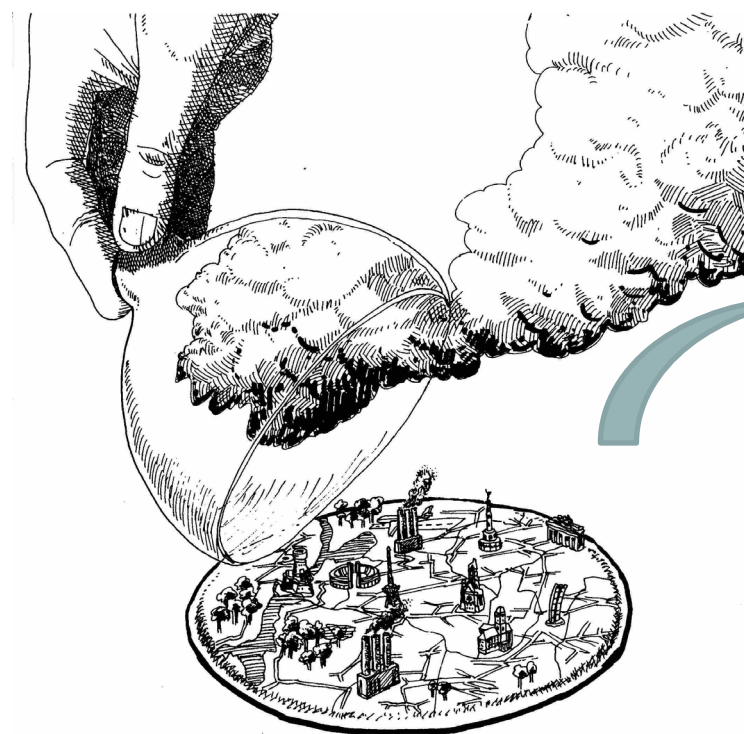


Position Paper on Clean Air in Cities

The chapter on **measures**

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Less pollutants. More quality of life.

Content

- Mandate to EPCAC with regard to measures - **what's at stake?**
- Assessing the effectiveness of (local) measures – what are the **difficulties?**
- Review of interventions – preliminary **results, interim conclusions**, some open **issues**
- **Local** versus **large-scale** measures - how does their impact **vary** for PM, O₃ and NO₂?
- **Local** versus **national/international** measures - how does the first **depend** on the second?
- **Short-term** actions and **hot spot** focus – how (in)effective are they to **gain health** benefits?
- **Conclusions**

What's at stake?

☞ Mandate to **EPCAC** with regard to measures

■ **Task** given to the EPCAC at its inauguration decision by the **EB** in 2018

☞ "to raise **awareness** among national and local policy makers of the **multi-scale interactions**" by preparing a position paper

■ EB acknowledged "that AQ on a **local scale** is affected by **international** policies - while impact of **local** policies is **propagated** to other **cities, regions and countries**"

■ Resulting **questions** linked to the chapter on **measures**

☞ Which actions at **which government** levels are most **effective** to reduce the negative health impact of air pollution?

☞ More specifically: to what extent does the implementation of **local** measures **depend** on action on **higher governance** levels

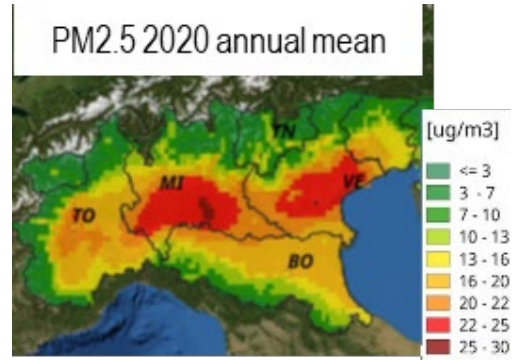
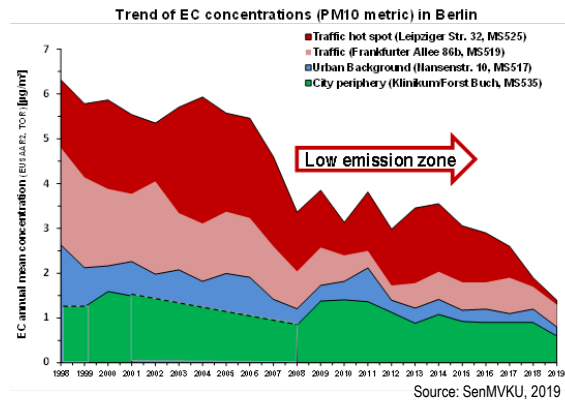
☞ Can we **say** more about the **cost-effectiveness** of measures at **different** government levels?

Assessing the (cost-) effectiveness of local measures

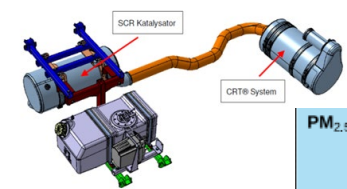
👉 what are the **difficulties?**

Effectiveness of local measures **depends** on many (confounding) **factors**, such as

- their **benefits**, in terms of
 - ↪ reduction of pollution **concentrations**
 - ↪ **Time-scale** of the achieved reduction
 - ↪ **Spatial scale** (number of people with less exposure) of the achieved reduction
 - ↪ **health** gains and other **secondary** advantages (less road accidents, noise, fossil fuel & energy savings)

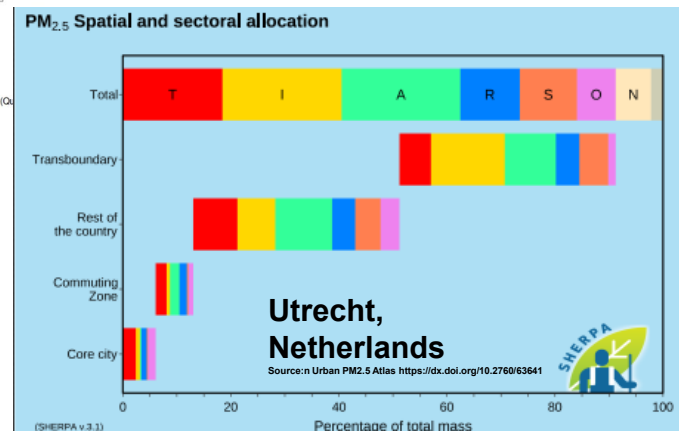


- the **boundary** conditions
 - ↪ **Natural**, e.g. **orographic** barriers for horizontal dispersion, **meteorological** conditions
 - ↪ **Structural/political**, e.g. already achieved **progress** in emission reduction by applying BAT
 - ↪ **Source** sector distribution inside and outside of the AQ management area and their **relevance** for regional **background** levels



- the **efforts** needed to achieve certain emission and exposure reductions, e.g. in terms of

- ↪ costs for technical/structural measures or investments
 - 👉 Often **difficult** to **allocate** to AQ management alone
- ↪ costs for economic **incentives** or of **regulatory** interventions to achieve **behavioural** changes
 - 👉 Often **difficult** to estimate **costs** and concrete **impacts**



Assessing the (cost-) effectiveness of (local) measures

👉 the results by PHE taken as a starting point (i)

- It covers a **broad range** of (in total 86) locally relevant **interventions** across ...
 - ↪ **Transportation** sector, incl. NRMM aviation, shipping and rail
 - ↪ **Industry** and residential **heating**
 - ↪ Measures on urban **planning** and on **behavioural** change
- Assessment was **limited** to a rough, **qualitative** evaluation scale
 - ↪ Taking as a starting point the “**review of interventions** to improve outdoor AQ and public health” by **Public Health England**, which is based on stakeholder consultations taking account of **measures** implemented **world-wide**
 - ↪ Adding a few **additional** measures based on own experience and other sources
- **Problem**
 - ↪ **Few** existing studies directly look at **effects** of measures on pollution levels and resulting health outcomes
 - ↪ Even **less** studies examine **cost & benefits** of interventions

Sector	Intervention group	Number of interventions	No/very little evidence	Low effectiveness	medium effectiveness	high effectiveness
Transport and NRMM	Reduce demand for more polluting forms of transport , by decreasing overall travel demand, incentivizing uptake of clean transport, driving restrictions for certain vehicle types	15	3 (20%)	5 (33%)	6 (40%)	1 (7%)
	Reduce emissions from existing vehicles through speed limits, improved traffic flow management, technical measures to reduce vehicle emissions	12	3 (25%)	7 (58%)	1 (8%)	1 (8%)
	Promoting vehicle ...					
	... determination of the rail network and promotion of lower emissions from rolling stock					
Industry and residential heating	Policy measures: Permits, BAT-requirement, emission limits	9	0	6 (66%)	3 (33%)	0
	Promoting and funding clean technologies , regulatory means	7	0	1 (14%)	1 (14%)	5 (72%)
Measures on urban planning and behavioural change	Sustainable transport planning	3				1
	Green infrastructure – urban greenery NOx-absorbing coatings		1	1		
	Behavioural change : Clean Air day, Alerts, public engagement	4	0	3 (75%)	1 (25%)	0
	Total	86	11 (13%)	36 (42%)	31 (36%)	8 (9%)

👉 Yet, **no** consensus on the evaluation scale and on the **criteria** of the assessment especially of some international **measures**

Assessing the (cost-) effectiveness of (local) measures

👉 the results and remaining issues (ii)

■ Interim conclusion

- ↪ There's **no** golden bullet **intervention** solving **all** urban air pollution **problems**
- ↪ A **wide range** of different **measures** are needed to ensure a “toxic-free” air quality

■ Issues to be discussed

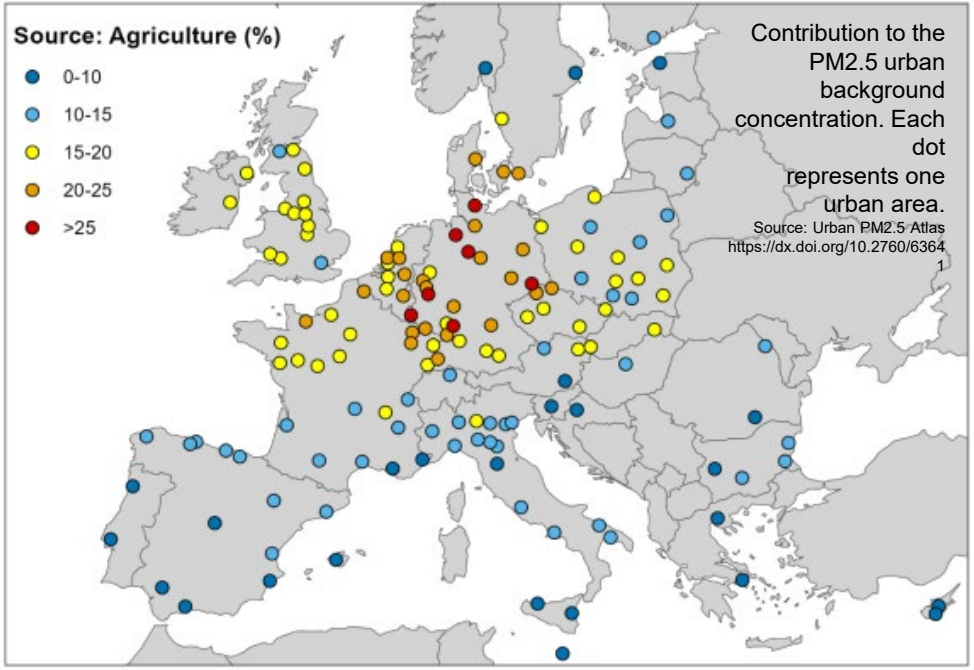
- ↪ What about measures in **agriculture** ?
Conclusion from **source** apportionment **modelling**...
 - 👉 In ~22% of the cities in the urban PM2.5 atlas agriculture **contributes** to more than **20% to PM2.5** concentrations
 - 👉 Achieving the **ammonia** emissions **reductions** stipulated by the NECD would result in a clear **benefit** to urban AQ

↪ Shall we **keep** the proposed **scale** to illustrate the **effectiveness** of interventions, given its **ambiguity**, **lack** of reproducibility and determination **depending** on the specific boundary **conditions** ?

Initial	No/very little evidence	limited effectiveness	Potentially effective	Fully effective
Already changed	No/very little evidence	Low effectiveness	medium effectiveness	high effectiveness

↪ Options:

- 👉 Further **modify** the assessment by PHE as considered necessary? Add a short **explanation** to highlight this **dependency**?
- 👉 **Drop** the column and **replace** it by what, based on which criteria???



Assessing the (cost-) effectiveness of (local) measures

👉 the preliminary results (iii)

Who is the main actor?

- For 63 out of 86 interventions (73 %) local authorities are “the main governance level in charge of implementation and enforcement”, not only for the typical local level playing field, like urban planning

- However ...

No.	Measure/intervention	Policy type(s)	Spatial scale of implementation	Target pollutants	Effectiveness to improve AQ & public health locally	Main governance level in charge of implementation and enforcement	Requisite support from other governance level
Planning measures							
P1	Co-implementation of various measures through sustainable urban mobility planning	Funding Taxation Infrastructure Regulation Guidance/Info	Local	NOx, PM, CO2		Local	National, by providing funding for requisite investments and by removing regulatory barriers
P2	Green infrastructure – urban vegetation	Infrastructure	Local	PM		Local	
P3	NOx – absorbing coatings	Infrastructure Regulation	Local	NOx	No/little	Local	National, by amending relevant construction regulations as necessary
Measures to change behaviour							
P4	Clean Air day	Guidance/Info	Local	NOx, PM, CO2		Local	
P5	Public engagement, citizens science, etc	Guidance/Info	Local	NOx, PM, CO2		Local	
P6	Exposure reduction programmes targeting especially sensitive parts of the population	Guidance/Info	Local	NOx, PM, CO2		Local	
P7	Air Quality alerts and information based on indices	Regulation Guidance/Info	Local	NOx, PM, CO2		Local/Regional	National, by setting harmonized AQ indices including concerted advice to relevant population groups and providing forecast tools

Local versus large-scale measures

👉 how their **impact** varies for PM, O₃ and NO₂

Local measures ...

- have very **little** (positive) **impact** on urban **ozone** concentrations

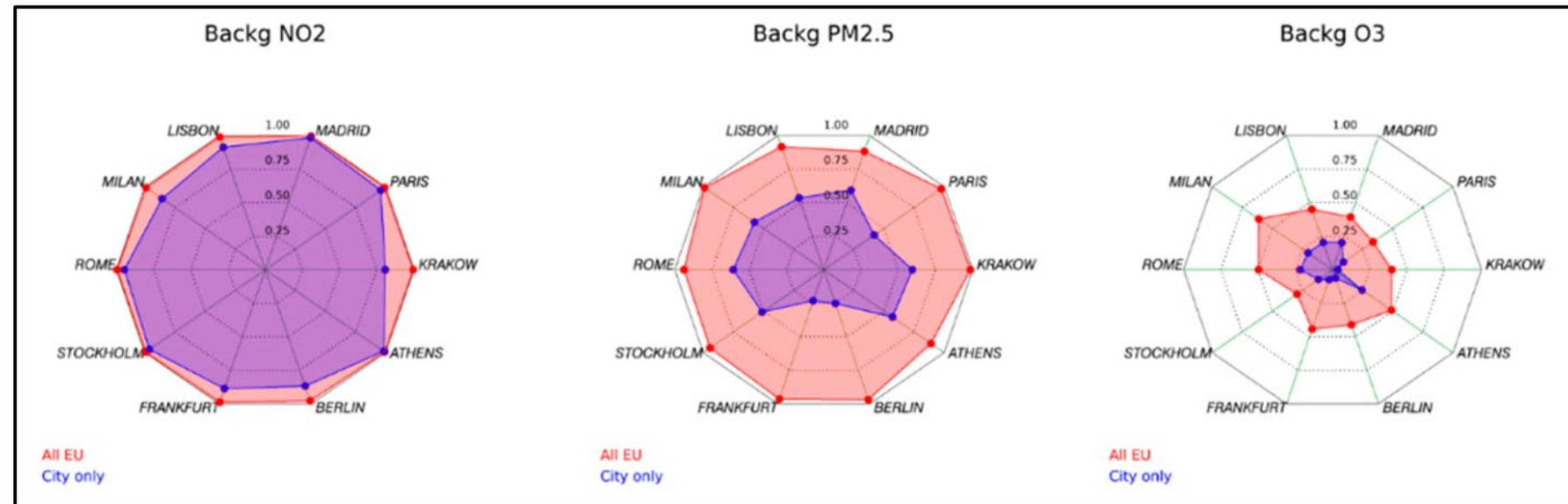
 - ↪ National and even hemispheric action needed

- reduce urban PM_{2.5} only

 - ↪ by **~20 – 40%** in flat parts of **central** and **western** Europe

 - ↪ by **~50 – 60%** elsewhere

- are (seemingly) **the solution** to the urban **NO₂-problem**



Relative response of measures taken on a large scale (here EU, in red) and only locally (blue/purple) to reduce yearly averaged PM_{2.5}, NO₂ and daily 8 h max (summertime O₃), assessed at the city location with the maximum modelled concentration.

Source: Pisoni et al (2022), <https://doi.org/10.3390/su14116384>

Local versus national/international measures

👉 how the first **depends** on the second

- **Example: Traffic**
low emission zones,
urban vehicle **access**
restrictions
- 👉 National **support** and
regulatory action is
indispensable for
efficient implementation
by city authorities
 - 👉 clean vehicle **labelling**
and **retrofit** regulation
 - 👉 **Funding**/incentives for
EVs, charging infra, ICE-
vehicle retrofit
 - 👉 Traffic **law** change

No.	Measure/intervention	Policy type(s)	Spatial scale of implementation	Target pollutants	Effectiveness to improve AQ & public health locally	Main governance level in charge of implementation and enforcement	Requisite support from other governance level
Transport							
T18	Promote or <i>require</i> abatement retrofit of Diesel (DPF, SCR) or <i>petrol</i> (3-way catalyst) vehicles	Funding Regulation	National	PM, NOx		National with regard to funding and setting up the requisite regulatory framework Local, if part of an LEZ scheme	EU/international by providing or harmonizing regulatory framework and by confirming the compatibility of funding with state aid rules to ensure fair trade
T31	Grant purchase of ultra-low emission cars	Funding	National	NOx, PM CO2		National	EU/international by confirming the compatibility with state aid rules to ensure fair trade
T32	Low emission zones, i.e. access restrictions for polluting vehicles	Regulation	Local	NOx, PM		Local	National, by providing the requisite regulatory framework
T34	Pollution car labelling scheme	Regulation	National	NOx, PM CO2	No/little	Local	National, by providing the requisite regulatory framework
T35	Development of electric vehicle charging infrastructure	Infrastructure Funding	National	NOx, PM CO2		Local	National, by providing funding and EU/international by defining the harmonized technical requirements
T36	Public information campaign to promote cleaner vehicles	Guidance/Info	National	NOx, PM CO2		National	Local, by conducting target group-specific information campaigns together with local initiatives

Local versus national/international measures

👉 how the first **depends** on the second

■ Example: residential **heating**

👉 (Inter-) National support indispensable...

👉 emission **standards** for new plants

👉 Emission standards and **funding** to **replace** old heating systems by **clean** solutions or **retrofit**

👉 Regulation to ensure **inspections**

No.	Measure/intervention	Policy type(s)	Spatial scale of implementation	Target pollutants	Effectiveness to improve AQ & public health locally	Main governance level in charge of implementation and enforcement	Requisite support from other governance level
S4	Eco-design and product standards	Regulation Funding	(inter)national	PM, NOx		National, by setting out the requisite national regulation to ensure efficient monitoring & enforcement (>S5/6)	EU/international, by setting the respective standards
S5	Elimination of polluting plants, small installations, heating systems etc	Funding Regulation	Regional/local	PM, NOx		Local/Regional	National, by setting up funding schemes and the requisite regulations
S6	Inspections (large installations, boilers, space heaters, fire places) and enforcement actions (e.g. ban of open fires, waste burning)	Regulation	National	PM, NOx		Local/Regional by ensuring efficient monitoring & enforcement	National, by setting out the requisite regulations
S7	Monetary incentives, e.g. replacement schemes for old polluting heating systems	Funding	National	PM, NOx		National, by setting up funding schemes	EU/international by confirming the compatibility of funding schemes with state aid rules to ensure fair trade
S16	Precipitator retrofit programme for small installations to control PM emission	Funding Regulation	Local/Regional	PM		Local/Regional	National, by setting out the requisite technical regulations and funding schemes

Assessing the (cost-) effectiveness of (local) measures

👉 the **results** and **conclusions** (iv)

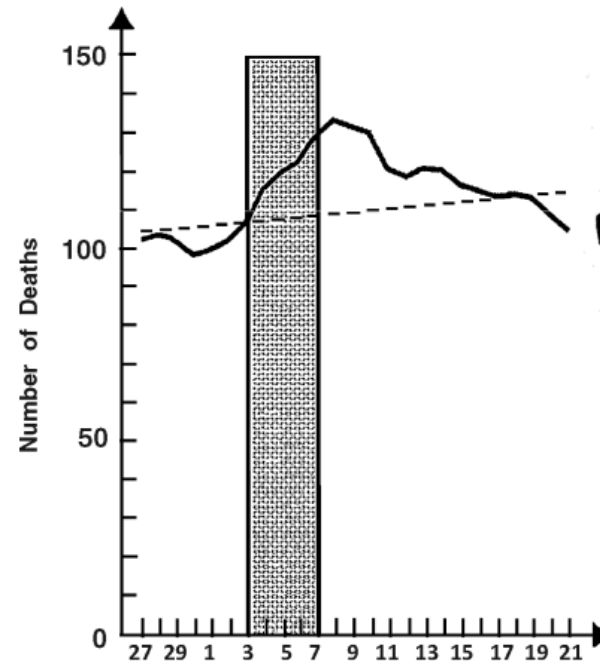
- Whats about **short-term actions**, i.e. interventions implemented during hours or days in reaction of pollution peaks ?
- Yes, there are detrimental **short-term health effects**, but ...

👉 *“An evidence assessment of short-term action plans ... concluded that there is **little or no evidence** that such measures will be **effective** in reducing the intensity, extent or duration of pollution events.”*

👉 *“**Most** of the burden of disease of air pollution is due to **long-term** exposure. Therefore, the primary focus should be on addressing this issue.”*

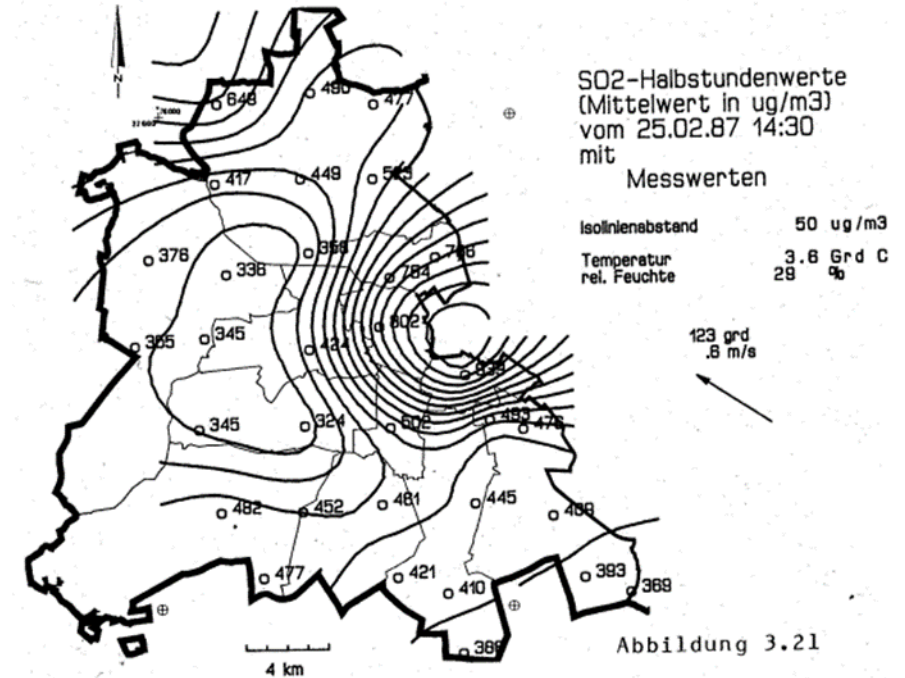
👉 However, short-term alerts could be a means *“to reduce individuals’ exposure ... using the daily AQ Index trigger and **awareness-raising**.”*

Quotes from the health review of interventions by Public Health England



November December 1962
Daily deaths (7 day moving average) in the Rhine-Ruhr areas during the December 1962 smog episode (grey column) with SO₂-levels up to 5000 µg/m³ and PM₁₀ around 1500 µg/m³
Source: Steiger/Brockhaus, Naturwiss. 53 (1966)

Berliner Luftgüte-Messnetz

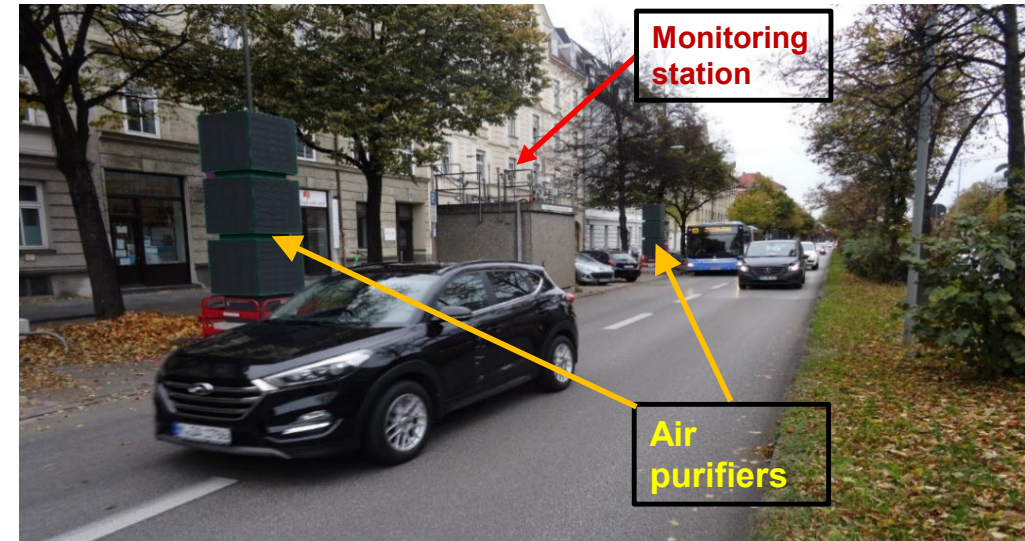


SO₂-concentrations (1/2h mean) during a pollution episode in West-Berlin in winter 1987 triggering a smog-alarm. Source: SenStadtUm (1987)

Assessing the (cost-) effectiveness of (local) measures

👉 Final conclusions

- **Long-term** measures are more **impactful** than short-term interventions
- We definitely need a **multi-level** approach, with measures, interventions and efforts be taken on local, national and international level, because
 - (1) pollutants of **large-scale nature**, like ozone and PM_{2.5}, need large-scale measures
 - (2) local measures often need **support** from higher governance levels
 - 👉 **half** of the considered local interventions could otherwise **barely implemented** efficiently
 - 👉 this is also true for tackling a **local-scale** pollutant, like NO₂
- We need stronger **coordination** between different **policy** areas
 - 👉 Not all measures in favour of **climate** change are necessarily beneficial for **air** quality
 - 👉 Promotion of **biomass** combustion without prescribing dust **filters**
 - 👉 Simply converting the vehicle fleet into **EVs** without **reducing** vehicle **mileage**
- Purely hot-spot driven planning is less effective than the “implementing **measures to reduce average exposures** of all people” in our cities
- Set “**binding average exposure reduction goals** for air pollutants **in combination with lowered fixed limit values**” 👉



Source: Bayrisches Staatsministerium für Umwelt

WHO Air Quality Guidelines 2021–Aiming for Healthier Air for all: A Joint Statement by Medical, Public Health, Scientific Societies and Patient Representative Organisations
Barbara Hoffmann et al., Int J Public Health, 23 September 2021 <https://doi.org/10.3389/ijph.2021.1604465>



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Thanks for listening!

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