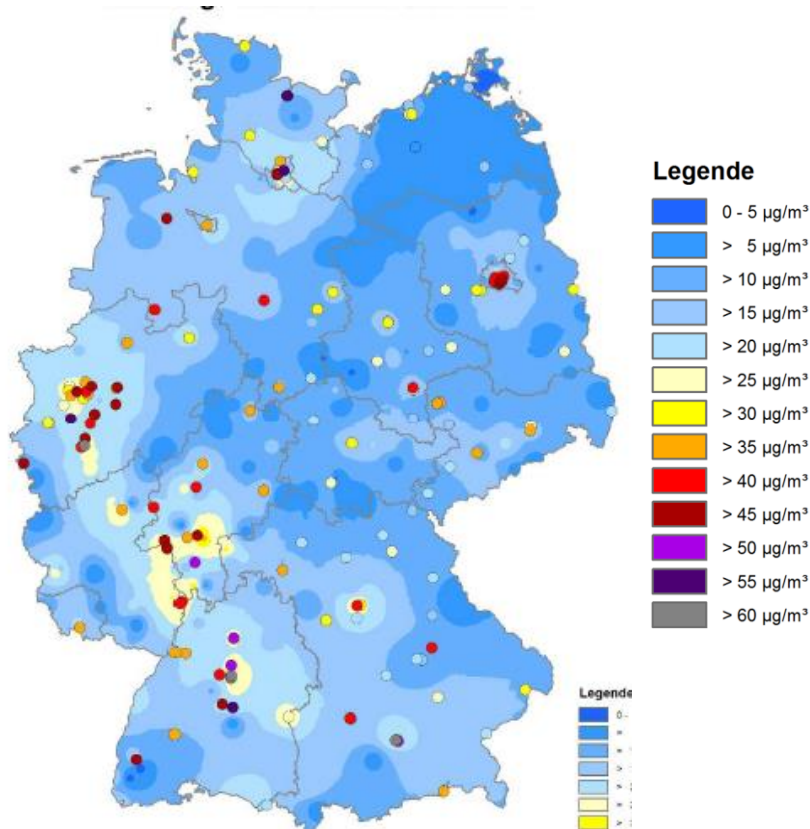
- 1 **NO₂-AIR QUALITY PROBLEMS IN CITIES AND TOWNS**
- 2 **NO_x-EMISSIONS OF TRANSPORT IN GENERAL
AND IN PARTICULAR DIESEL PASSENGER CARS**
- 3 **DEVELOPMENT OF THE
EU-EMISSION LEGISLATION FOR
LIGHT DUTY VEHICLES**
- 4 **NATIONAL FORUM DIESEL AND
OTHER MEASURES /
PROJECTIONS FOR NO₂**
- 5 **CURRENT STATUS, SUMMARY
AND OUTLOOK**



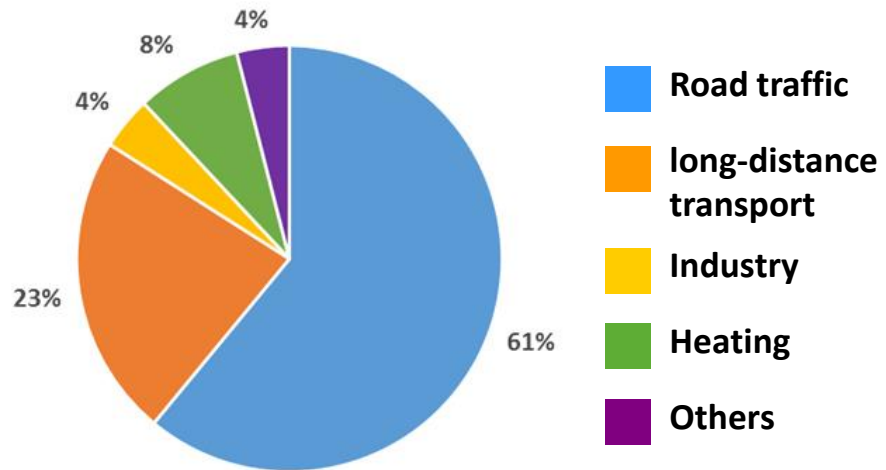
www.wikipedia.org, Mariordo, CC BY-SA 3.0

Status quo of nitrogen dioxide (NO₂) in Germany

NO₂ concentration
in 2017 (yearly average)



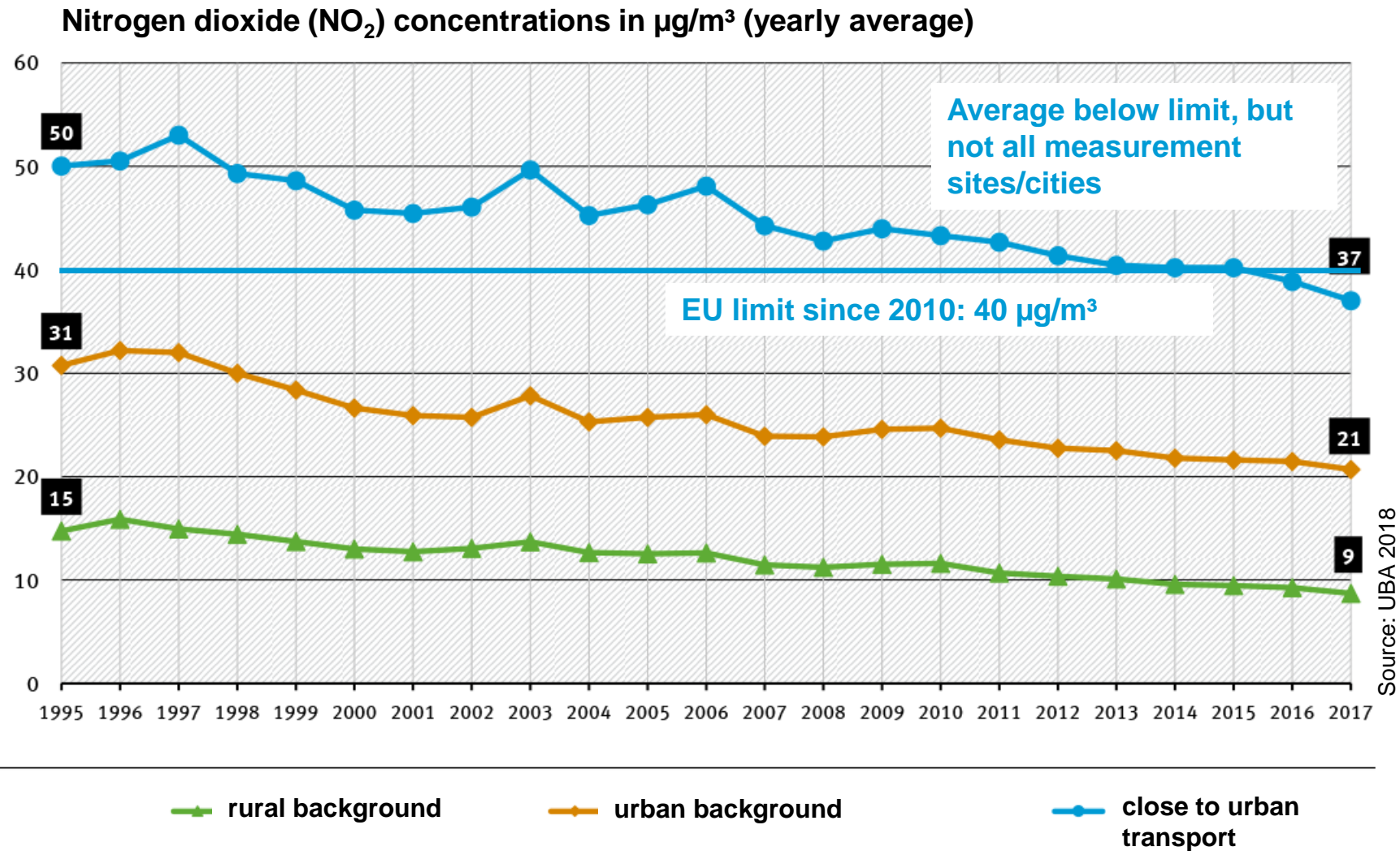
Contribution to the NO₂
concentration in Germany cities
(source analysis)



- In 2017 the air monitoring sites on streets in 65 cities lie over the year-averaged EU limit value of NO₂ (40 µg/m³; share of about 45% of the measurement sites at streets).
- Main source for NO₂ air pollution are diesel vehicles, particularly diesel-fueled passenger cars.

Source: UBA 2018.

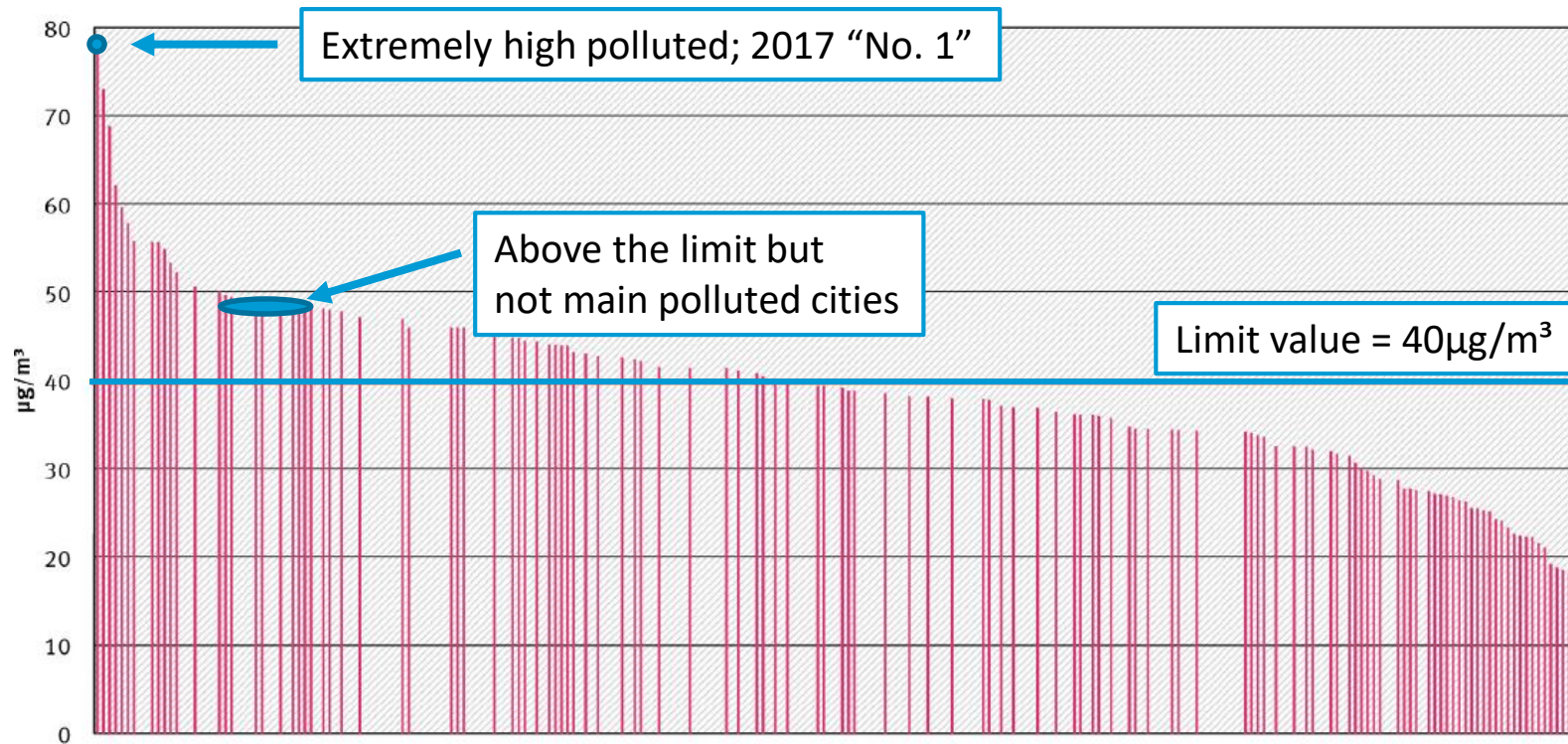
Development of average nitrogen dioxide (NO₂) concentrations in Germany from 1995 to 2016



Measurement sites close to transport – 2017 levels

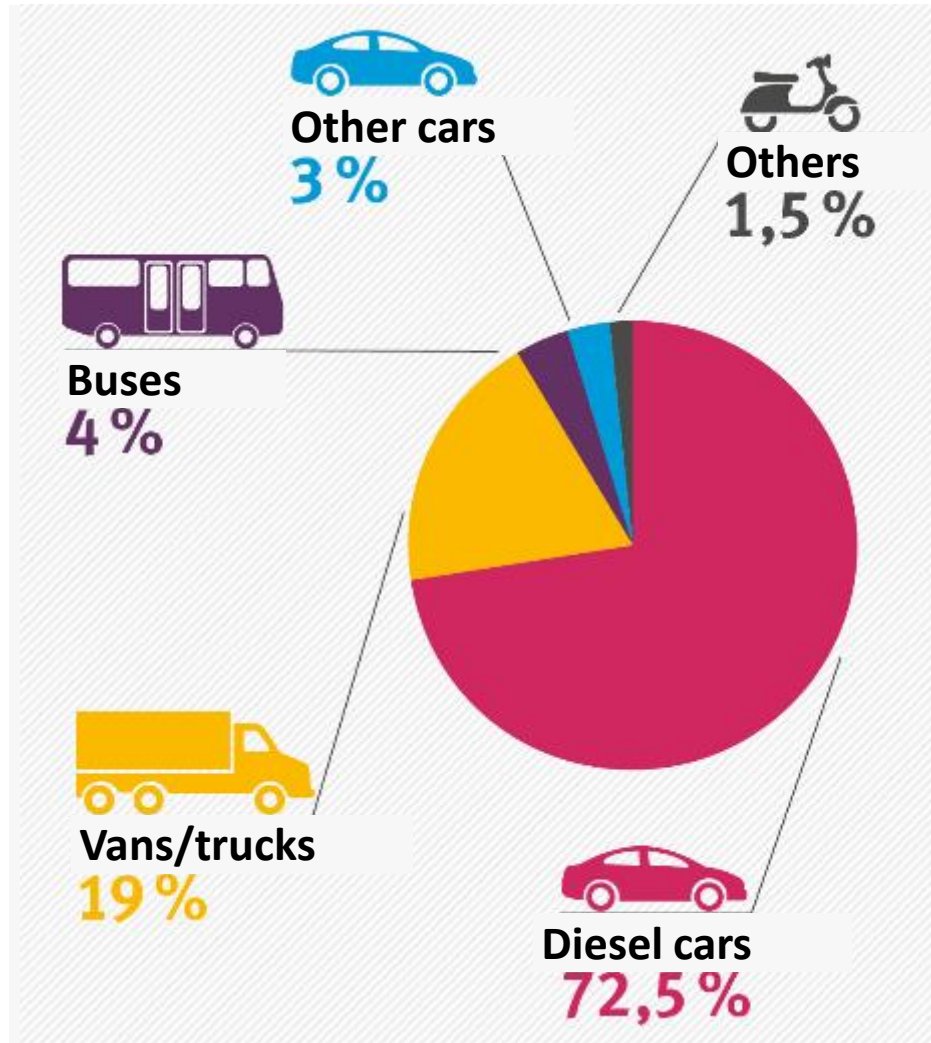
Mean yearly average for NO₂ 2017
All measurement sites for traffic

*gaps or passive collectors that are
not yet updated. Here with 2016 value



Quelle: Umweltbundesamt 2018

Nitrogen dioxide (NO₂) emissions caused by the transport sector in cities in Germany for the year 2015



Source: UBA 2017.

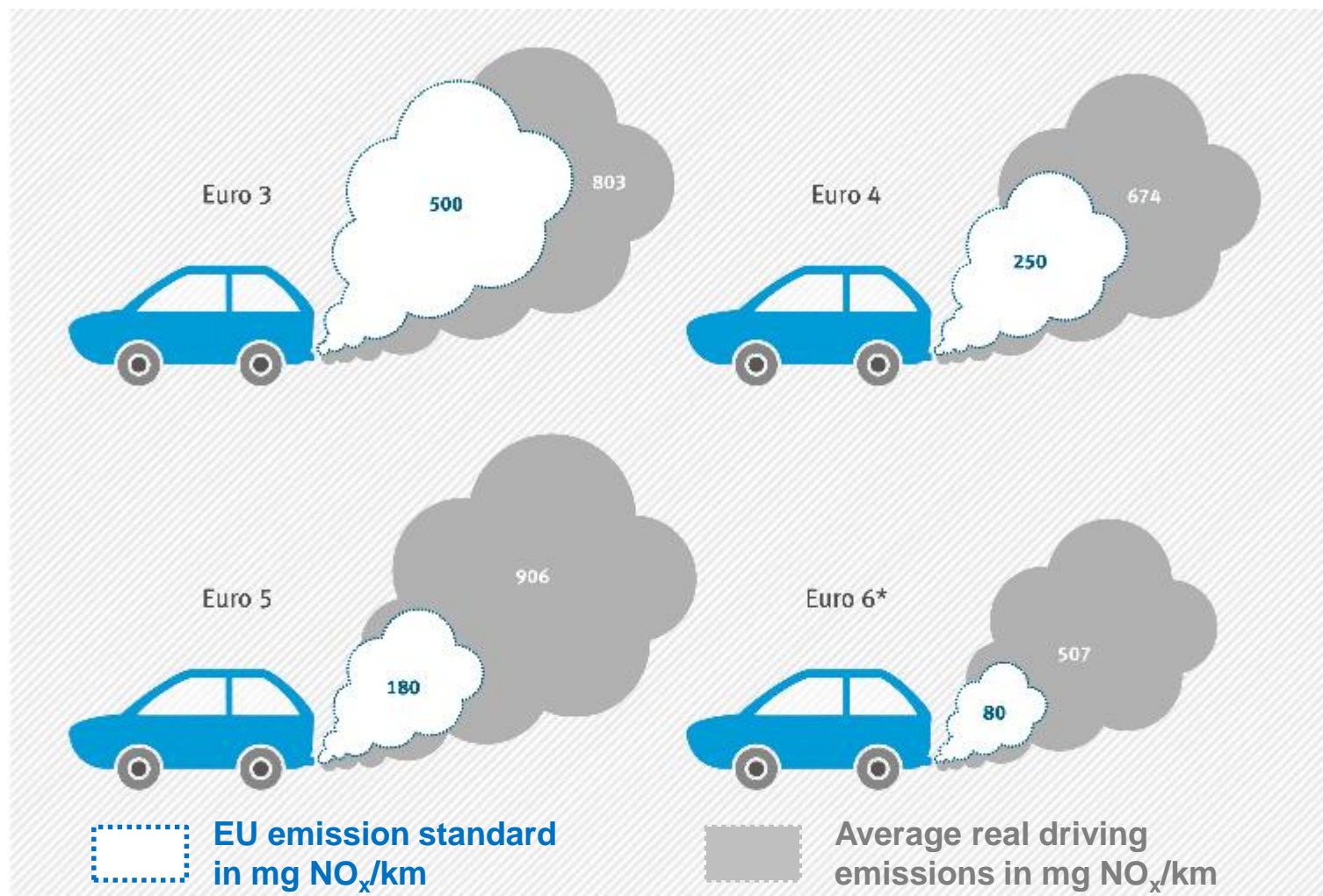
Reasons for the high share are:

- High diesel-share in Germany that further increased until the Diesel-Gate in 2015
- Bad real-world performance regarding NO_x-emissions of diesel cars, in particular for Euro 5 and most of the Euro 6* cars

*without mandatory on-road testing with portable emission measurement systems (PEMS/RDE)

NO_x-emissions of transport in general and in particular diesel passenger cars

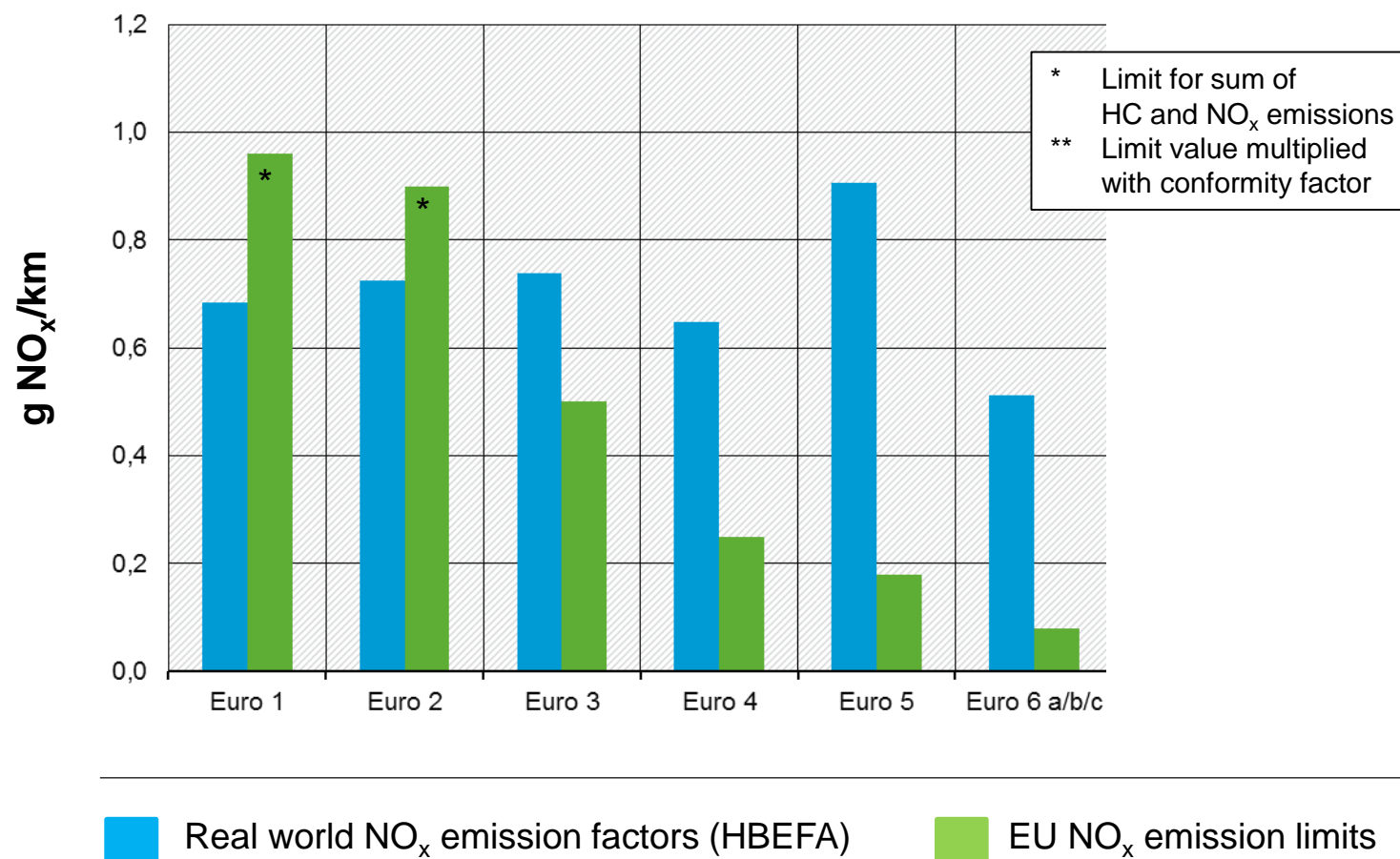
Average real driving nitrogen oxide (NO_x) emissions of diesel-fueled cars in Germany compared to emissions standards in Europe



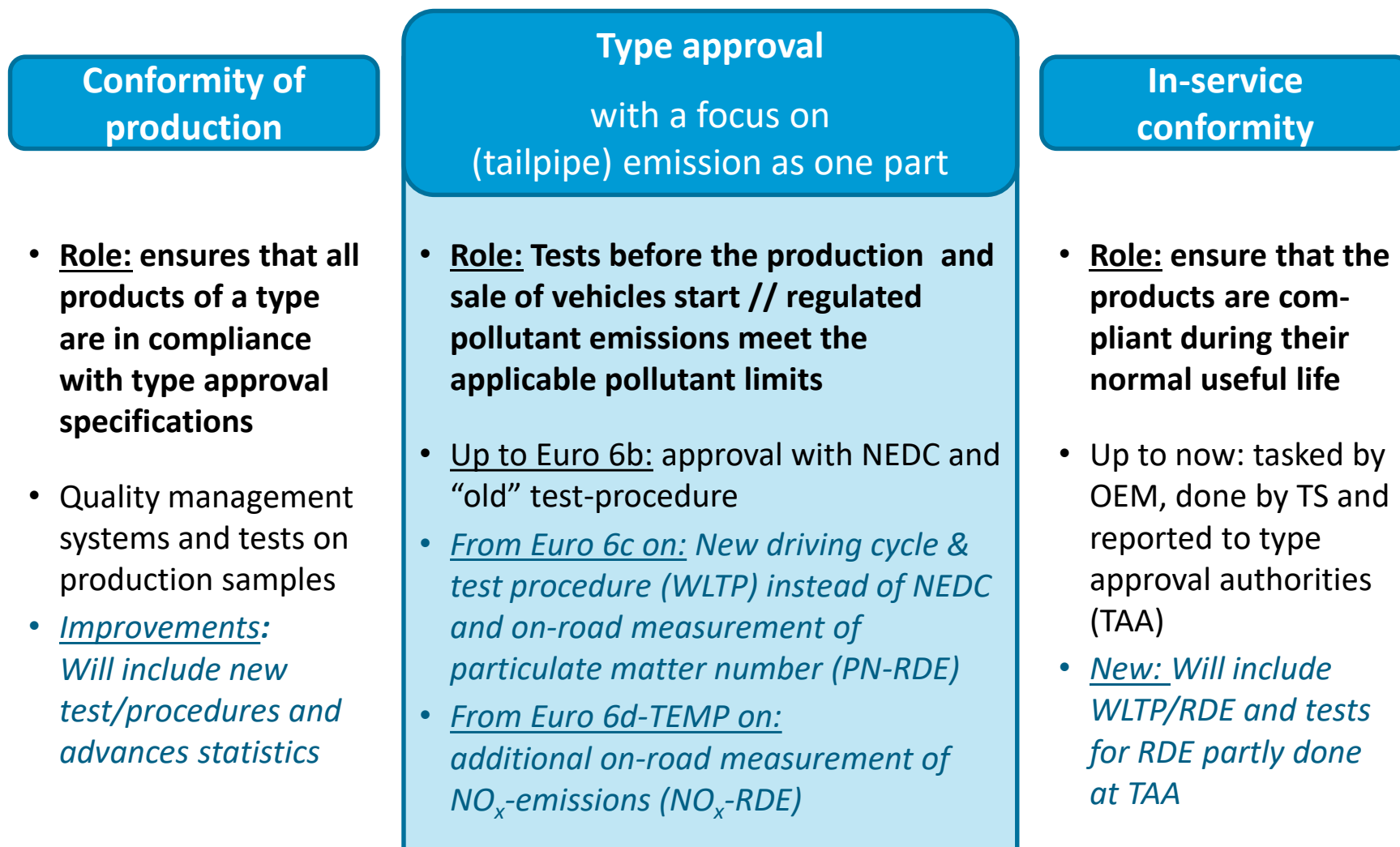
Source: HBEFA 3.3 (24/04/2017).

Average real world nitrogen oxide (NO_x) emissions of diesel-fueled cars compared to emissions standards in Europe

Real world NO_x emission factors for diesel passenger cars compared to EU limits



Emission standards and test procedures within Euro 6 standard: WLTP and Real Driving Emissions (both initiated before Dieselgate)

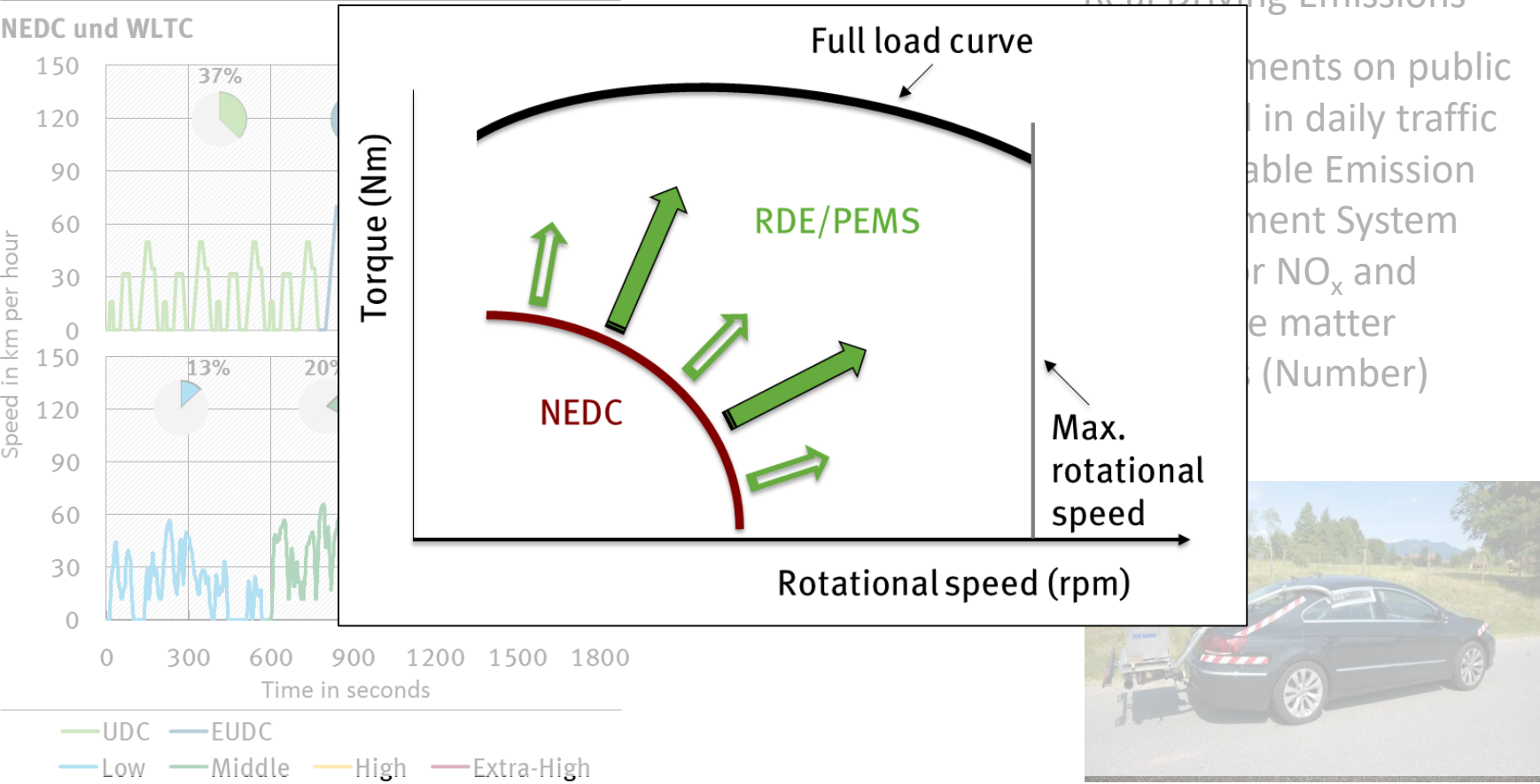


New test procedure WLTP and real driving emissions RDE

WLTP: Test cycle + plenty changes in the test procedure

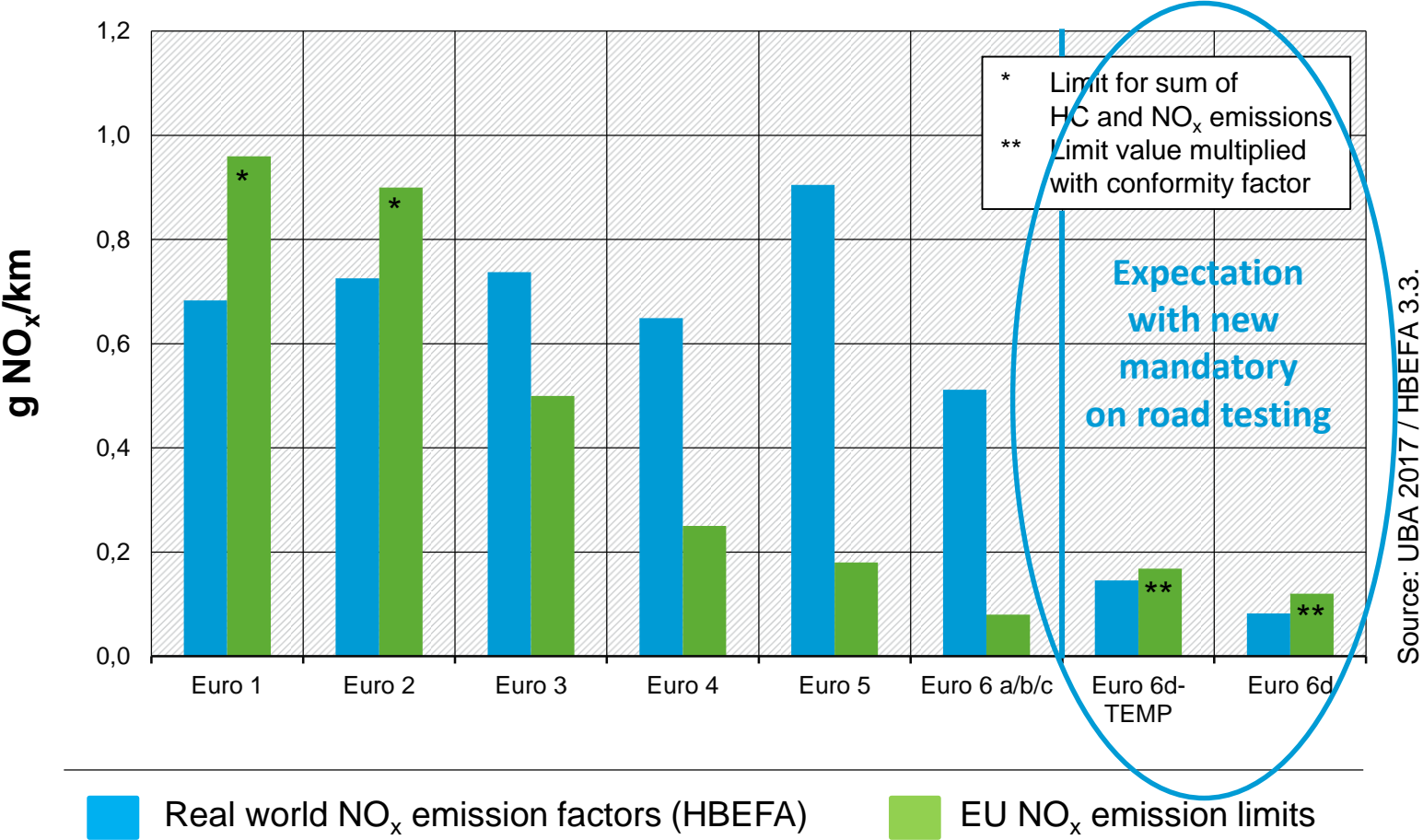
RDE

Real Driving Emissions



Average real world nitrogen oxide (NO_x) emissions of diesel-fueled cars compared to emissions standards in Europe

Real world NO_x emission factors for diesel passenger cars compared to EU limits



„National Forum Diesel“: August 2017 with Federal and State Government as well as Car-Industry

SOFTWARE UPDATES FOR EURO 5 AND EURO 6 LIGHT DUTY VEHICLES

- 5,3 Mio. vehicles (of ~46,5 Mio. PC) with updates expected
- VW-vehicles are included (~2.2 Mio. LDV; mandatory recall)
- NO_x-reductions of 30% are proposed by OEM; but no proofed values are published until now
- Also for the number of Updates for non-VW cars („voluntary updates“) the realization is not clear

EXCHANGE PREMIUM FOR NEW LDV BY RETURNING OLD DIESEL

- Programs organized by OEM only
- Trade-in or scrapping of Euro 4 Diesel or older in exchange to money if new (in some cases also young used) car is bought
- sometimes in addition to current discount or instead of them
- Non-official value indicate that 10% to 20% of all new cars are bought using it

Reductions are expected to be not enough (~2-4 µg/m³)



Immediate Programm „Clean Air 2017-2020“ and Model Towns and Cities

MEASURES OF THE IMMEDIATE PROGRAM „CLEAN AIR 2017-2020“

1 Bill. Euro for all cities and regions above the NO₂-limits
aim: avoid car bans

- Electrification of urban car fleets (e.g. busses, taxis, delivery fleets, etc.) and building of charging structure
- Digitalization of the transport system
- Retrofit of Diesel-Busses in public transport with more advanced exhaust after-treatment systems

MODEL TOWNS AND CITIES

130 Mio. Euro for 5 selected towns and cities

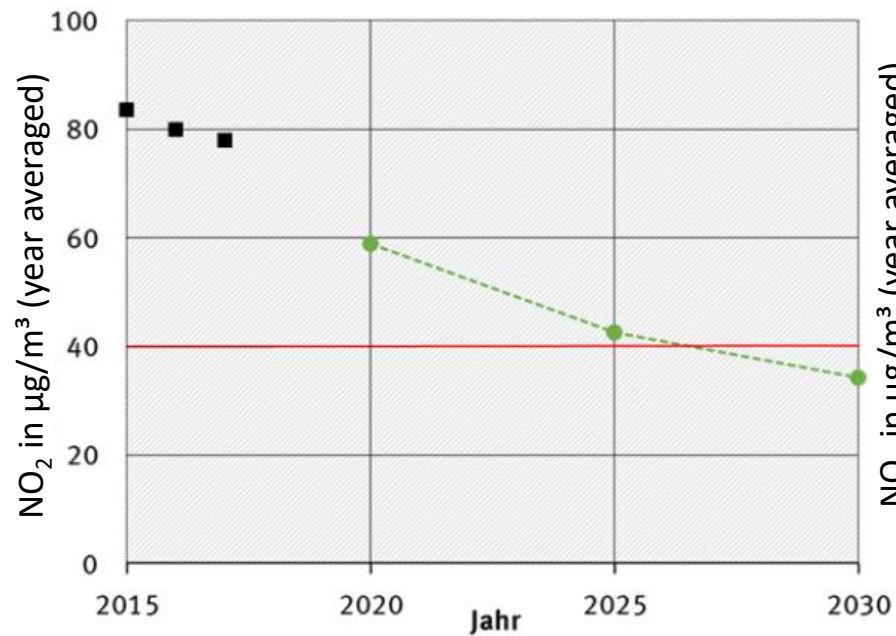
- Bonn, Essen, Mannheim, Reutlingen and Herrenberg
- Examples to swift and effective measures
 - e.g. 1€ ticket for local public transport
 - Park and Ride services
 - 50 more dedicated cycling roads



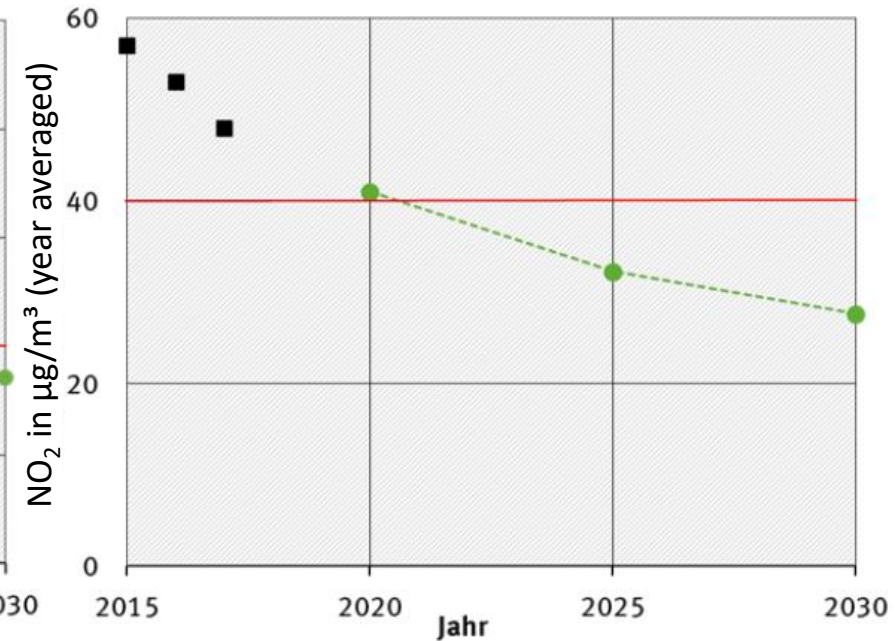
Current Reference Scenario: Yearly Averaged NO₂-levels for two streets in two cities

Reference Scenario with measures of „National Forum Diesel“ and with 2017-2020 of the immediate program „Clean AIR 2017-2020“

NO₂-concentration for Munich,
Landshuter Allee



NO₂-concentration for Mainz,
Parcusstraße



—●— Reference case (with Updates and discounts)

■ Measured values

Current situation (varity of new proposals popping up)

DRIVING BANS FOR DIESEL CARS IN SOME CITIES:

- **Selected streets in Hamburg** (in place)
for all cars/trucks older than Euro 6/VI
- **Within environmental zone in Stuttgart** (planned)
for all cars Euro 4 and older (inclusion of Euro 5 will be decided)
- **Within environmental zone in Frankfurt** (court decision; currently under appeal)

OTHER MEASURES (SOME ONLY FOR CITIES/TOWNS WITH HIGH LEVELS):

- **Retrofit (Hardware Upgrades) for municipal vehicles and Busses**
(agreed)
- **Hardware Upgrades for passenger cars**
(under discussion; which cars and who pays for that)
- **Rebuy of cars by the OEM** with current value + 20%
(proposed by the ministry of transport)
- **New or prolonged discounts** (potentially also higher) for (new) passenger cars (under discussion)
- Harmonized **environmental zones for NO_x** (federal level) not discussed

Summary and Outlook

IMPROVEMENT OF THE EMISSIONS LEGISLATION AND THE TYPE APPROVAL FRAMEWORK

- Real-driving emissions (RDE) and new test procedure WLTP for new cars should significantly reduce NO_x-emissions
- Upcoming Euro 7/VII discussions
(possibly more pollutants, more stringent limit values, new instruments/measures, etc.)

TECHNICAL AND NON-TECHNICAL MEASURES TO COMPLY WITH LIMITS AS SOON AS POSSIBLE

- Software Updates and Retrofits as a promising contribution
- Potentially also new harmonization environmental zones on federal level for NO_x

CLIMATE PROTECTION

- Post2021-discussion for fuel economy- / CO₂-standards
- Transition of transport system (avoid, shift and improve) and energy transition in transport (alternative fuels and propulsion technologies)

AIR POLLUTANTS

GOOD REAL-WORLD PERFORMANCE

DURABILITY

NEEDED AS COMBUSTION ENGINES
WILL STAY ON MARKET FOR A WHILE

APPROPRIATE ACTIONS SHOULD BE
INITIATED

NEED FOR CLIMATE ACTION ALSO IN
TRANSPORT

Thank you very much!

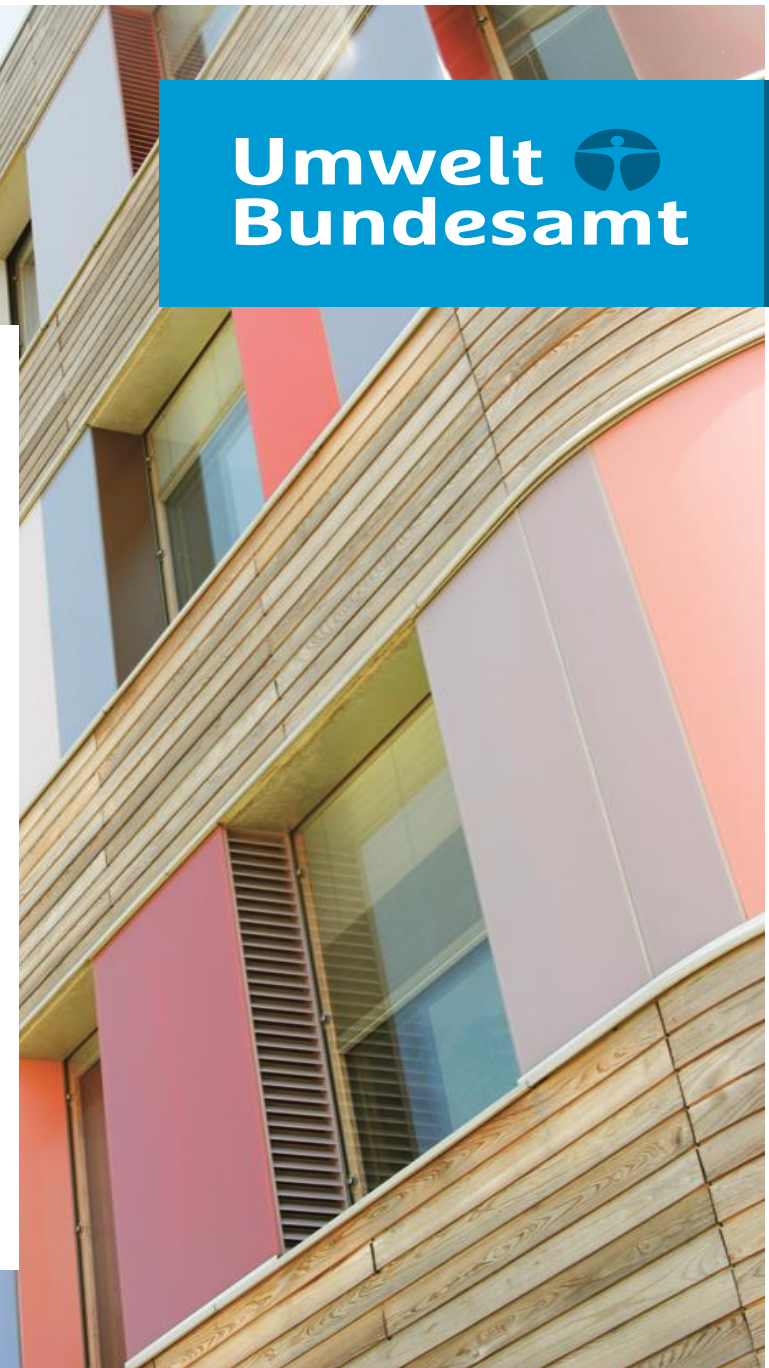
Martin Lange

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and Energy Saving in Transport

Umweltbundesamt
Wörlitzer Platz 1
06844 Dessau-Roßlau
Germany

martin.lange@uba.de

<https://www.umweltbundesamt.de/en/topics/transport-noise>



Light-blue or dark-blue sticker as an offer for a suitable solution (UBA proposal from march 2018)

UBA-PROPOSAL

LIGHT BLUE STICKER:

- Diesel Euro 5 (poss. older) with a good technical retrofit
- Diesel Euro 6a/b/c

DARK BLUE STICKER:

- Diesel Euro 6d-TEMP and 6d
- Gasoline from Euro 3 on
- Electric cars (battery electric or fuel cell electric)

6. März 2018, 07:28 Uhr Diesel-Urteil

"Das Verkehrsministerium fühlt sich der Autoindustrie verbunden"



Krautzberger schlägt zwei neue Plaketten vor, um zu erkennen, welche Diesel sauber sind und welche nicht. (Foto: imago/photothek)

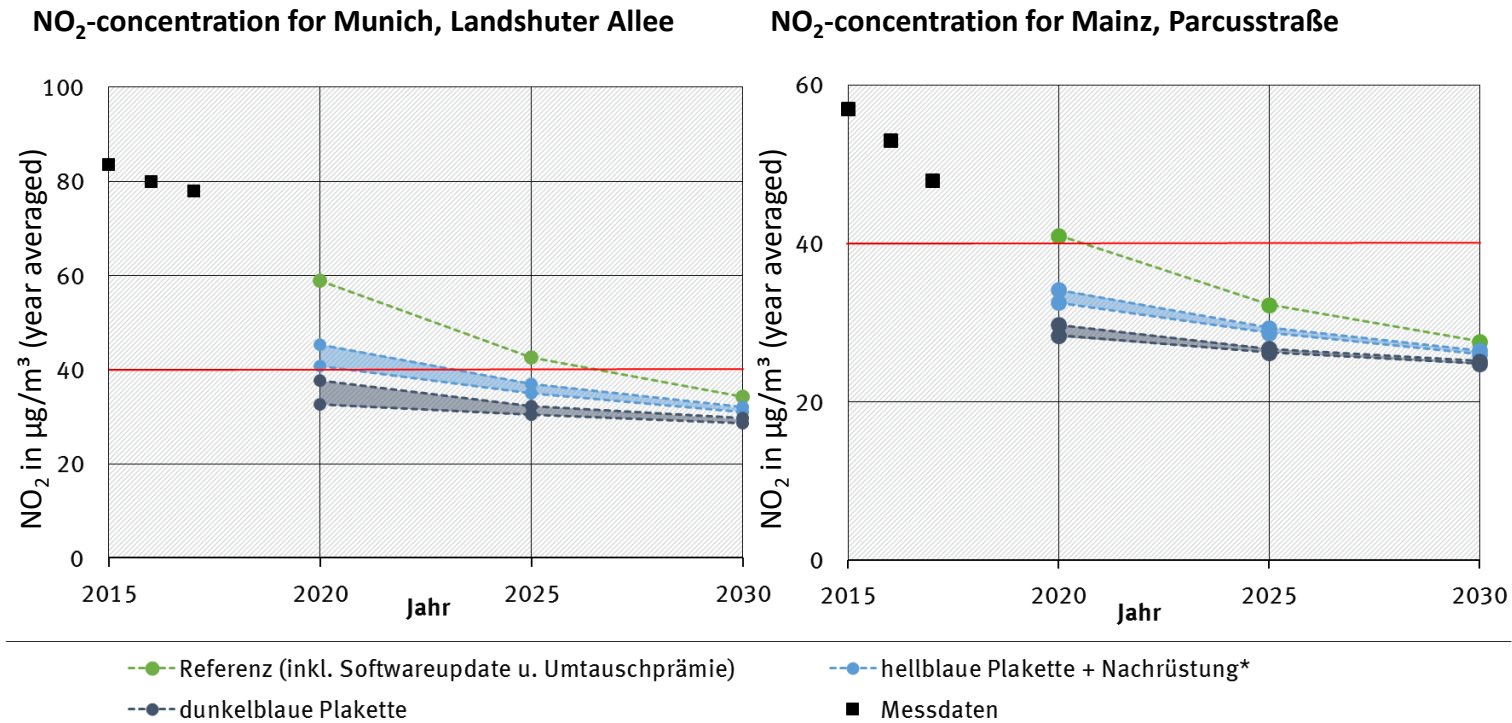
Die Chefin des Umweltbundesamtes, Maria Krautzberger, sieht keine Alternative zu Diesel-Fahrverboten. Sie schlägt zwei neue Plaketten vor - damit mehr Menschen ihren Diesel weiterfahren können.

ANZEIGE

Süddeutsche Zeitung, 6.3.2018

Software Updates, Hardware-Upgrades und drive bans: improvement of the NO₂-air quality

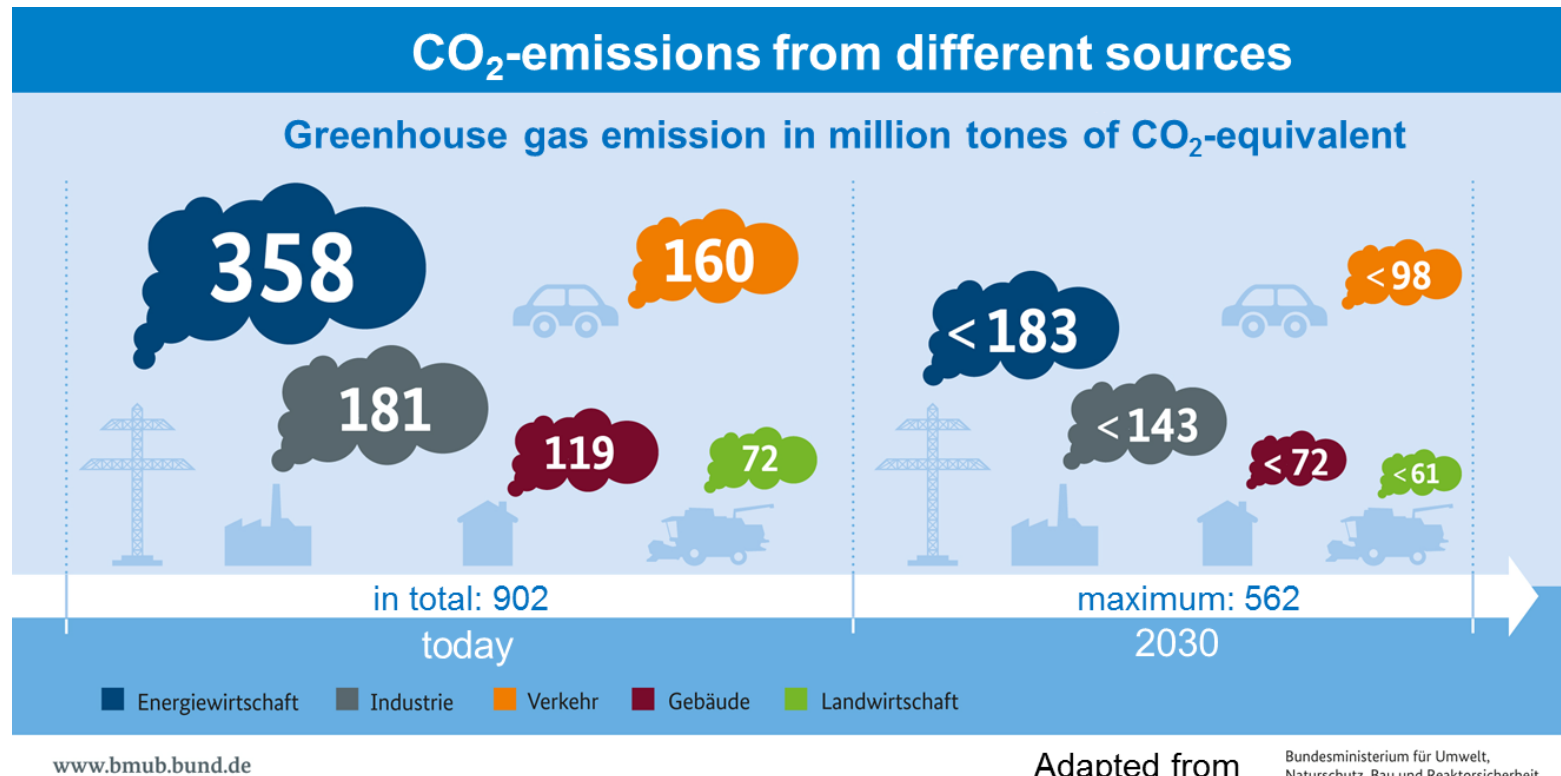
Fall: Mit Nachrüstung und inkl. Lkw



*Nachrüstung garantiert Einhaltung von 432 mg NO_x pro km in RDE-Tests bis -7°C

- Sticker system (LDV and HDV) would already with the light blue sticker secure compliance with the limits before 2020 and on extremely polluted sites well before 2025
- Retrofit options for passenger cars (as discussed) would reduce the number of affected owners

Germany has ambitious climate protection targets for 2030 from its “Climate Action Plan 2050”

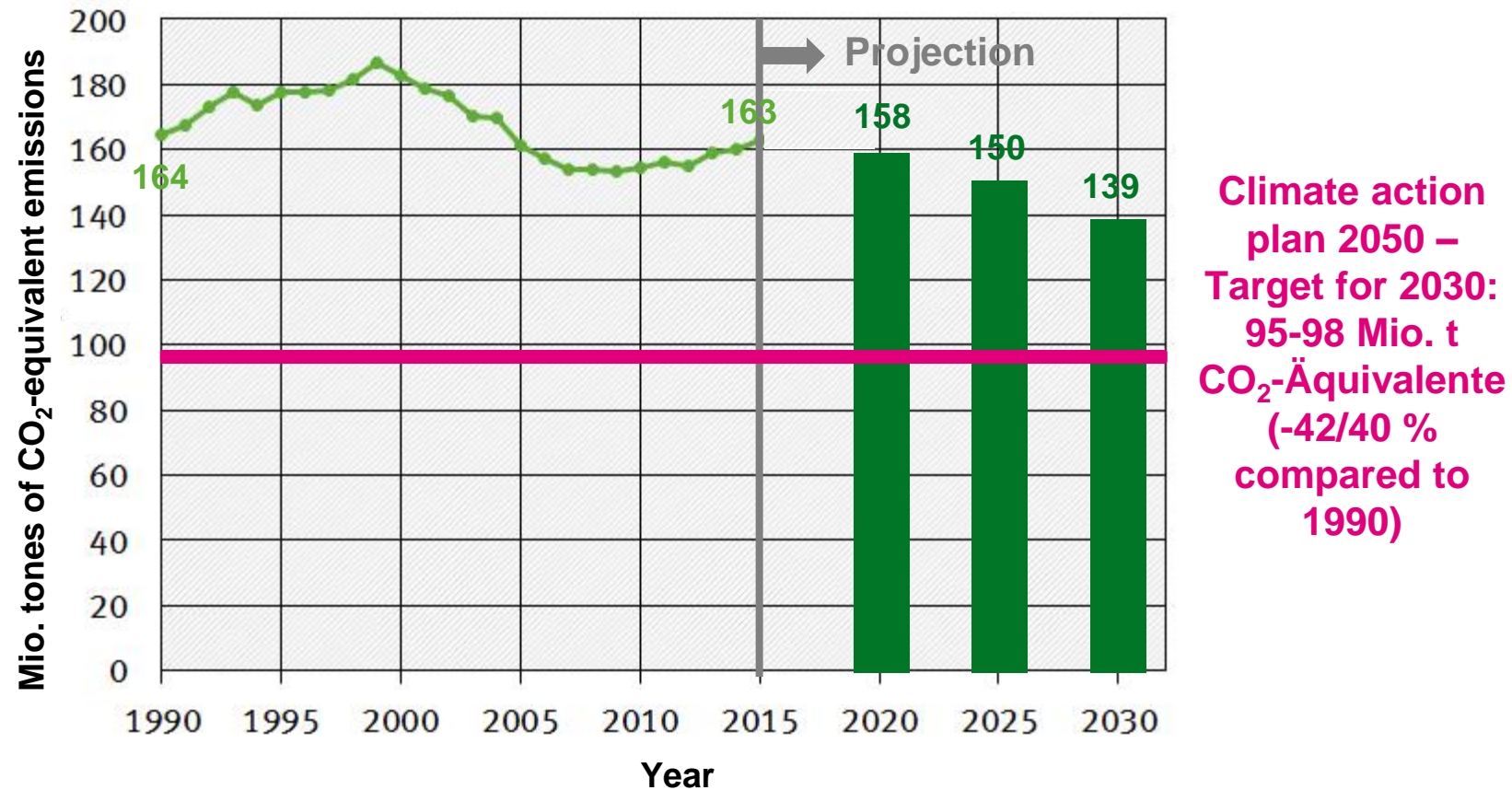


Fixed transports GHG-emission targets for:

- - 40 to - 42% relative to 1990-level
- 1990-level is comparable to the one in 2015!

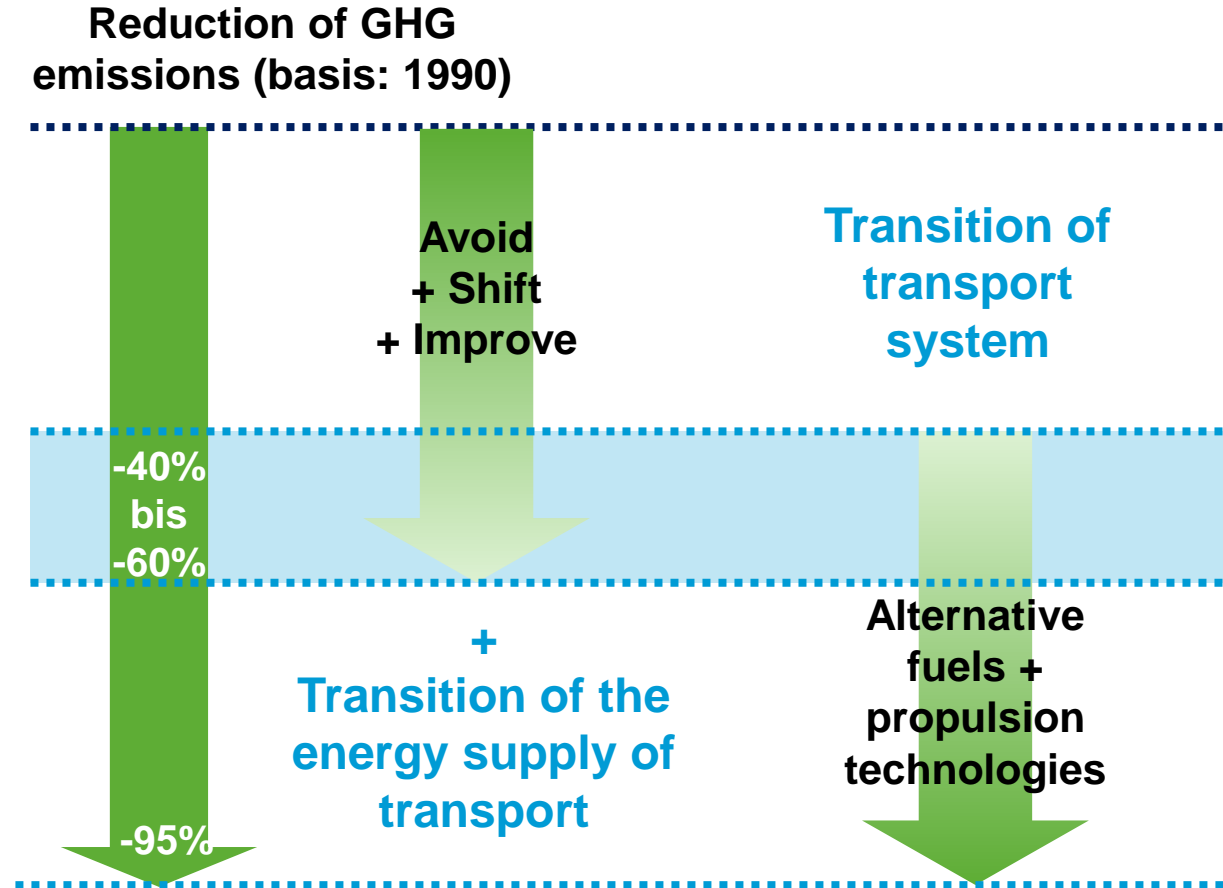
Adopted measures are not enough to reach the climate targets in transport in 2030

Development of GHG emissions of transport in Germany 1990-2017 and projection until 2030 (only adopted measures)



Sources: UBA 2018; Projektionsbericht 2017 für Deutschland gemäß Verordnung (EU) Nr. 525/2013.

Ambition climate protection targets in transport require a general transition and an energy transition in the sector



- **GHG mitigation goals above 60 %** can be only reached with an **energy transition in the transport sector**
- For **reducing costs of energy transition** a **transport transition** with avoiding, shifting and improving of traffic is needed