Requirements for Post EU VI/6 Emissions from a NGO Perspective

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Justification for Vehicle Emission Limits

The aim of vehicle emission limits is to protect people and nature against negative impacts of pollutants. For the definition of the negative impact air quality standards are set by the EU and recommentions of the World Health Organization as well as EU limit for deposition of acidification and nitrification. In addition the precautionary principle should be applied. Unluckily this approach isn’t very often followed.
Politically the best available technology and the cost for the society are taken into account.

The scientific approach is to model the required emission standards

EU Air Quality Directive 2008/50/EC

Pollutant	*Concentration*	*Averaging period*	*Legal nature*	*Permitted exceedences each year*
Fine particles (PM2.5)	25 µg/m3***	1 year	Target value entered into force 1.1.2010 Limit value enters into force 1.1.2015	n/a
Nitrogen dioxide (NO2)	200 µg/m3	1 hour	Limit value entered into force 1.1.2010	18
	40 µg/m3	1 year	Limit value entered into force 1.1.2010*	n/a
PM10	50 µg/m3	24 hours	Limit value entered into force 1.1.2005**	35
	40 µg/m3	1 year	Limit value entered into force 1.1.2005**	n/a

WHO Air quality guideline values

Particulate matter (PM)

Guideline values

Fine particulate matter ($PM_{2.5}$)

10 µg/m^3 annual mean

25 µg/m^3 24-hour mean

Coarse particulate matter (PM_{10})

20 µg/m^3 annual mean

50 µg/m^3 24-hour mean

Nitrogen dioxide (NO_2)

Guideline values

NO_2

40 µg/m^3 annual mean

200 µg/m^3 1-hour mean

Ozone (O_3)

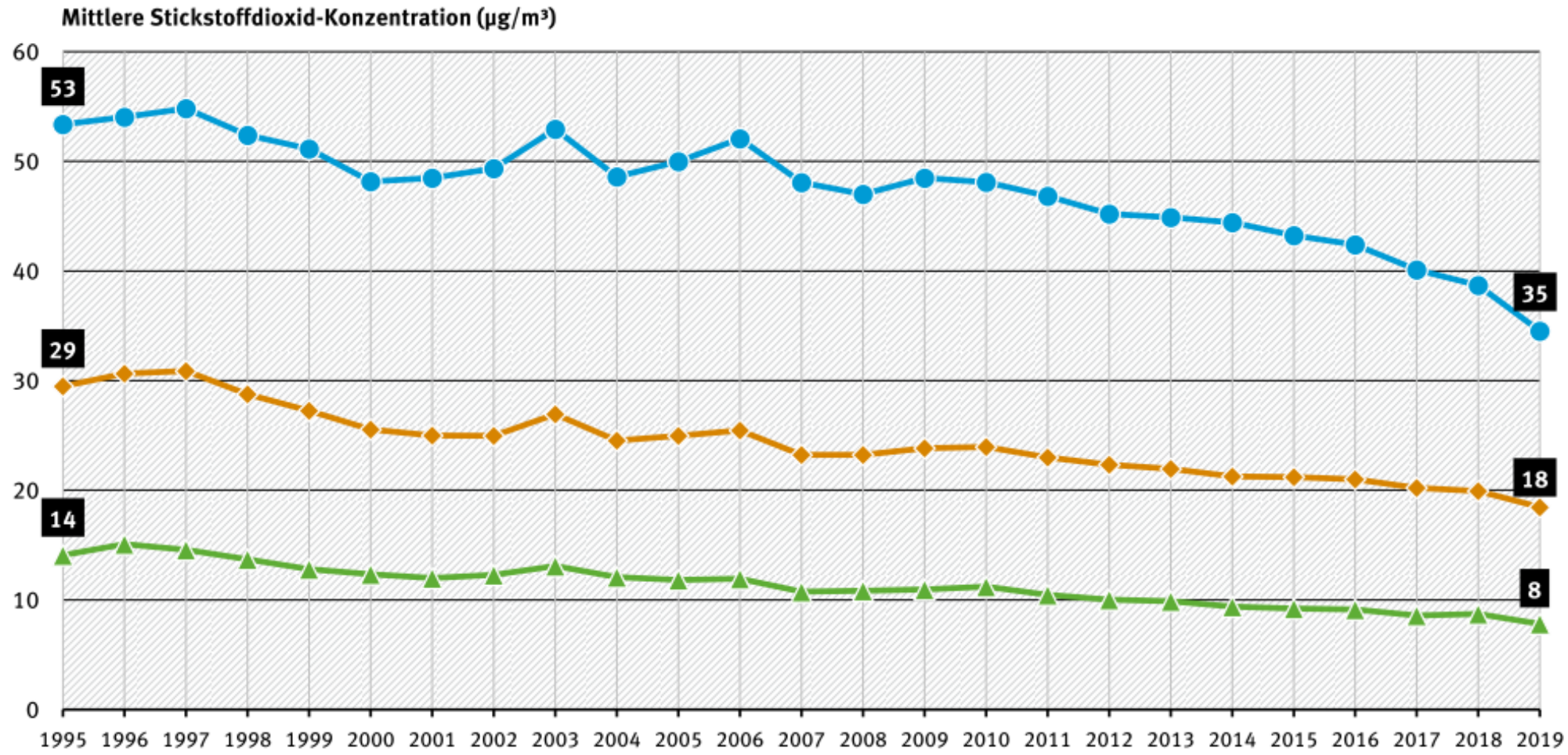
Guideline values

O_3

100 µg/m^3 8-hour mean

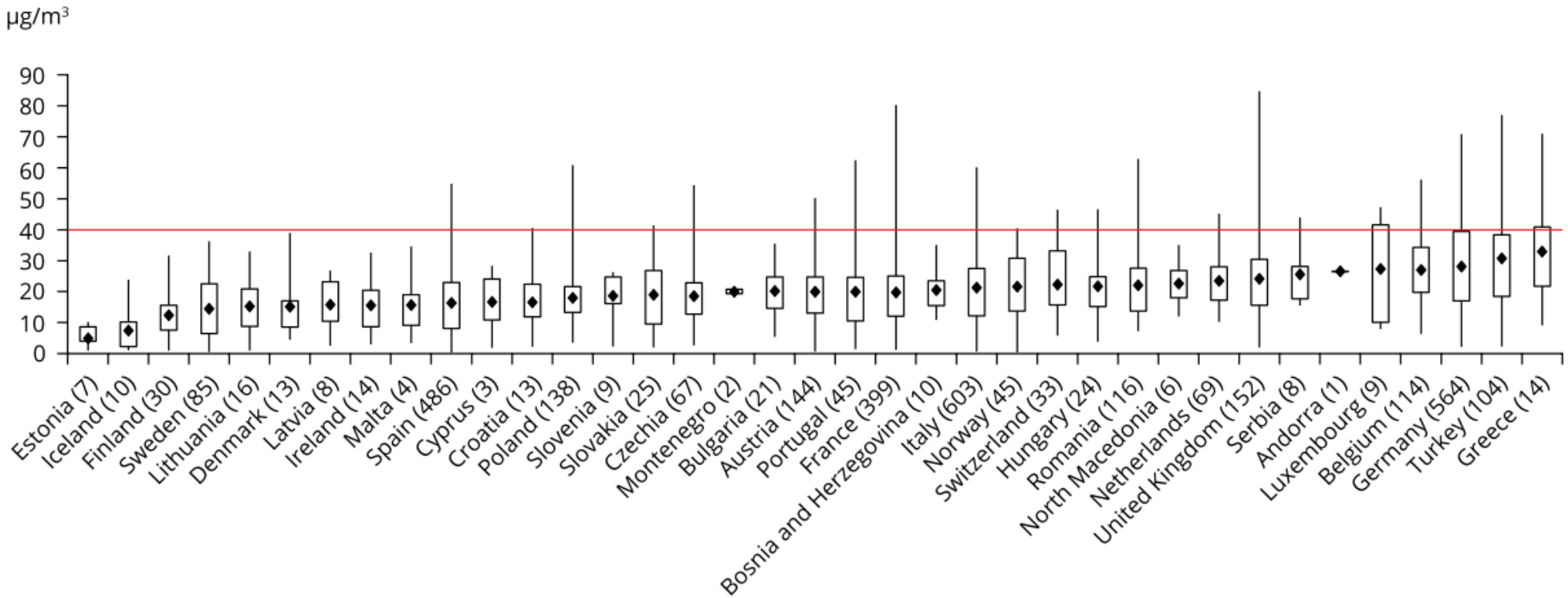
It is planned by the WHO to publish in Summer 2021 new Air Quality Guidelines.
It is expected that the recommendation for $pm_{2.5}$ and for NO_2 will be lowered significantly.
For NO_2 it is likely the recommendation be in the range 20 microgram/m^3.

Trend der Stickstoffdioxid-Jahresmittelwerte



Quelle: Umweltbundesamt 2020

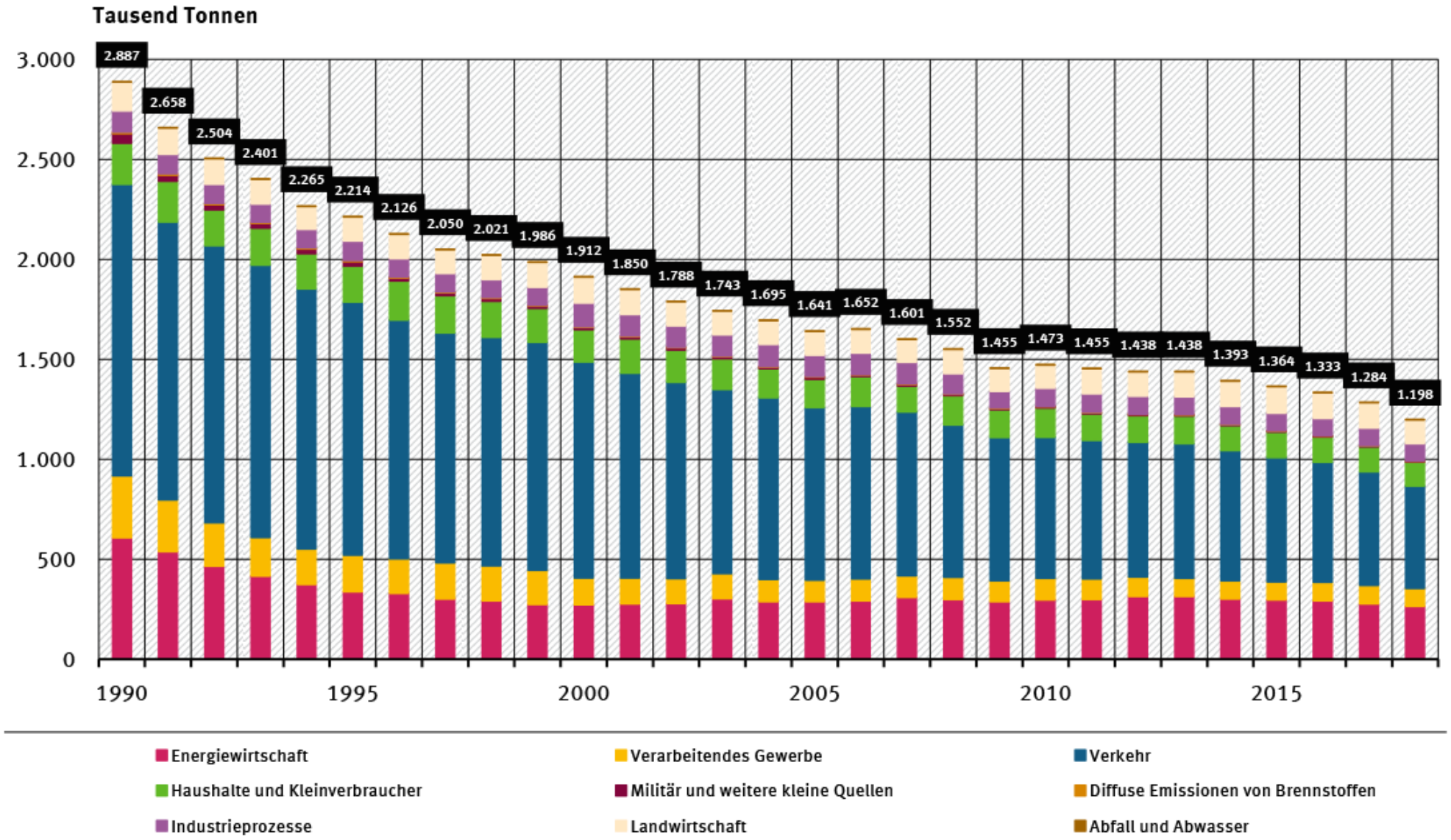
Figure 6.1 NO_2 concentrations in relation to the annual limit value in 2018 and number of stations considered for each country



Note: The graph is based on the annual mean concentration values. For each country, the number of stations considered (in brackets) and the lowest, highest and average values (in µg/m³) recorded at its stations are given. The rectangles mark the 25th and 75th percentiles. At 25 % of the stations, levels are below the lower percentile; at 25 % of the stations, concentrations are above the upper percentile. The limit value set by EU legislation (which is equal to that set by the WHO AQG) is marked by the horizontal line. The graph should be read in relation to Map 6.1, as a country's situation depends on the number of stations considered. Belgium and the United Kingdom also reported exceedances of the annual limit value in 2018 assessed using models (please see main text).

Source: EEA (2020c).

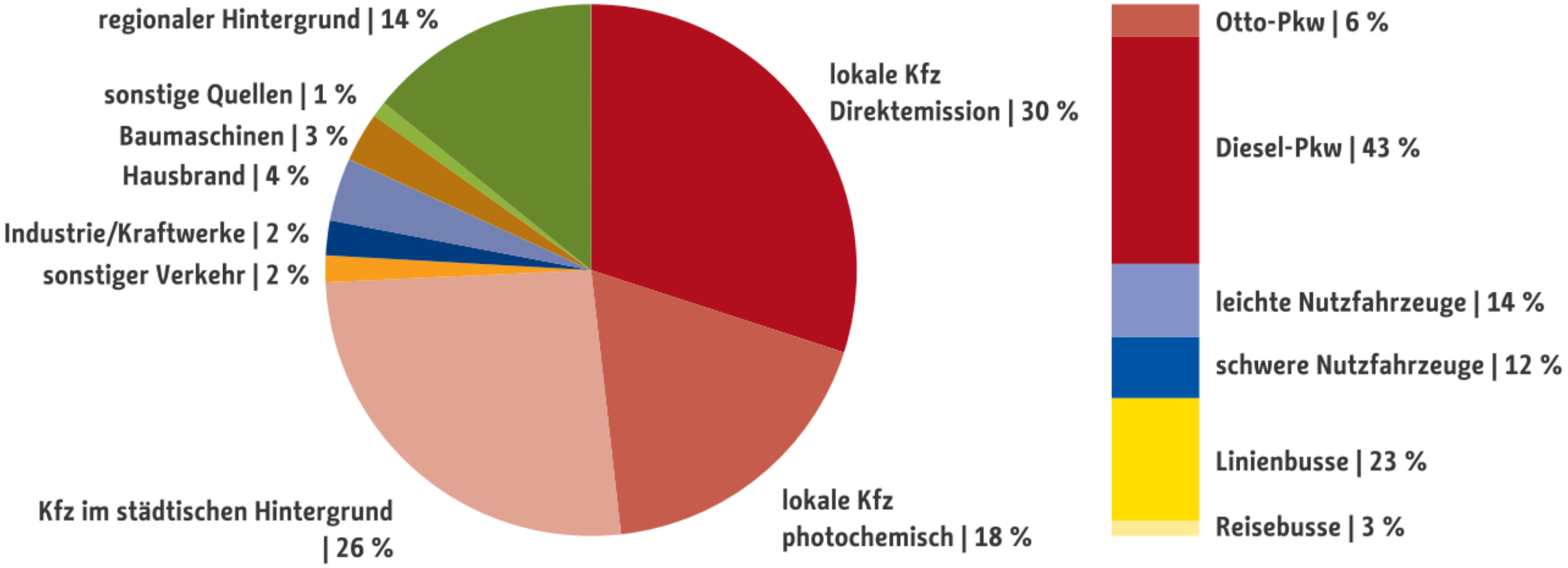
Sources of NOx Emissions in Germany



Verkehr: ohne land- und forstwirtschaftlichen Verkehr
Haushalte und Kleinverbraucher: mit Militär und weiteren kleinen Quellen (u.a. land- und forstwirtschaftlichem Verkehr)

Quelle: Umweltbundesamt, Nationale Trendtabellen für die deutsche Berichterstattung atmosphärischer Emissionen seit 1990, Emissionsentwicklung 1990 bis 2018 (Stand 02/2020)

Source Share of NO_2 Concentrations on Main Streets in Berlin 2015



Luftreinhalteplan Berlin 2. Fortschreibung 2019

Vehicle Emission Factors HBEFA 4.1

PC 2018 NOx Urban EF= 0,505178332 g/km

PC 2018 PM Urban EF= 0,004949948 g/km

HDV 2018 NOx Urban EF= 3,888275623 g/km

HDV 2018 PM Urban EF= 0,050068542 g/km

To meet the expected air quality WHO recommendation the NO_2 concentration at all monitoring sites has to be lowered at least by a factor 4

To achieve this goal the emission factor the NO_2 emission factor has to be below 60 mg/km in real world.

As the exhaust mass particle don’t add much to the pm2.5 concentration there is no need to reduce the mass particles limits.

Real World Emissions

- Even if the emission factors are based on real world emission (RDE Tests) measurements they don‘t reflect the real world.
- There is particle filter tampering and defect filters which are not part of emission factor measurement programs. E.g. 10% of the Diesel taxis in German cities have removed the particle filter. In many EU countries the share of removal is even higher. The risk of the cheater to be detected by the PTI Test is nearly zero.
- There is no control of the NOx abatement system by the PTI test
- HDV vehicle operators use ADBLUE similators and reduce or switch off the urea supply to the emission control systems in order to save money.
- Recent measurements on German, Austrian and Slovakian Autobahns by plume chasing test measured on 280 HDV revealed that about 20% of the trucks are manipulated or defect. This results in an increase of the German HDV Emission factor by about 50% compared to the HBEFA 4.1.

Proposal for EU 6+

The recent development of emission control regulation demonstrates that is a need for a radical change.

The emission standards should be based on RDE measurements only.

The OBD requirements should be replaced by Onboard Measurements (OBM).

The sensors for OBM exists for HC, CO and NO_x. Even the existing Nox sensors in cars and HDV aren‘t used to supervise the emission level.

For the control of NH_3 emissions a slip catalyst should be required instead of an expensive measurement.

Emission Limits for EU 6+

- Based on the considerations I propose the following emission standards proposed:

  1. PC
  NOx Limit: 30 mg/km in RDE measurement over a temperature range
  from – 7 to + 35 C
  Particle limits: No change

2. HDV
   NOx limit: 0.4 g/kWh in RDE test
   Particle limits: No change

Durabilty Requirements

- The scenarios include extended durability requirements.
- Only a single kilometer requirement is proposed for all cars.
- The problem is that different vehicle sizes have different useful life.
- Small vehicles run per only 10.000 km/ year, large vehicles run up 40.000 km/year.
- The emission system should have at least a durability of 12 years.
- The manufacturer should cover the emission control system by a warranty for 12 years and normal use.

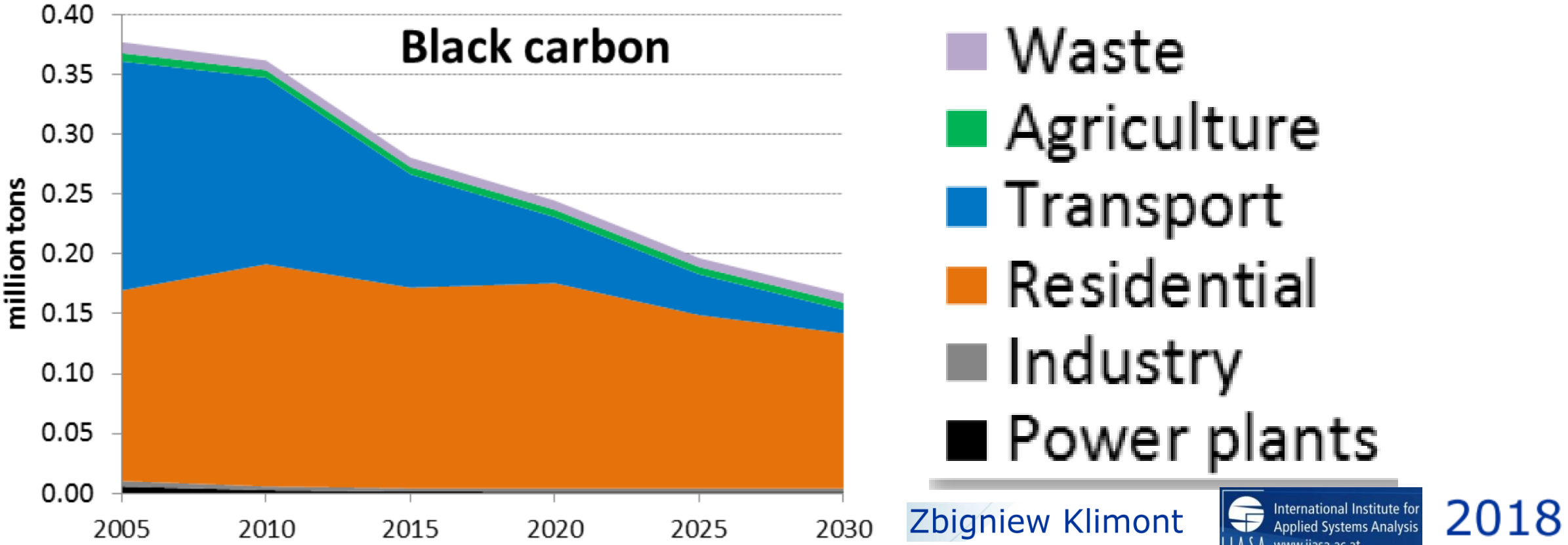
Additional Requirements

- The periodical test inspection needs a radical change.
- There is a urgend need to test particle number by a idle and high idle test for Diesel and gasoline vehicles with particle filters
- The PN number limit should be not higher than 40.000 particles/cm3
- Proposals of a limit of 250.000 or even 1.000.000 as just adopted in Netherland will leave defect filters undetected.
- For NOx emissions are short loaded test is available and should be introduced into the PTI.
- The EU commission should immediately propose a concept for the PTI regulation including NOx and PN testing.
- For HDV an extensive Plume Chasing Testing to stop the urea cheating

Black Carbon Emissions

- Black Carbon (BC)is a strong climate change driver
- BC particles have a high negative health impact

Sources of BC Emissions by IASSA



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