Für Mensch & Umwelt

Umwelt Bundesamt

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Potential annual mean concentrations ($PM_{2.5}$ and NO_2) in Germany in 2030, using a simple approach for traffic-related measurement sites

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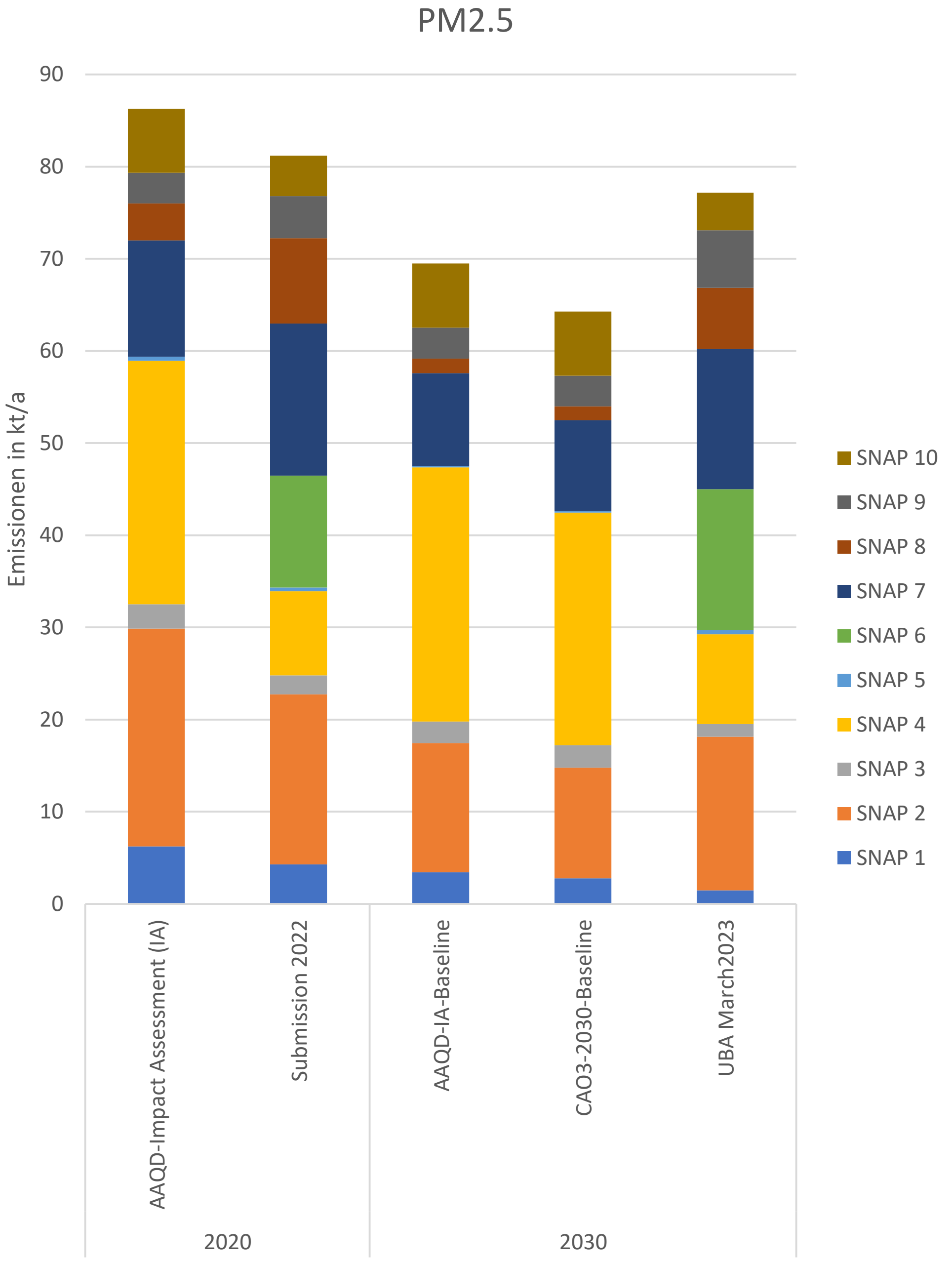
Comparison of emission scenarios: $PPM_{2.5}$

SNAP Code	SNAP Description
01	Combustion in the production and transformation of energy
02	Non-industrial combustion plants
03	Industrial combustion plants
04	Industrial processes without combustion
05	Extraction and distribution of fossil fuels and geothermal energy
06	Use of solvents and other products
07	Road Transport
08	Other mobile sources and machinery
09	Waste treatment and disposal
10	Agriculture

- SNAP 6 (handling of bulk products, tobacco use, fireworks, etc.) recorded in SNAP 4 by IIASA
- lower emissions from road abrasion, tyre and brake wear (in SNAP 7) and emissions from overhead lines, railways and train brakes (in SNAP 8) are not well reflected by IIASA
- SNAP 1 to 6 (lower emission factors in UBA emissions, due to condensables?, reflection of emission control measures in implied emission factors?)
- lower decrease in SNAP 2 in UBA scenario because of increasing use of biomass
- SNAP 10 – different shares of low emitting techniques for soil management and fertilizer application



Comparison of emission scenarios: NO_X

SNAP Code	SNAP Description
01	Combustion in the production and transformation of energy
02	Non-industrial combustion plants
03	Industrial combustion plants
04	Industrial processes without combustion
05	Extraction and distribution of fossil fuels and geothermal energy
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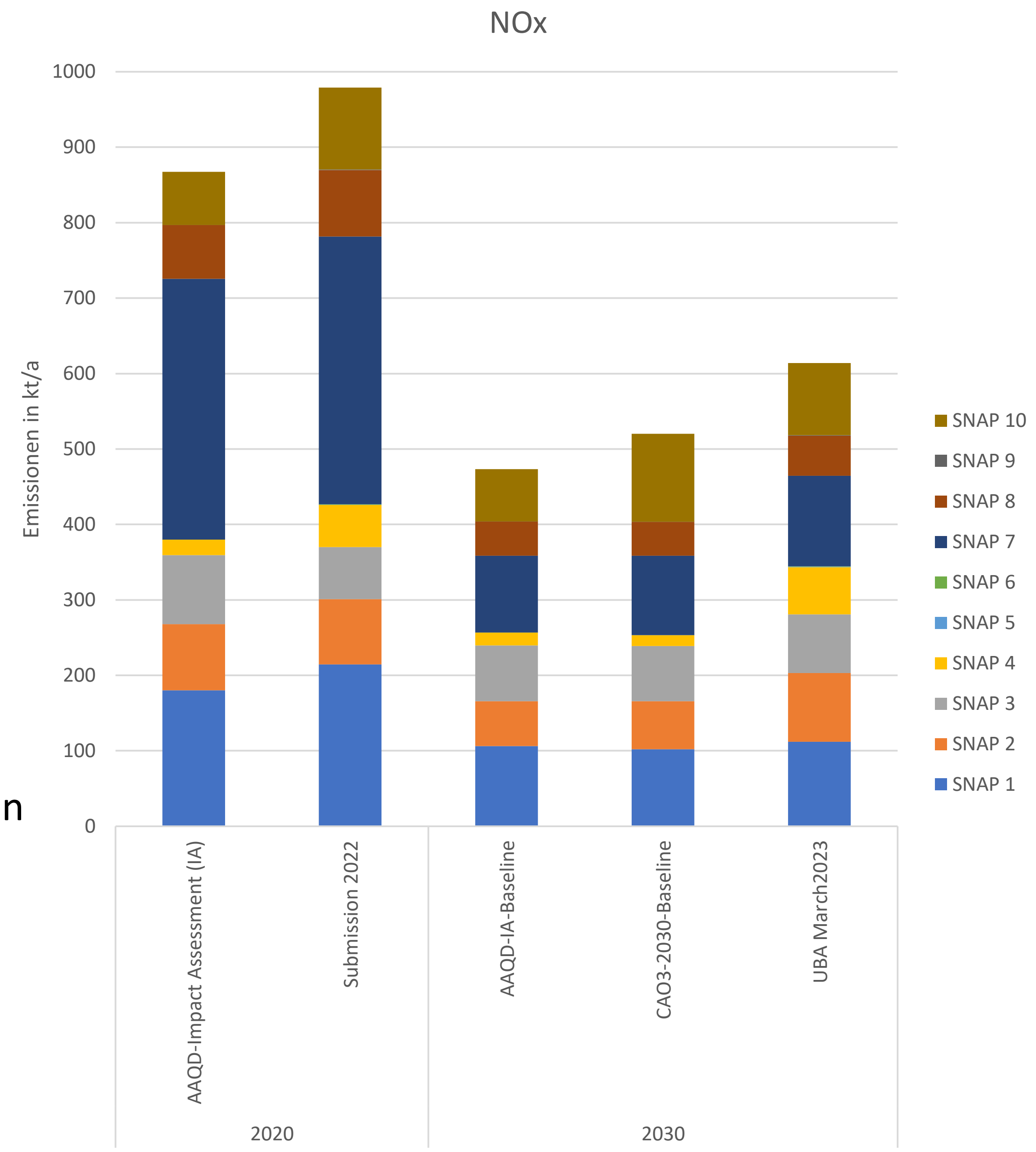
- continuing systematic deviation between UBA and IIASA
- UBA vs. IA – higher emissions in buildings (small combustion through higher use of solid biomass), industrial processes, transport, agriculture



Comparison of emission scenarios: NH_3

SNAP Code	SNAP Description
01	Combustion in the production and transformation of energy
02	Non-industrial combustion plants
03	Industrial combustion plants
04	Industrial processes without combustion
05	Extraction and distribution of fossil fuels and geothermal energy
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08	Other mobile sources and machinery
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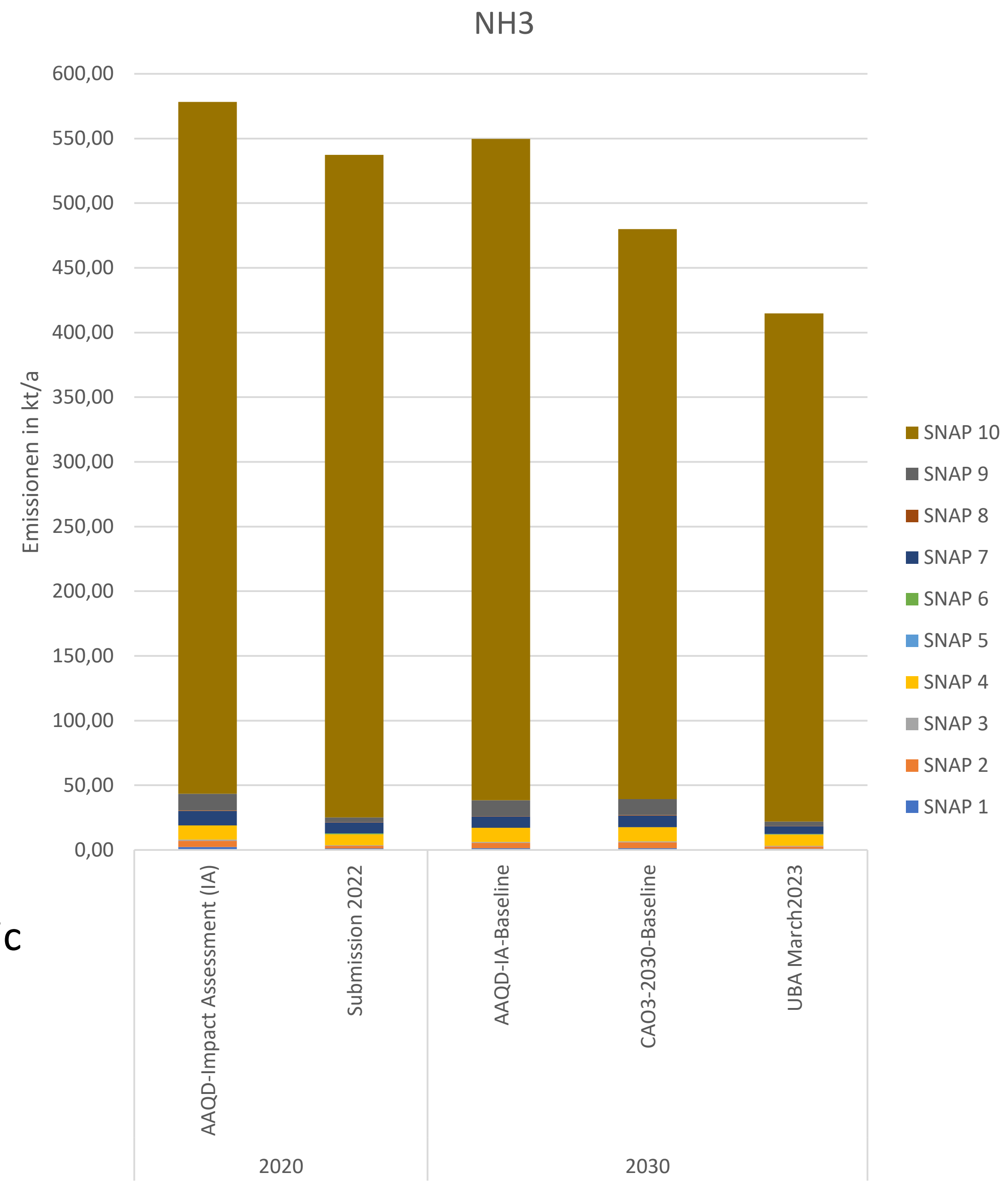
10	Agriculture

- Recalculation with submission 2022 using lower emission factors for dairy heifers than for fattening heifers (approx. -30 kt)
- Lower animal numbers in UBA scenario than in the Baseline
- Emission factors in SNAP 1 to 9 are highly uncertain (systematic deviation?)
- IED revision is reflected in CAO3 (not in IA)



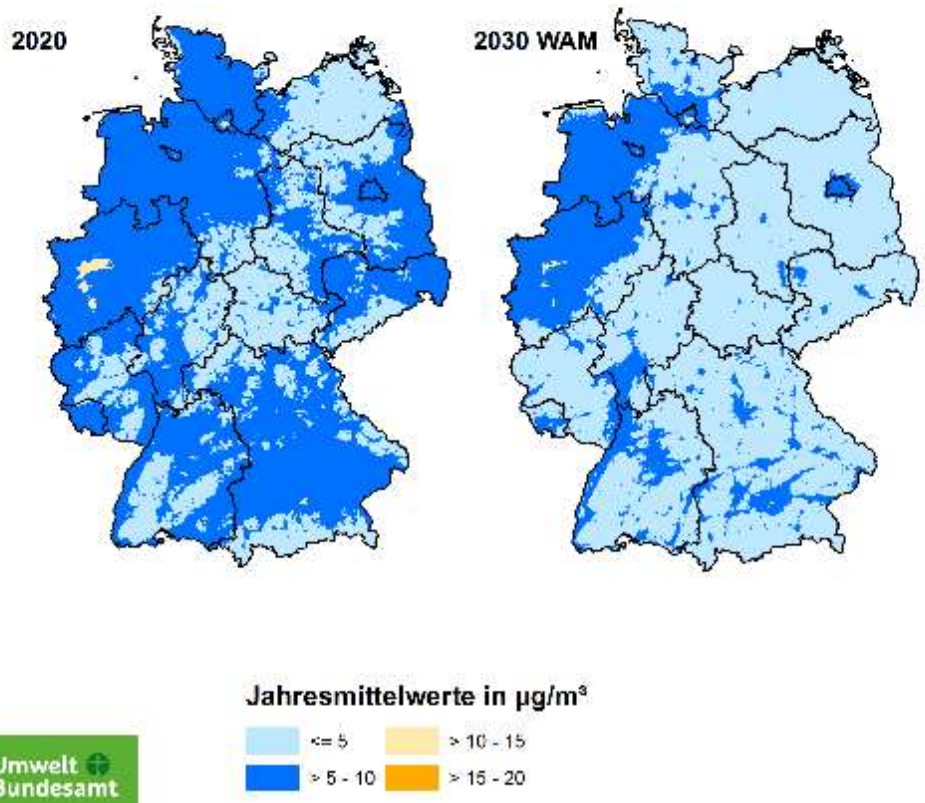
Basic information regarding modelling methodology

- emissions for scenario 2030 were spatially distributed with GRETA[1]
- EU-emissions are taken from CAMS v5.1 (for 2018) with country specific scaling for 2030[2]
- meteorological base year 2020
- Modelling with CTM REM-CALGRID (RCG) on (2x2) km² horizontal resolution
- rough bias-correction for visualization (see next slide, trend approach for site-based evaluation doesn‘t need bias-correction)
- concentrations at traffic-related sites were estimated by applying simple proportions between emissions and concentrations (Lohmeyer-method, Düring et al., 2021[3])

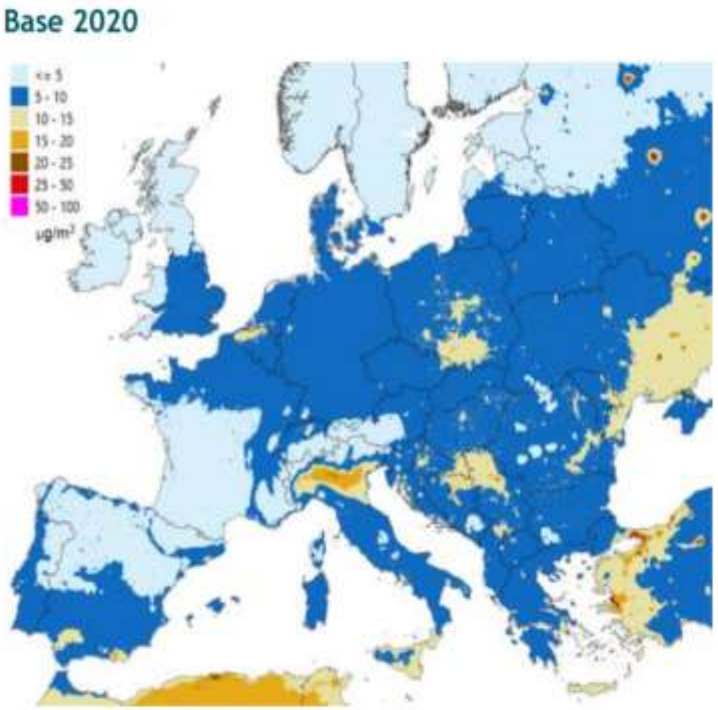
[1] https://www.umweltbundesamt.de/publikationen/arcgis-basierte-loesung-zur-detaillierten
[2] using officially reported emissions for 2030 by EU member states
[3] https://www.umweltbundesamt.de/publikationen/beispielhafte-modellierung-der-no2-pm10-pm25

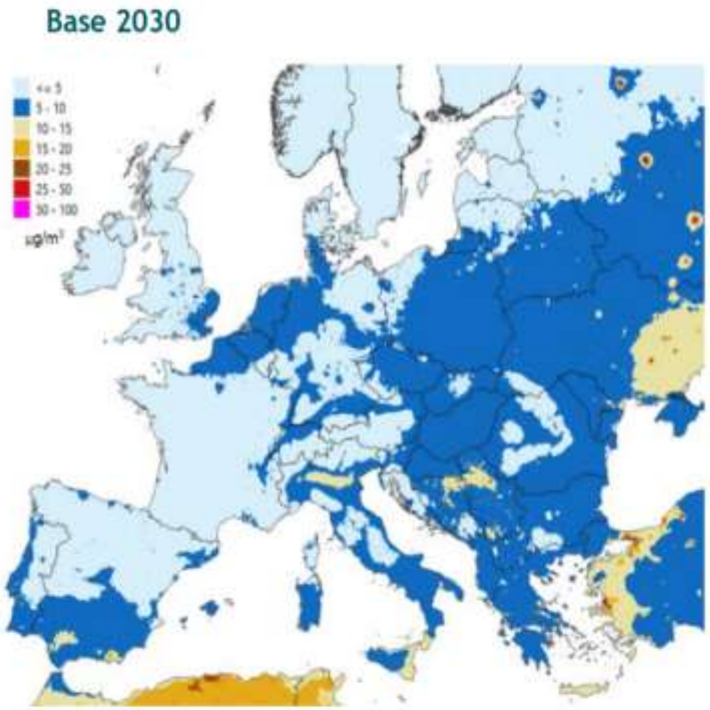
Visual comparison with the Impact Assessment for $PM_{2.5}$

$PM_{2,5}$ - Jahresmittel (RCG)



Impact Assessment





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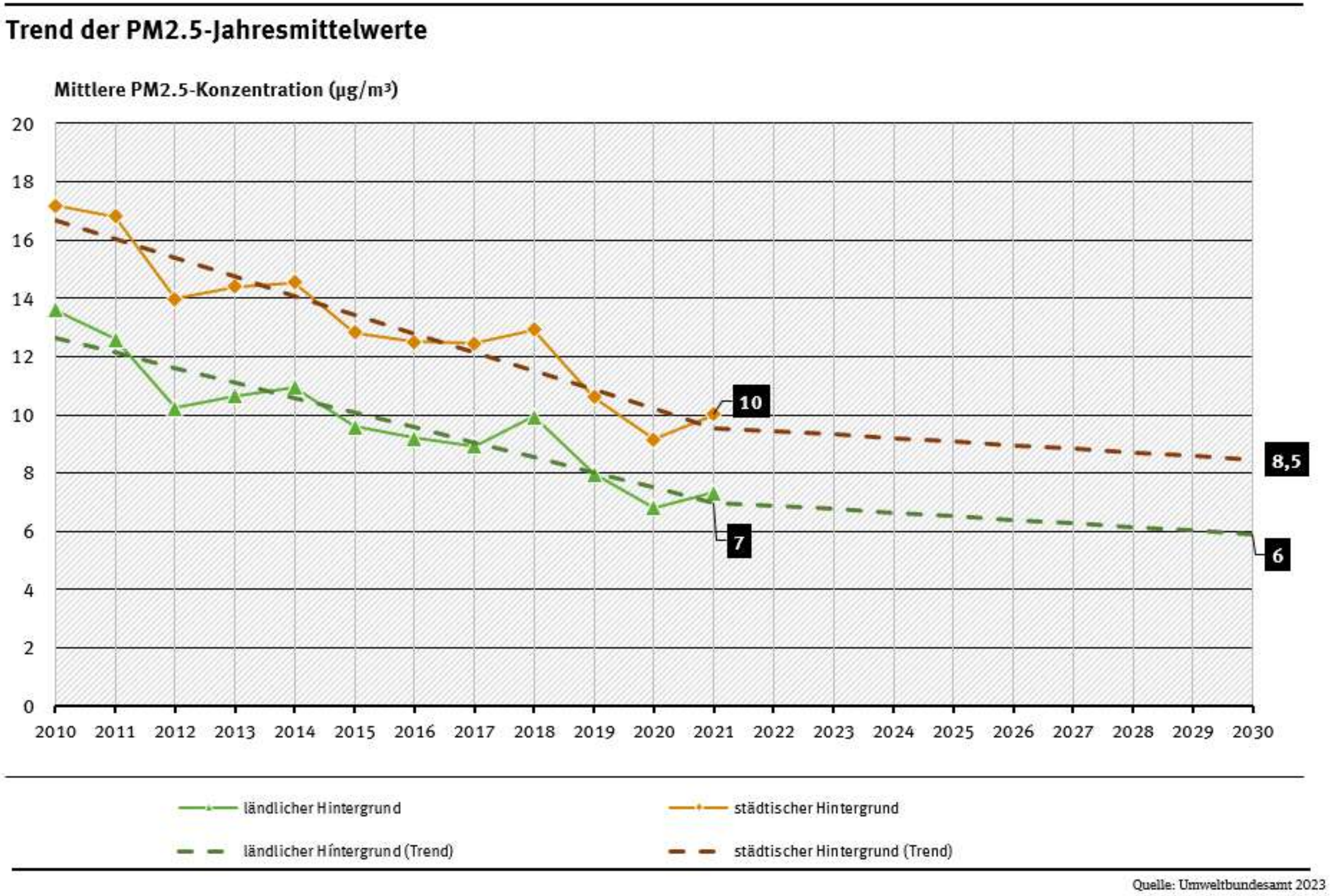
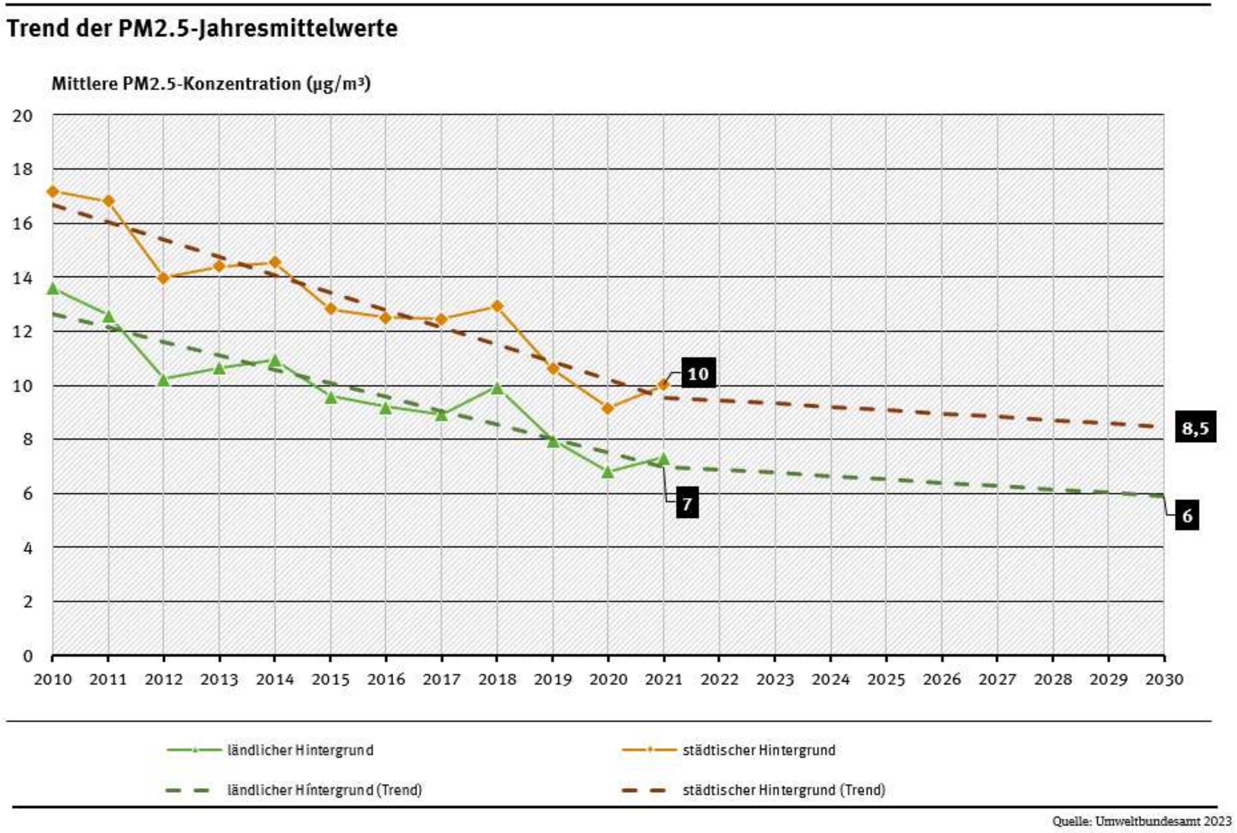
rough bias correction by multiplying grid concentrations with 1.25 (for PM2.5); not suitable for quantitative evaluation

Site-based assessment of background concentrations in 2030

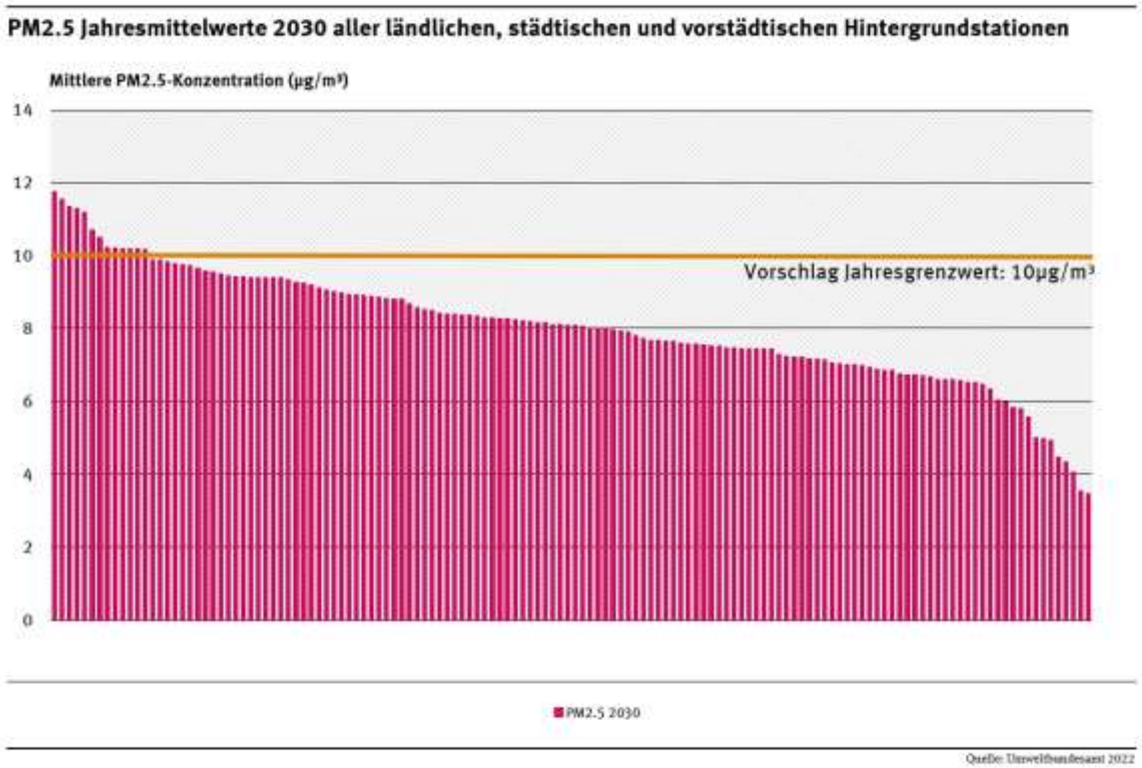


- Base: RCG-model runs for 2020 and 2030
- Linear trends in the decade 2020 – 2030 obtained from RCG-model runs were applied for grid cells with measurement sites to the measured concentrations in 2021
- Only grid cells with measurement sites were evaluated

Site-based results for $PM_{2.5}$ annual average

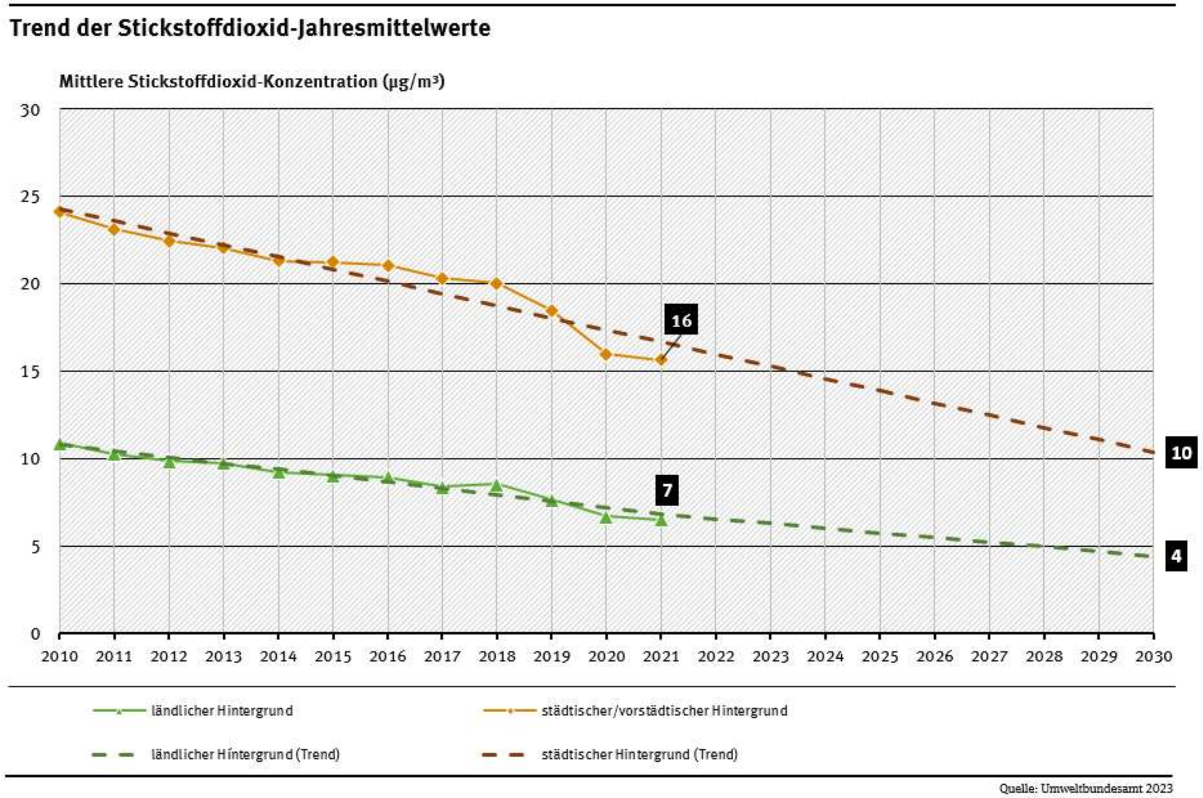


- $PM_{2.5}$ will only sligthly decrease until 2030 in urban background and rural locations

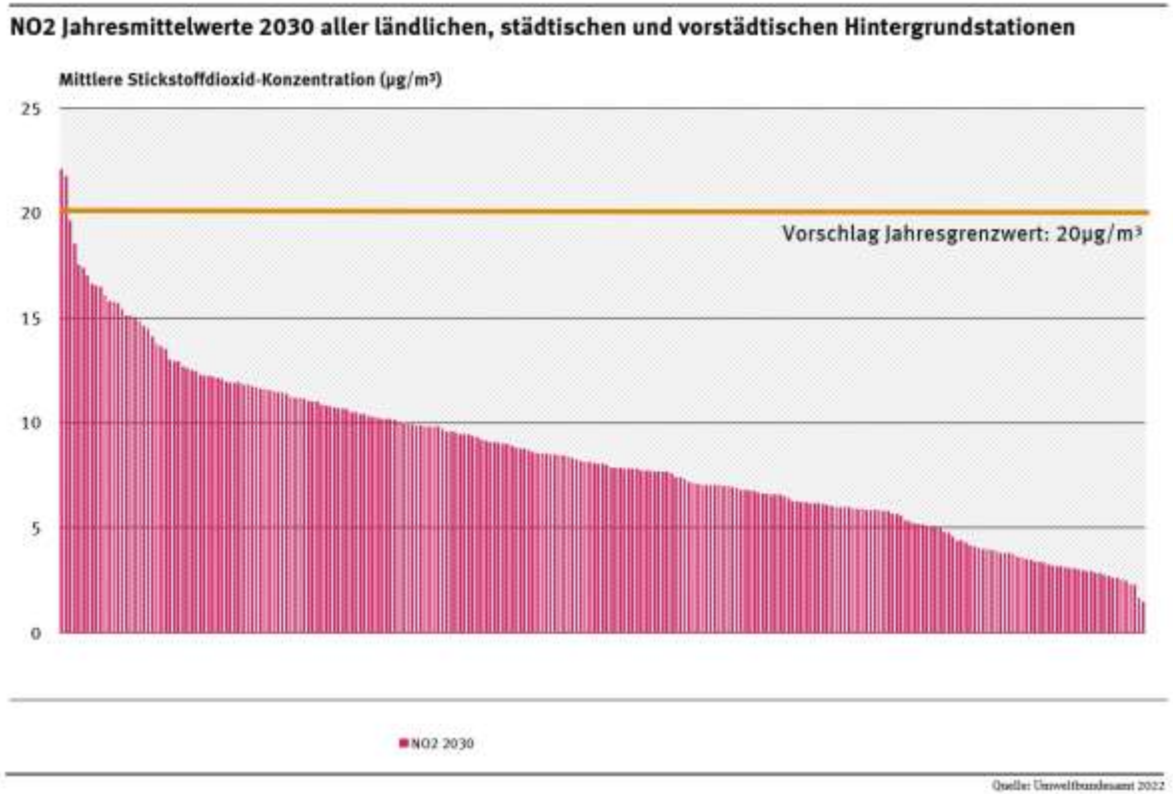


- Exceedances of 10 µg/m³ in the **urban background** at 13 observation sites
- For **traffic sites** probably 30 % of the sites will exceed 10 µg/m³ in 2030

Site-based results for NO_2 annual average

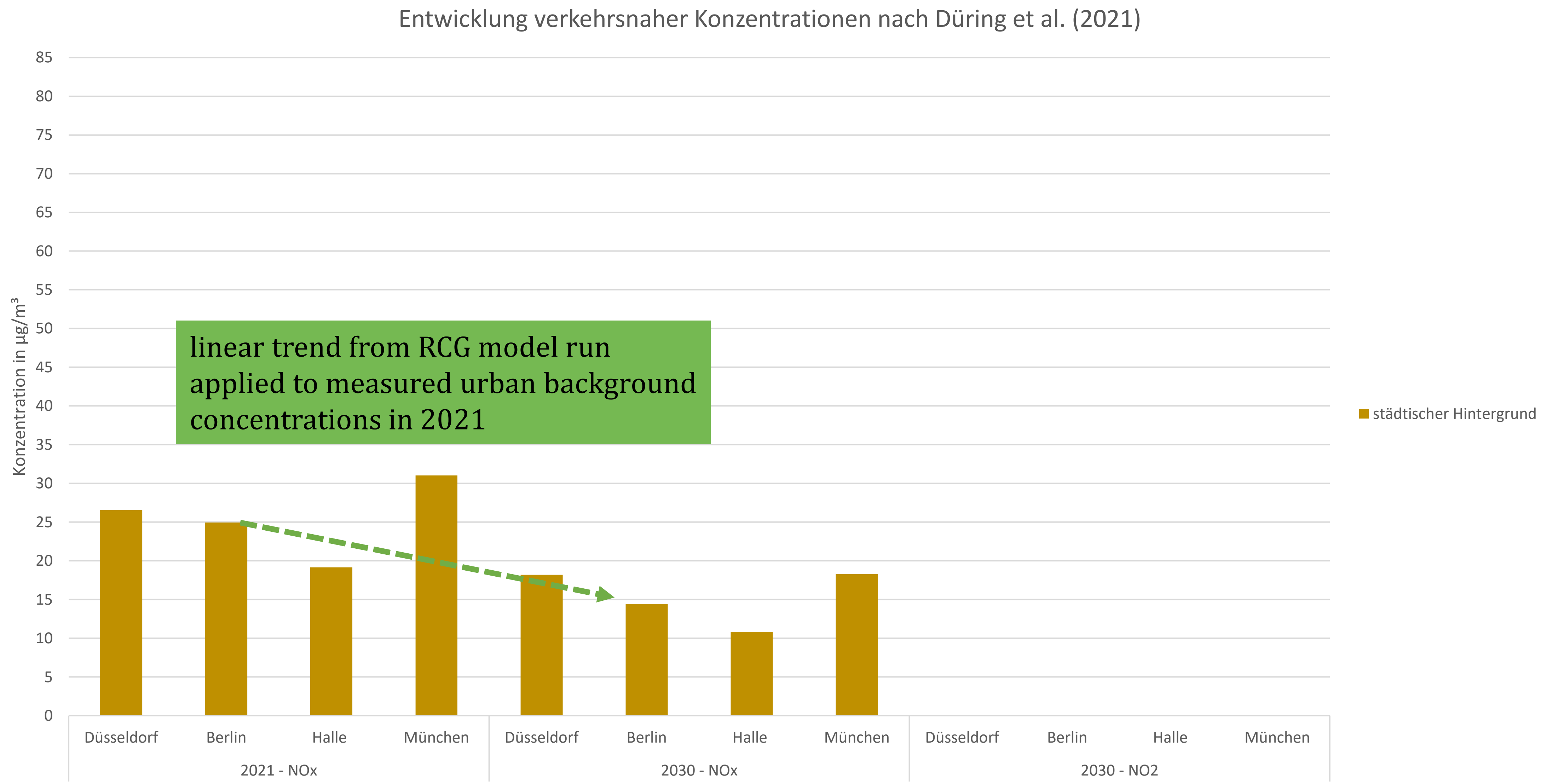


- Strong decrease in the NO_2 annual average from 2021 to 2030 in urban background and rural locations



- Two measurement sites with exceedances of 20 µg/m³ in the **urban background**, both connected to port activities
- For **traffic sites** probably 21 % of the sites will exceed 20µg/m³ in 2030

Site-based assessment of traffic-related concentrations in 2030



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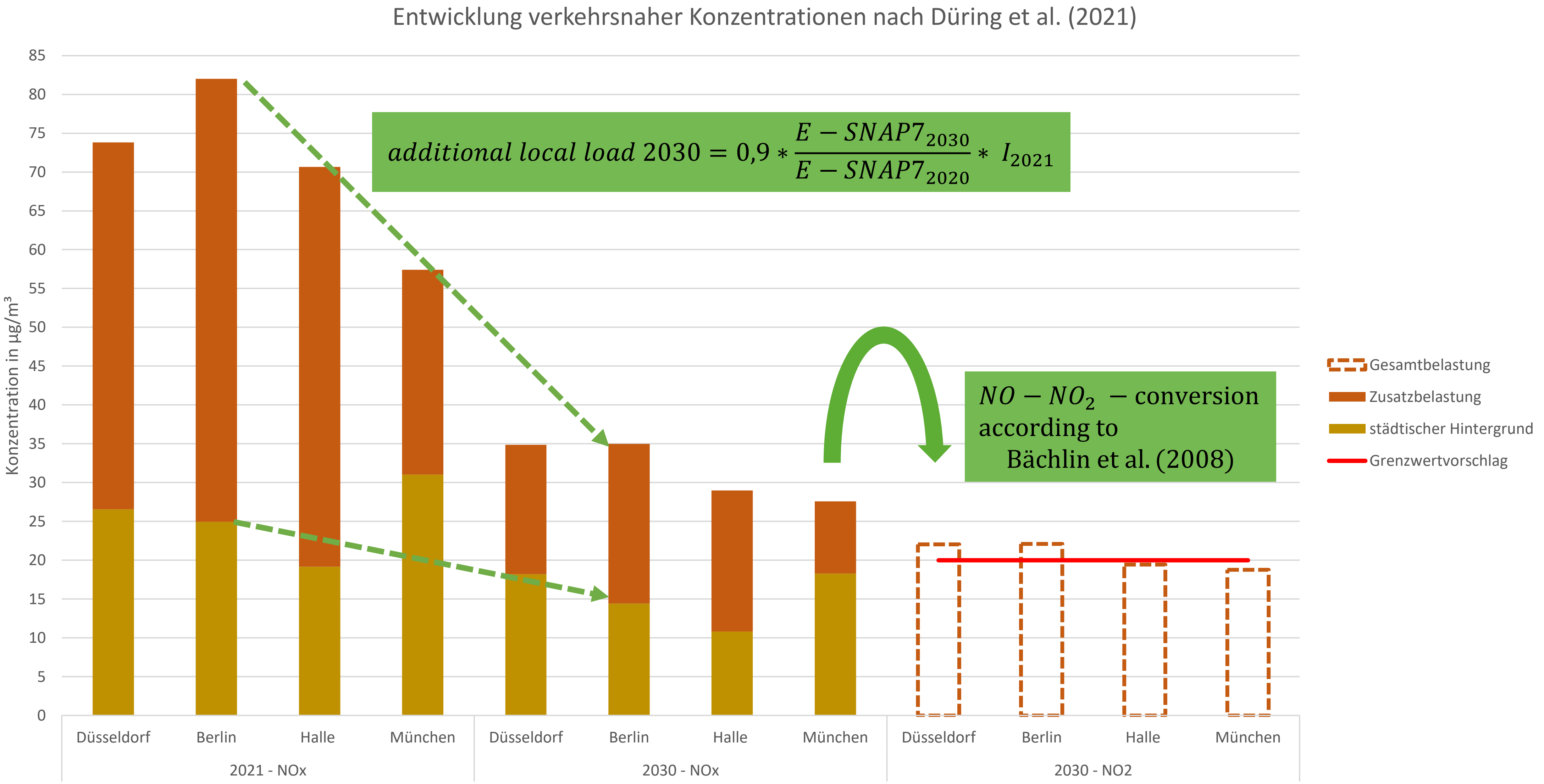

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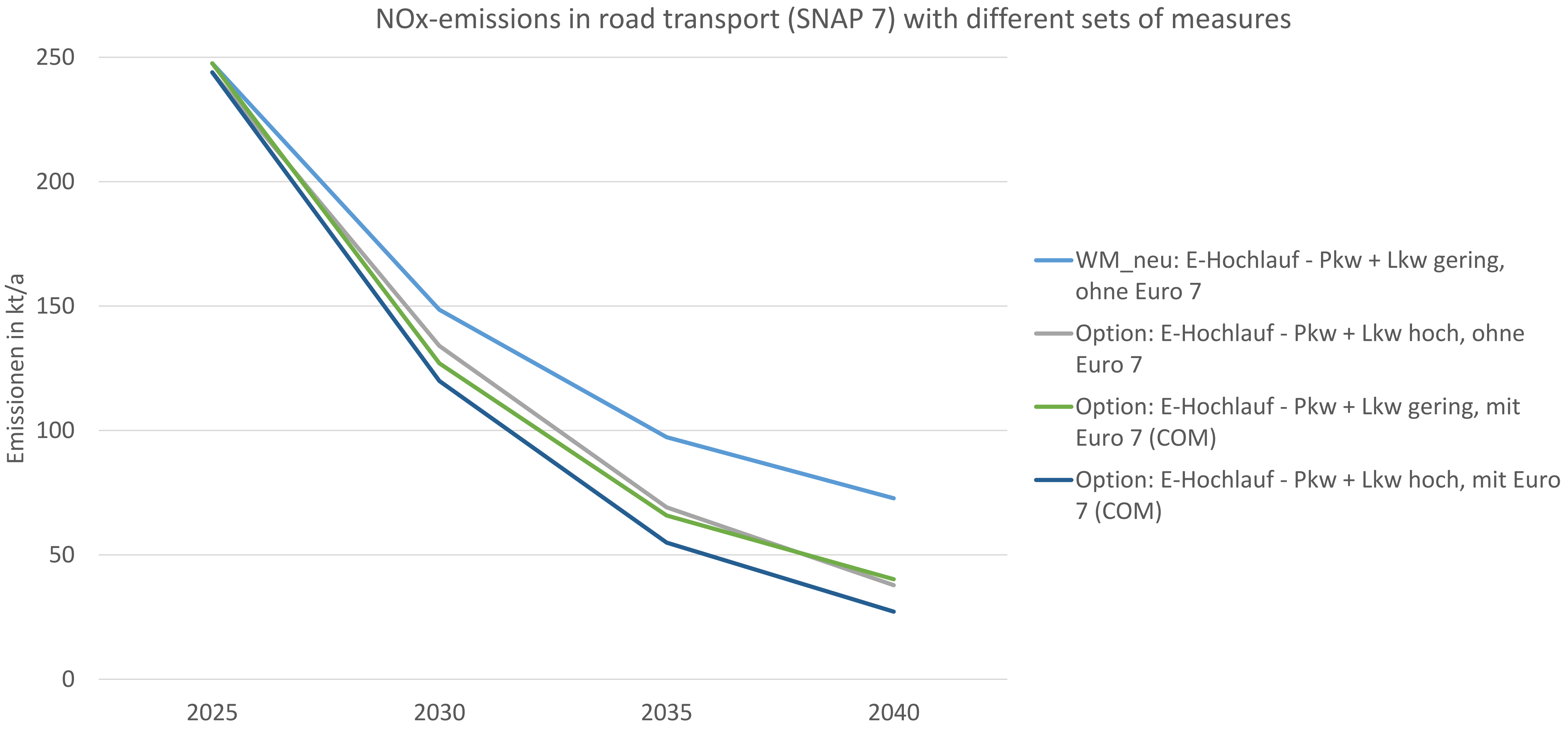

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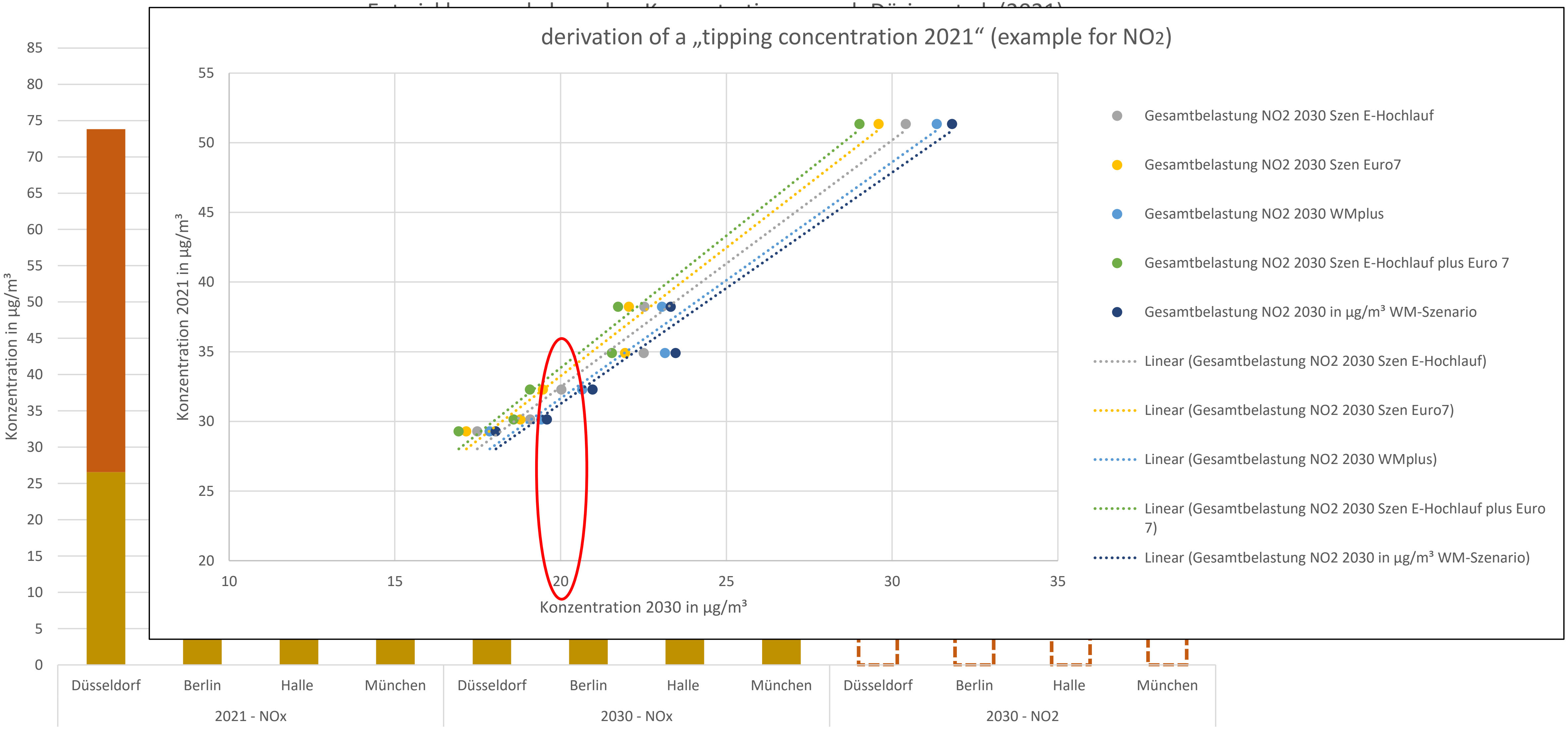

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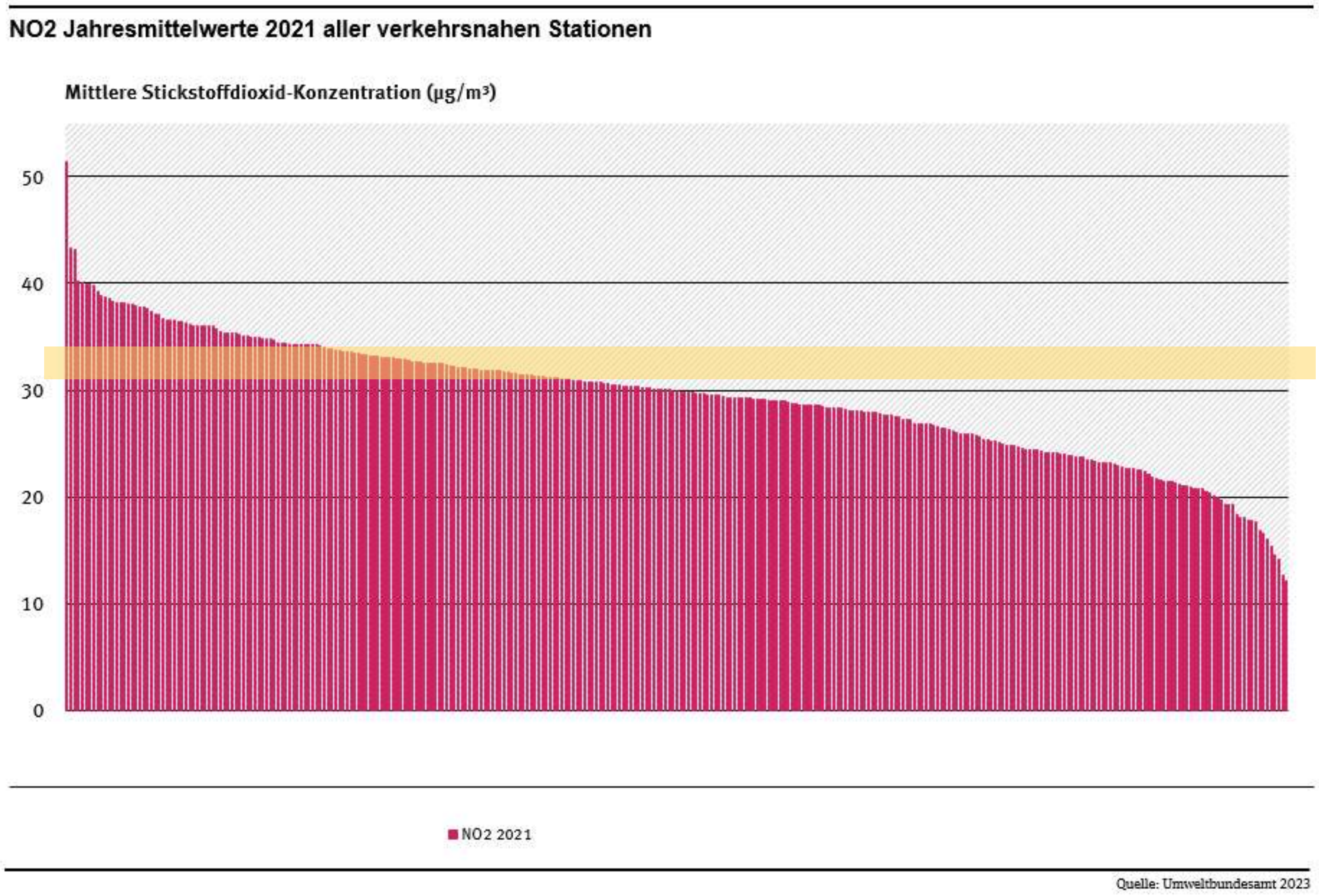
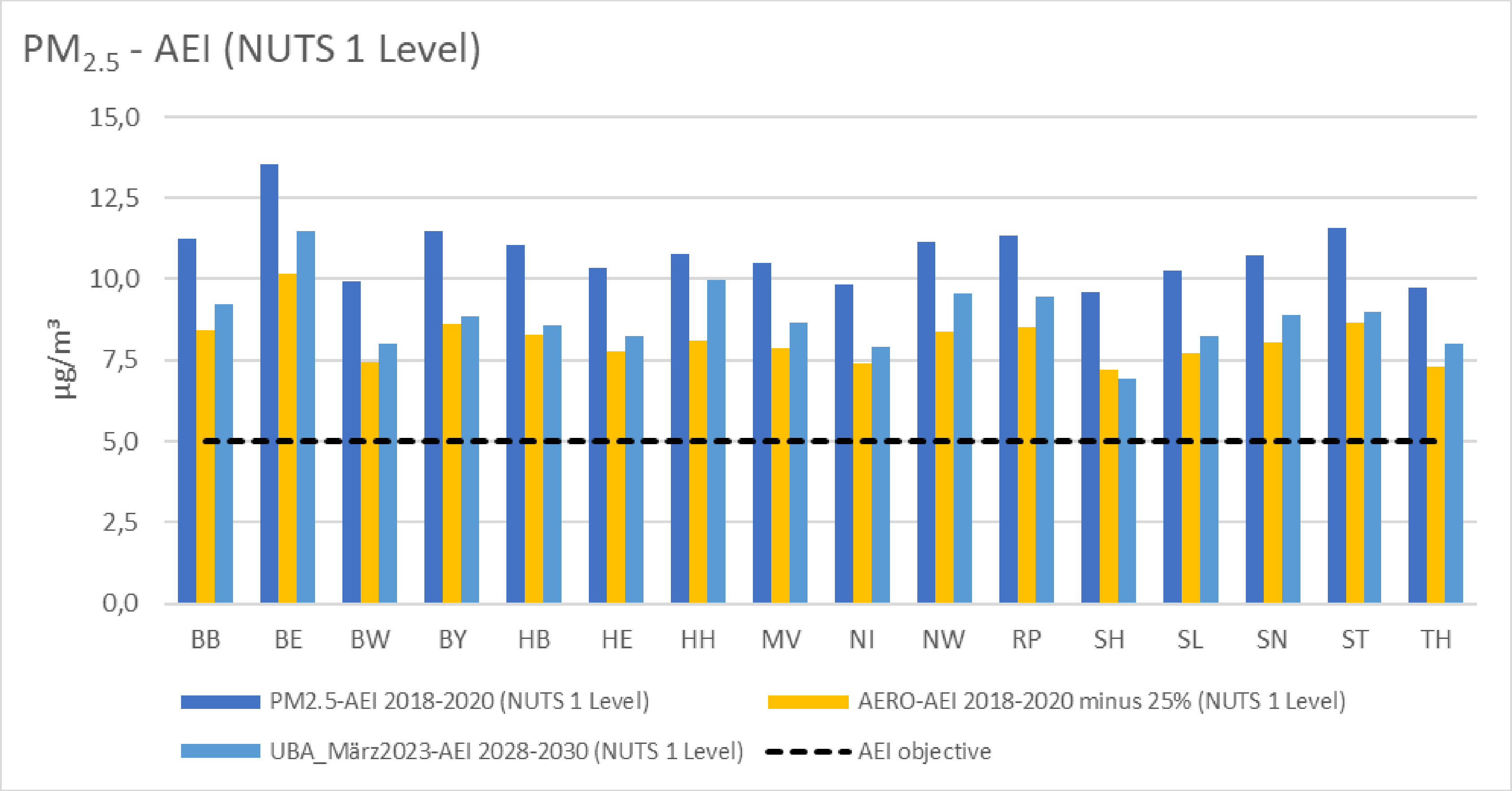


- calculated „tipping concentration“ of 31 to 34 µg/m³ in 2021 depending on the set of measures in SNAP 7
- Exceedance of 39 to 21 % in 2030 of the traffic-related measurement sites (according to considered sites in 2021)
- a lot of the „exceeding“ sites are only slightly above 20 µg/m³ in 2030 and may reach the limit value with „painless“ additional measures

Average Exposure Reduction Obligation (AERO)

- NO_2 AERO of 25 % may be reached in most German Federated States (NUTS 1 level, assessment based on the current AEI-stations)
- $PM_{2,5}$-AERO of 25 % will not be reached in 2030 (except in Schleswig-Holstein [SH])



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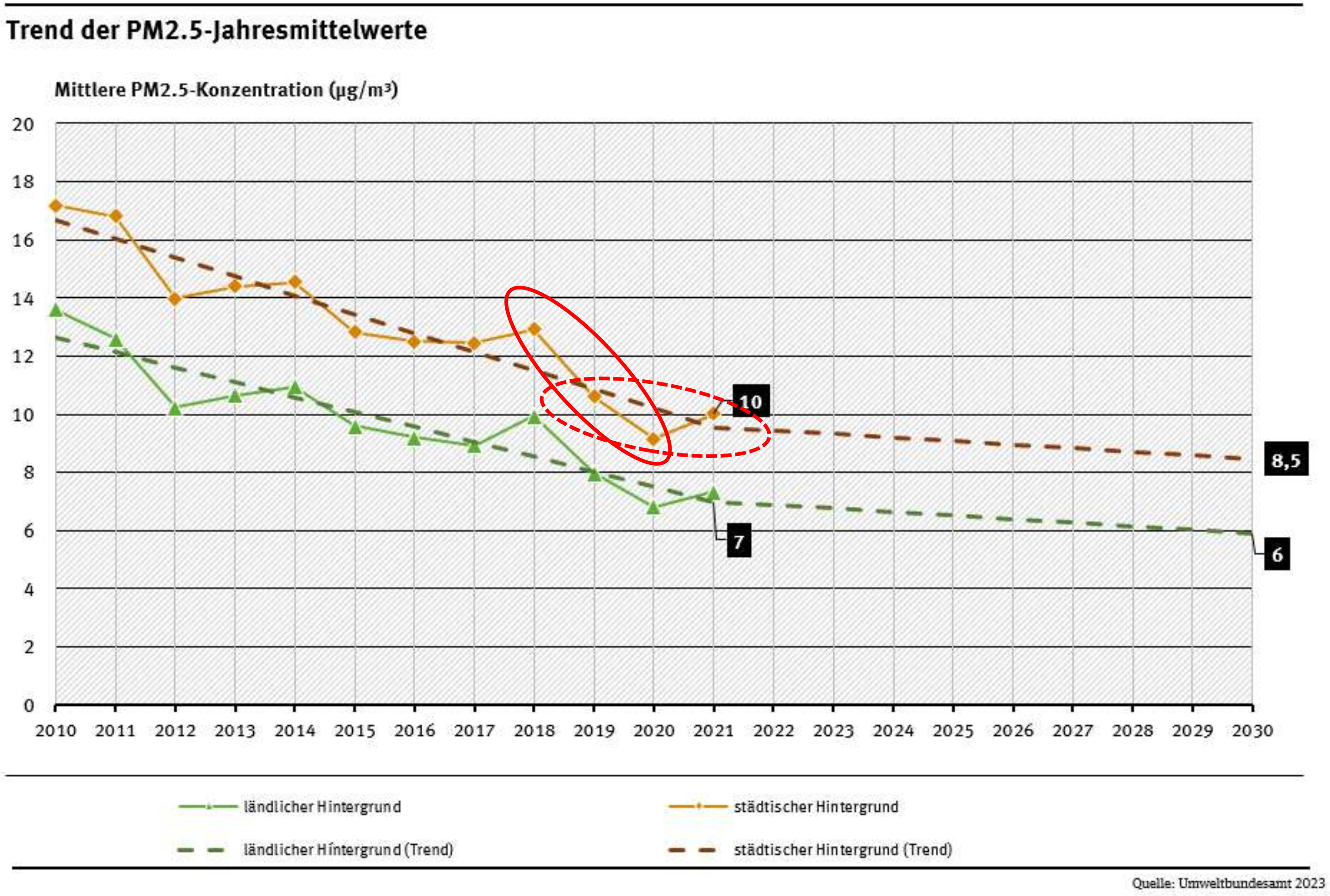

Looking on moving average of 2018-2020 will give an AERO that could be reached more easily than looking on 2019-2021

AEI 2020: 11,01 µg/m³
AERO 2030: 8,26 µg/m³
AEI 2021: 10 µg/m³
AERO 2031: 7,5 µg/m³
AEI 2022: 10 µg/m³
AERO 2032: 7,5 µg/m³

averaged concentration decrease per year from RCG model run = 0,12 µg/m³

Summary of the results

Projected potential annual mean exceedances in 2030 (according to number of valid stations in 2021)	**NO_2 (20 µg/m³)**	**$PM_{2.5}$ (10 µg/m³)**
only background (urban and rural) stations	**< 1 %**	**≈ 9 %**
only traffic-related sites	**≈ 21 %**	**≈ 30 %**
all measurement sites	**≈ 12,5 %**	**≈ 17 %**

➢ comparison with the EMEP/uEMEP results in the Impact Assessment?

Thank you for your attention!

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https://www.umweltbundesamt.de/en/topics/air