



Air Quality

- revision of EU Rules -

2n Congrés Qualitat de l'aire. Sabadell, 14 October 2021

*European Commission
Clean Air Unit*

“The Commission will continue to work closely with the WHO to ensure that the EU’s air quality standards are aligned with the WHO’s recommendations. This will help to protect public health and the environment.”

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#EUGreenDeal

EU clean air policy

EU clean air policy



Ambient Air Quality (AAQ) Directives

Maximum concentrations of
air polluting substances

(PM₁₀, PM_{2.5}, SO₂, NO₂, O₃ + 8 more)

**SETTING OBJECTIVES
FOR GOOD AIR QUALITY**

**REDUCING EMISSIONS
OF POLLUTANTS**



**National Emission reduction
Commitments Directive**

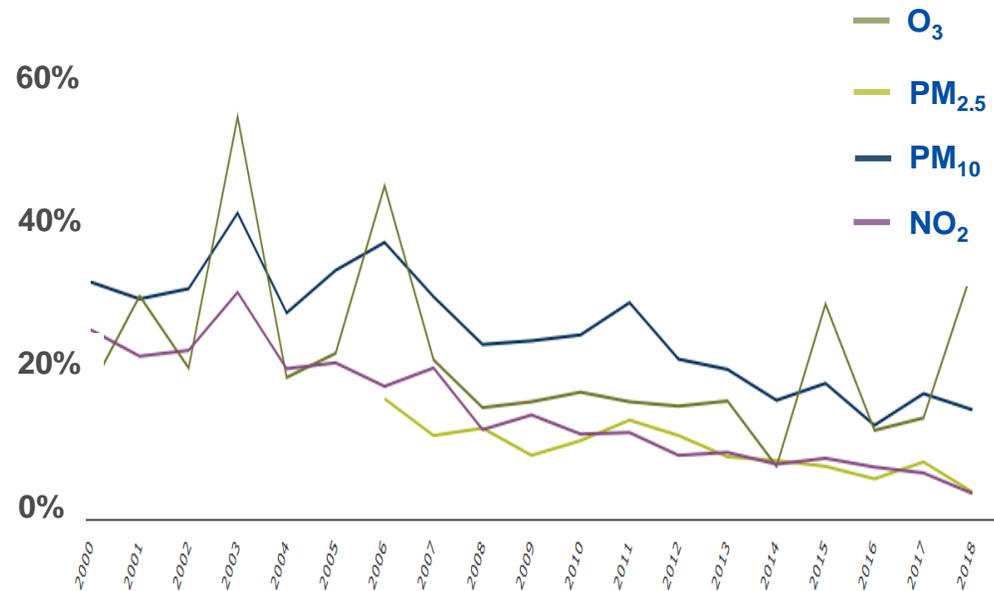
National emission totals
(SO₂, NO_x, NMVOC, PM_{2.5}, NH₃)

**Source-specific
emission standards**

- IED Directive
- MCP Directive
- Eco-design Directive
- Energy efficiency
- Euro and fuel standards

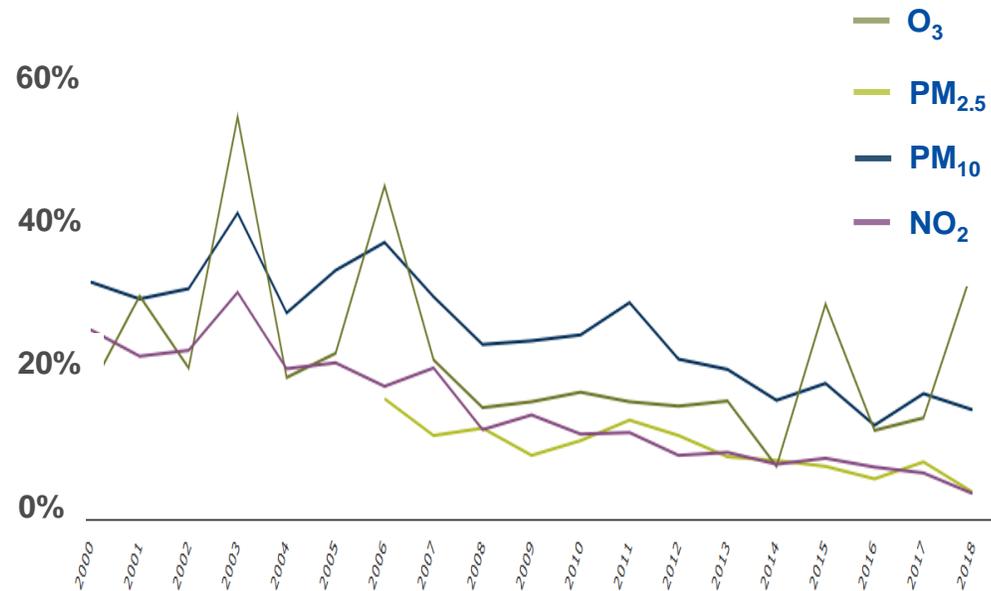
EU clean air policy works

EU urban population exposed to air pollution above **EU standards from 2000 to 2018**

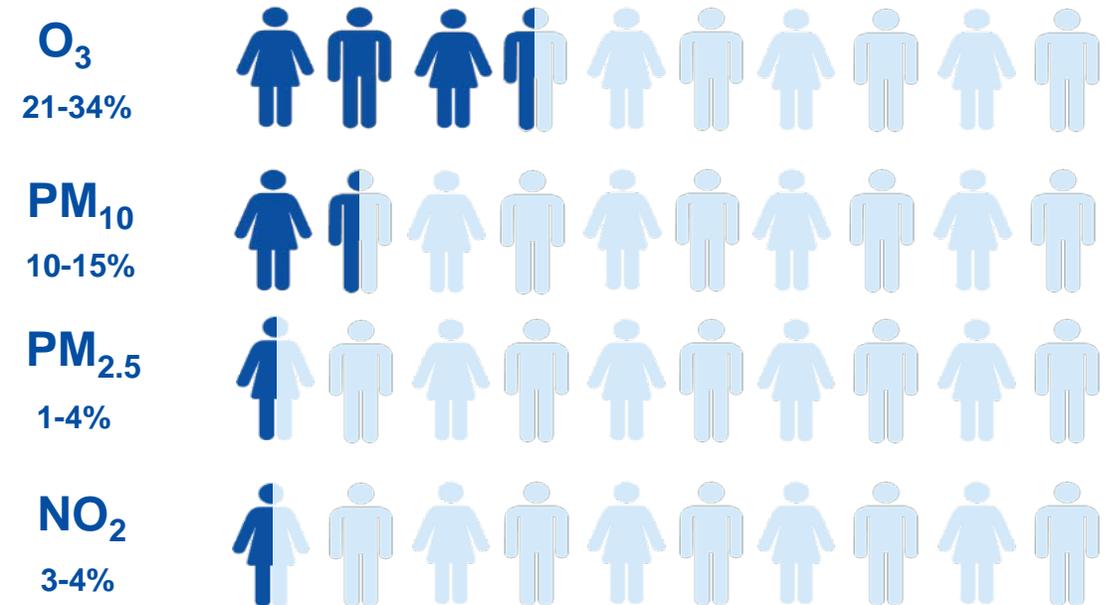


EU clean air policy works ... but ...

EU urban population exposed to air pollution above **EU standards from 2000 to 2018**

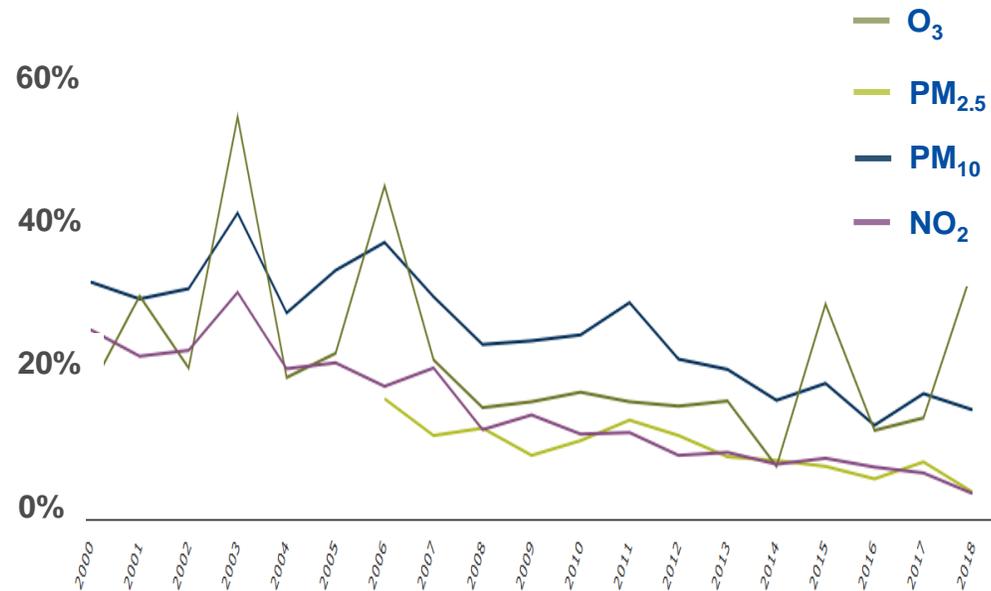


EU urban population exposed to air pollution above **EU standards** in 2018 / 2019

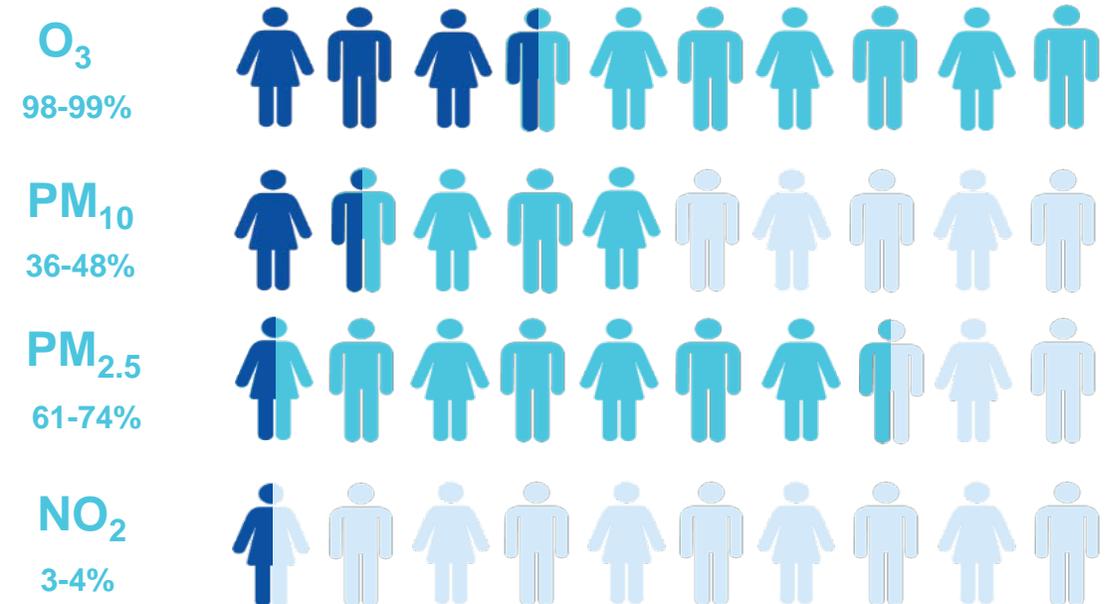


EU clean air policy works ... but ...

EU urban population exposed to air pollution above **EU standards from 2000 to 2018**



EU urban population exposed to air pollution above **WHO (2005) guidelines** in 2018 / 2019



Fitness Check of the AAQ Directives

In 2019, an **evidence-based, retrospective evaluation** offered a number of **lessons learnt**:

- Air quality remains a major **health and environmental concern**;
- Air quality standards have been instrumental, and **partially effective**, to reduce pollution;
- Current EU standards are **less ambitious than scientific advice**;
- **Limit values** have been more effective than other types of air quality standards;
- Legal **enforcement action** by European Commission, and civil society, works (*with some caveats*);
- Scope to further harmonise **monitoring, modelling**, and **air quality plans**;
- Not all reported data equally useful, **e-reporting** allows for further efficiency.



A decade of air data
For period 2008 to 2018
from all Member States



Stakeholder feedback
Open public consultation
and expert questionnaires



Seven case studies
BG,DE,ES,IE,IT,SE,SK
each with specific focus



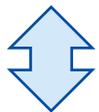
Literature & analysis
600 scientific sources
& a cost-benefit model

Key shortcomings

Air quality health outcome shortcomings

Premature deaths due to air pollution halved during last two decades, but ...

Health outcome shortcomings
EU Standards are not fully aligned with scientific advice ...



Exceedances above WHO Air Quality Guidelines and negative health impacts persist

Lack of flexibility to adapt to evolving science and new recommendations

Pollutants	2005 WHO AQ Guidelines	EU Air Standards	EU Exceptions
PM ₁₀ (year)	20 µg/m ³	40 µg/m ³	-
PM ₁₀ (day)	50 µg/m ³	50 µg/m ³	(35d a year)
PM _{2.5} (year)	10 µg/m ³	25 µg/m ³	-
PM _{2.5} (day)	25 µg/m ³	-	-
NO ₂ (year)	40 µg/m ³	40 µg/m ³	-
NO ₂ (hour)	200 µg/m ³	200 µg/m ³	(18d a year)
SO ₂ (daily)	20 µg/m ³	125 µg/m ³	3d a year
O ₃ (8-hour)	100 µg/m ³	120 µg/m ³	(75d in 3yr)

Source(s): Fitness Check of the Ambient Air Quality Directive SWD(2019) 427

NOTE: Revised WHO Air Quality Guidelines on 22 Sep 2021

Air quality implementation shortcomings

Frequency, extent and magnitude of exceedances has declined, but ...

Implementation shortcomings

Exceedances are not always addressed sufficiently and/or on time ...



Air quality plans and measures have often proven ineffective



Insufficient penalties and compensation linked to exceedances

As of September 2021, still **31 cases** addressing 18 Member States (+ 1 vs UK) related to bad application:

- 15 particulate matter (PM₁₀ and/or PM_{2.5})
- 13¹ nitrogen dioxide (NO₂)
- 1 sulphur dioxide (SO₂)
- 2 monitoring problems

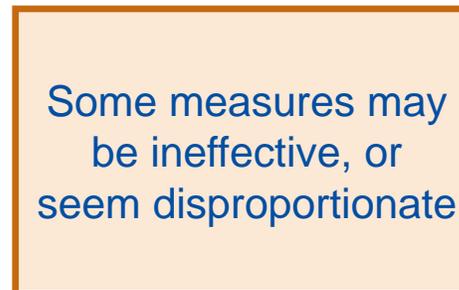
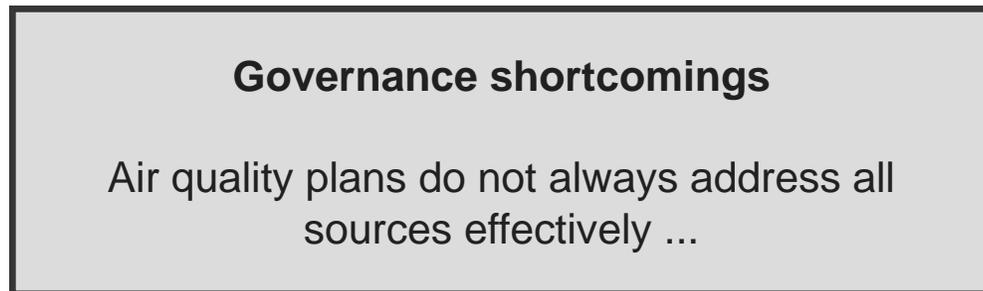
Of these, 15 cases (i.e. 9 Member States + 1 vs UK) have been referred to the Court of Justice of the EU.

With 8 rulings so far: BG, PL, RO, IT, HU (for PM₁₀) and UK, DE, FR (for NO₂).

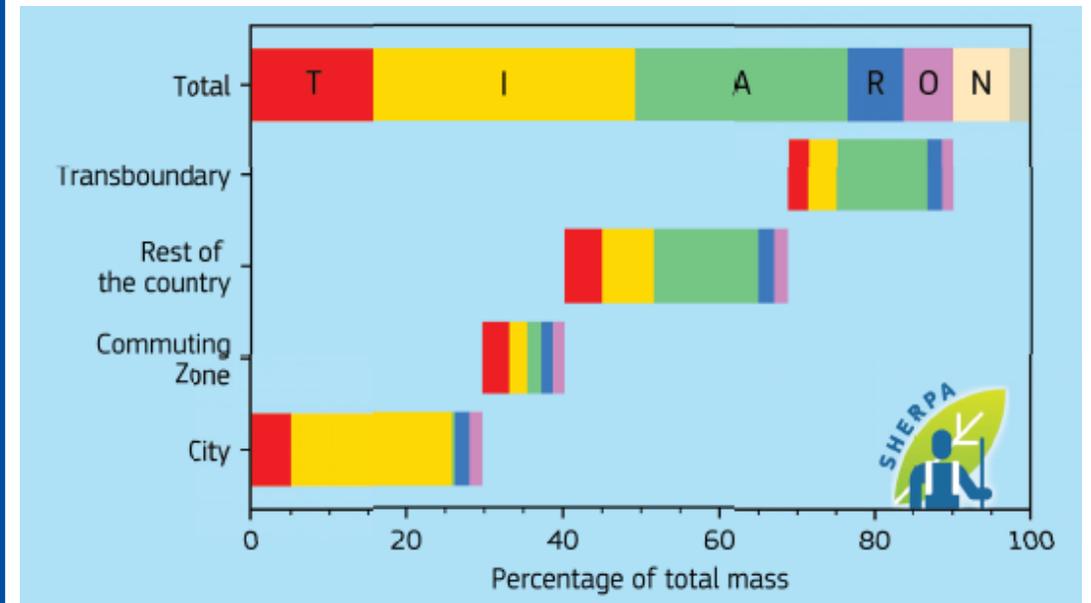
These cases address both exceedances of air quality standards and not keeping these as short as possible.

Air quality governance shortcomings

To limit exceedances, competent authorities develop plans, but ...



Example: Air pollution (here: PM_{2.5}) in Frankfurt (DE) is a combination of emissions in the city, its surroundings, the rest of the country and from other parts of Europe:



This combination requires air quality plans to address all sectors & all scales – in a coherent manner (!)

Air quality assessment shortcomings

More than 4.000 air quality monitoring stations deliver robust data, but ...

Assessment shortcomings

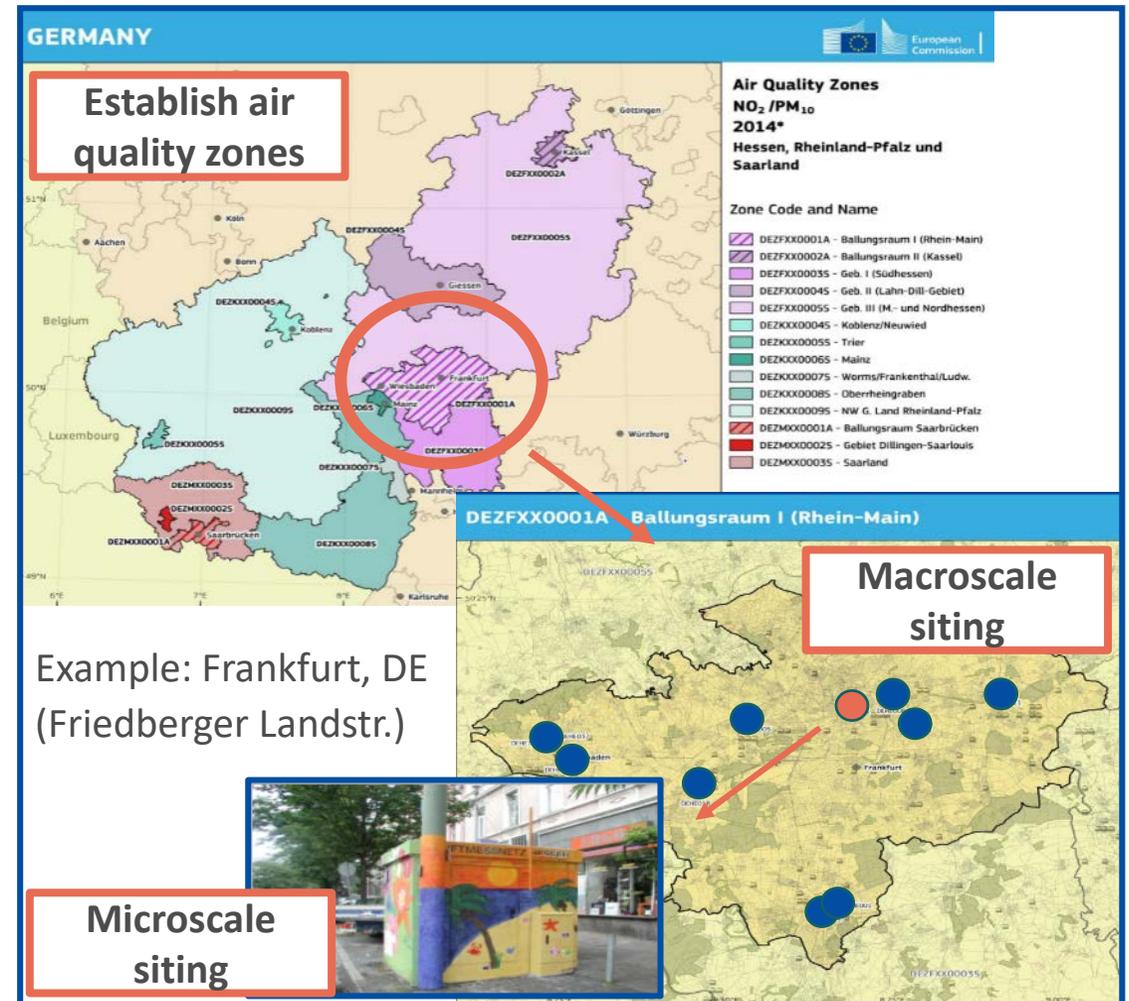
Flexibilities may sometimes impact the comparability of data ...



Monitoring rules offering flexibility are sometimes 'stretched'



Modelling ability has improved, allows for much more detail



Air quality information shortcomings

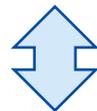
Reliable air quality information is widely available, often even in real-time, but ...

Information shortcomings

Public feels under-informed about poor air quality and its impacts ...



Concerns about health impacts have increased

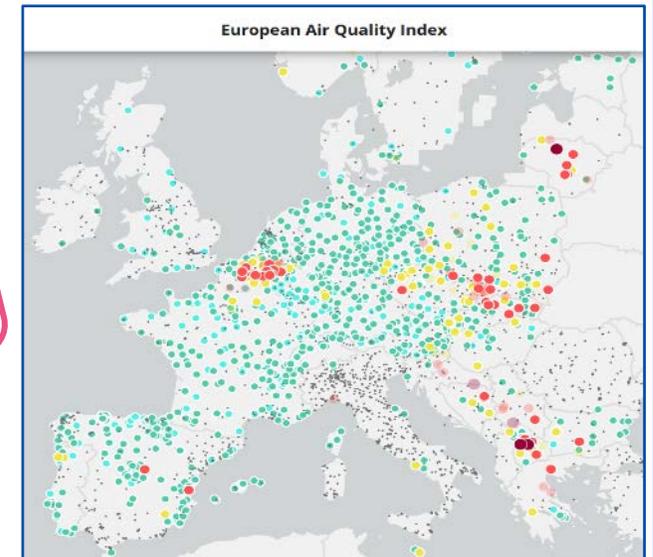


Public information is not always clear, and not harmonised



54%
MORE THAN HALF OF EUROPEANS SAY THAT THEY ARE **NOT WELL-INFORMED ABOUT AIR QUALITY PROBLEMS**

Real time data @
<https://airindex.eea.europa.eu>



The consequences of these shortcomings

Environment & Health

Elevated concentration levels of air pollutants, both general exposure of population and at pollution hotspots

Health impacts, more than 400.000 premature deaths each year across the EU, plus morbidity health impacts

Ecosystem impacts, eutrophication limits are being exceeded in 62% of ecosystem areas across the EU territory

Links with climate change, as higher temperature are associated with elevated ozone levels

Synergies with other EU policies, and in particular with the goals of the EU Zero Pollution Action Plan

Administrative burden of air quality management, in particular as relates to air quality assessment regimes

Cost to society, EUR 20 bn direct cost to health-care, lost work-days, crop losses, plus EUR 330-940 bn indirect costs

Measures needed to meet EU air quality standards, with costs for industry, transport, energy, and agriculture sector

Impacts on the EU's international competitiveness, with innovation potential, especially for clean air technologies

Sensitive population groups (children, pregnant women, elderly citizens) are more susceptible to air pollution

Inequalities and social sustainability, as groups of lower economic status tend to be more negatively affected

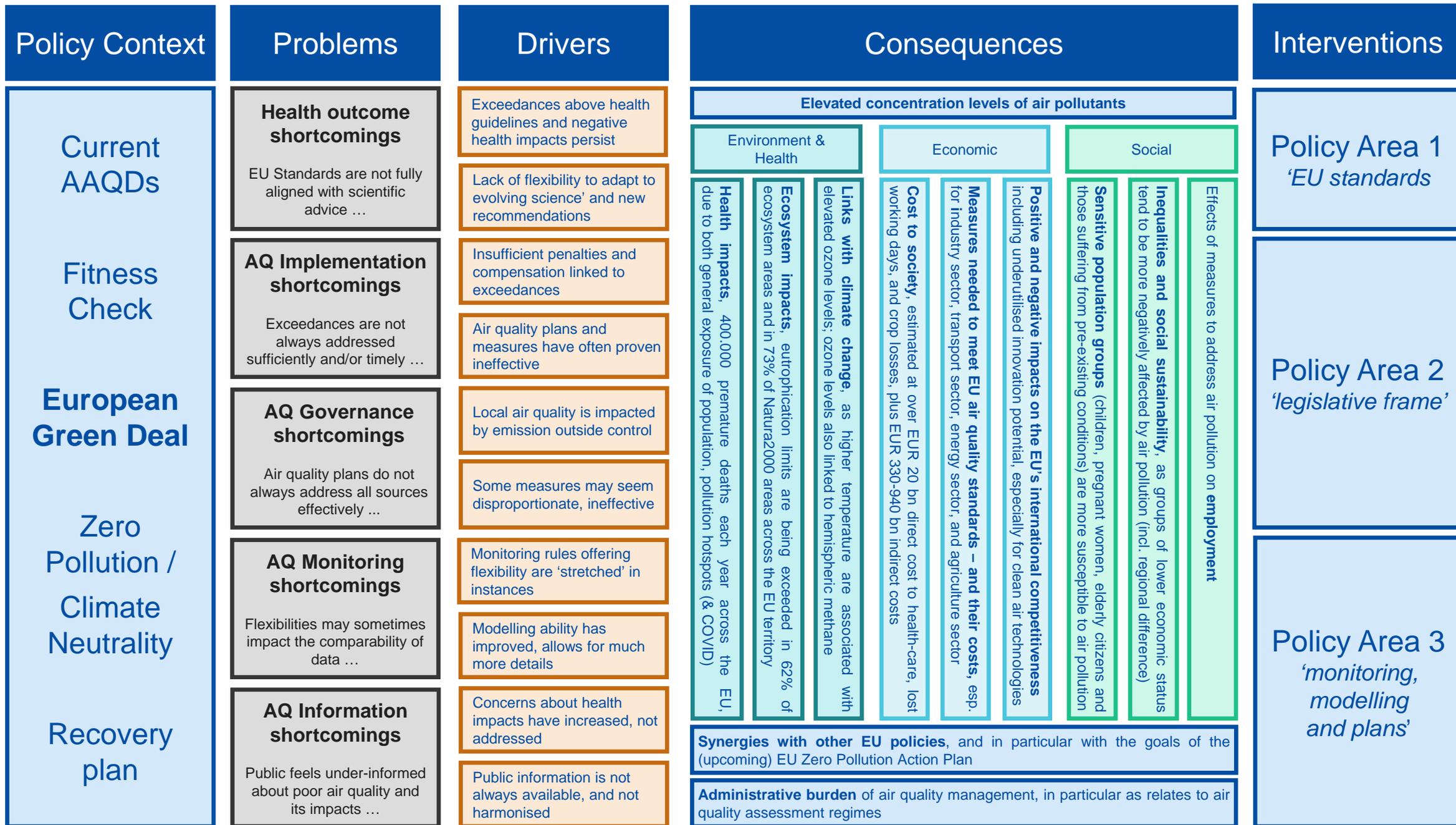
Measures to address air pollution may have effects on **employment**

Economic

Social

Impact assessment

Intervention Logic of the IA

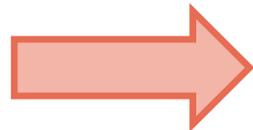


Different levels of ambition (example: for PM_{2.5})

AMBITION LEVEL



EU standards today / baseline



Low ambition



Mid ambition



High ambition



WHO – Air Quality guidelines and interim targets for PM (annual mean)

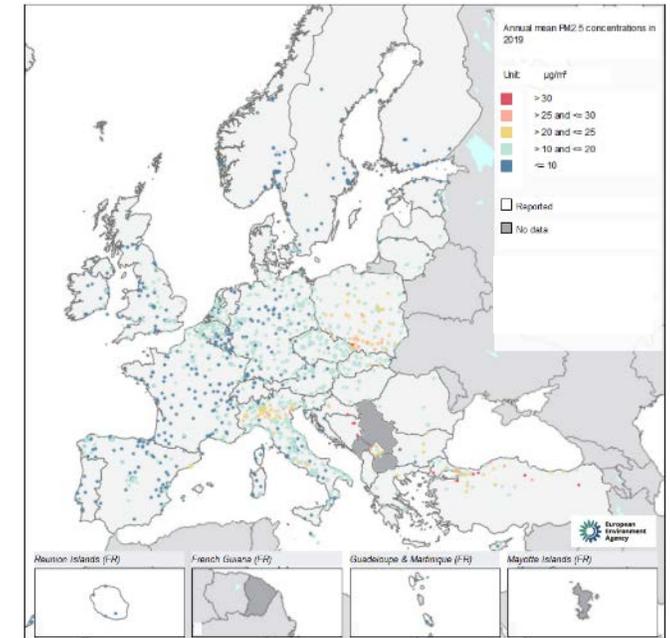
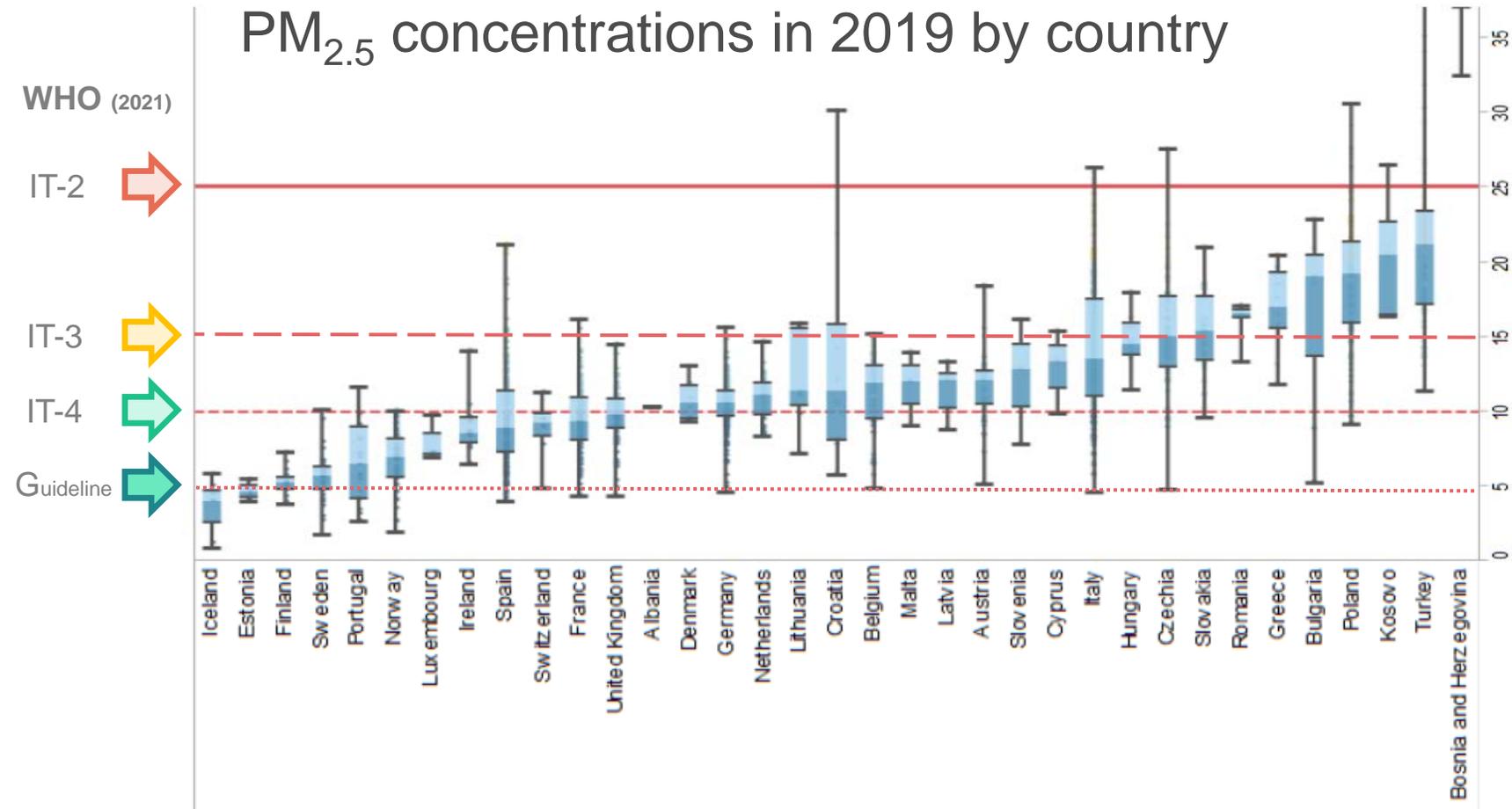
Annual mean level	PM _{2.5} (µg/m ³)	Mortality
Interim target 1	35	+ 24 % above guideline level
Interim target 2	25	+ 16 % above guideline level
Interim target 3	15	+ 8 % above guideline level
Interim target 4	10	+ 4 % above guideline level
AQ guideline level	5	mortality at guideline level



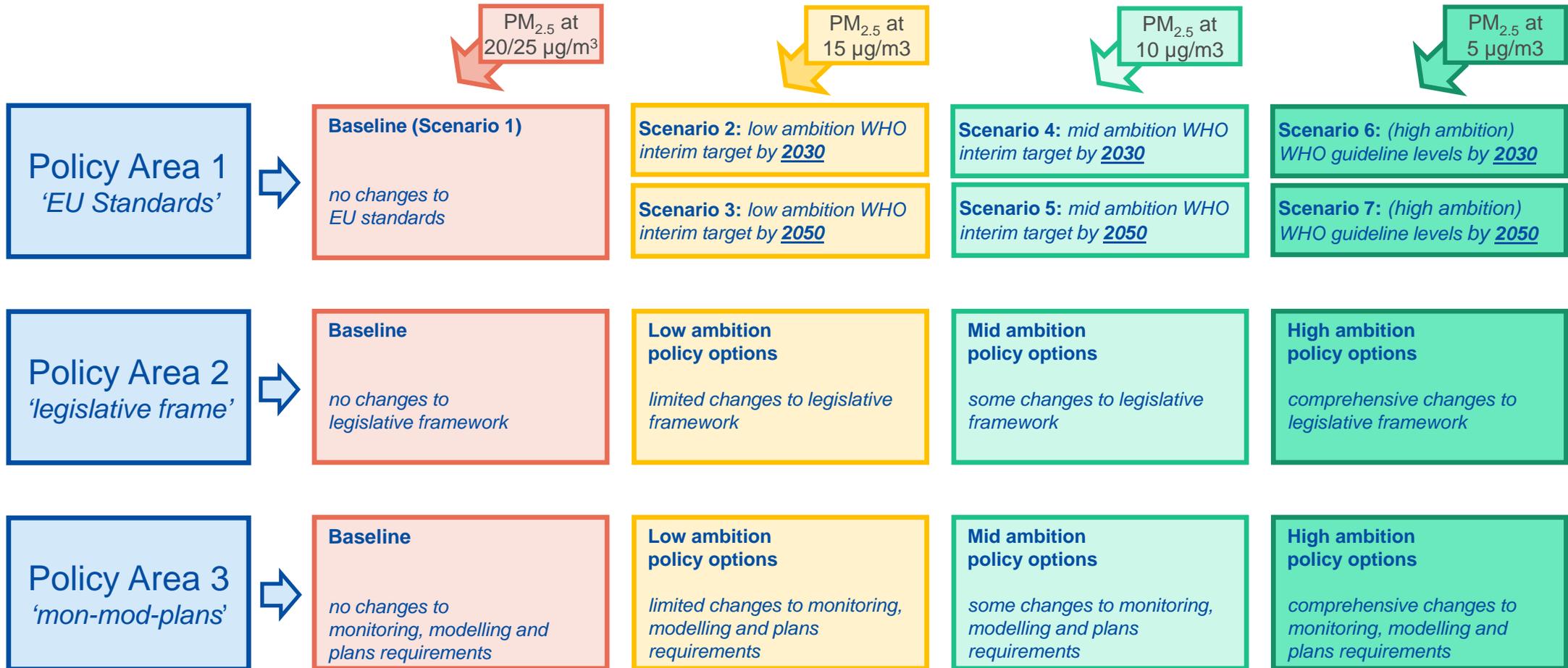
Ambition level versus WHO recommendations

Pollutant	Avg.time	IT1	IT2	IT3	IT4	AQG level	EU standard
PM _{2.5} (µg/m ³)	Annual	35	25 	15	10	5	25
“	➔ 24-hour	75	50	37.5	25	15	N/A
PM ₁₀ (µg/m ³)	Annual	70	50 	30	20	15	40
“	24-hour	150	100	75	50 	45	50
NO ₂ (µg/m ³)	Annual	40 	30	20	-	10	40
“	➔ 24-hour	120	50	-	-	25	N/A
“	1-hour	-	-	-	-	[200] 	200
O ₃ (µg/m ³)	➔ Peak Season	100	70	-	-	60	N/A
“	8-hour	160	120 	-	-	100	120
SO ₂ (µg/m ³)	24-hour	125 	50	-	-	40	125
“	➔ 1-hour	-	-	-	-	-	350
“	➔ 10-min	-	-	-	-	[500]	N/A
CO (mg/m ³)	➔ 24-hour	7	-	-	-	4	N/A
“	8-hour	-	-	-	-	[10] 	10
“	➔ 1-hour	-	-	-	-	[100]	N/A

Ambition level versus air quality today



Assessment of policy options per policy area



→ based on assessment of consequences, combine different policy options to **policy packages**

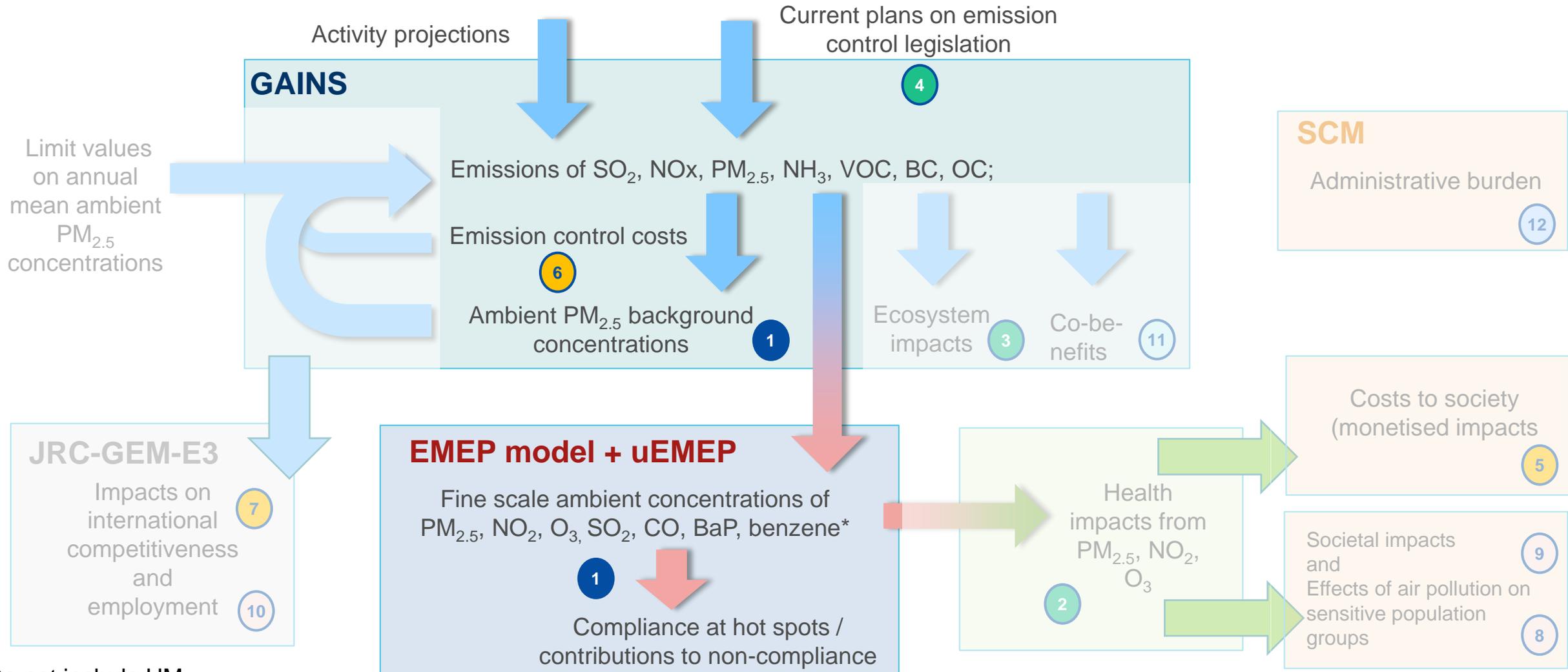
Policy area 1 – possible policy interventions

Particulate Matter (PM10)	Particulate Matter (PM2.5)	Sulphur Dioxide (SO2)	Nitrogen Dioxide (NO2) (and Nitrogen Oxides, NOx)	Carbon Monoxide (CO)	Ozone (O3)	Ultrafine particles
Based on WHO 2021	Based on WHO 2021	Based on WHO 2021	Based on WHO 2021	Based on WHO 2021	Based on WHO 2021	Based on good practice statements by WHO 2021
Arsenic	Cadmium	Nickel	Lead	Benzo(a)Pyrene	Benzene	Black carbon
Based on WHO 2000, and others	Based on WHO 2000, and others	Based on WHO 2000, and others	Based on WHO 2000, and others	Based on WHO 2000, and others (including WHO 2016)	Based on WHO 2000, and others	Based on good practice statements by WHO 2021

Preparatory analysis

Impact Assessment Modelling

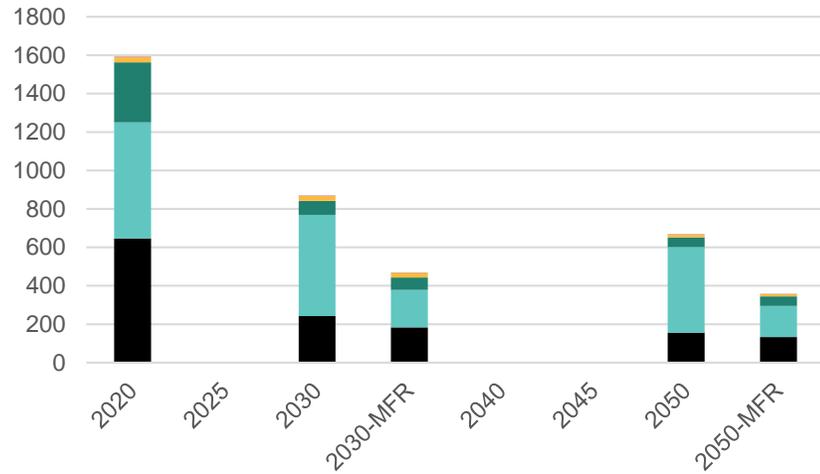
1	Elevated concentration levels of air pollutants, both general exposure of population and at pollution hotspots	Cost to society, EUR 20 bn direct cost to health-care, lost work-days, crop losses, plus EUR 330-940 bn indirect costs	5
2	Health impacts, more than 400.000 premature deaths each year across the EU, plus morbidity health impacts	Measures needed to meet EU air quality standards, with costs for industry, transport, energy, and agriculture sector	6
3	Ecosystem impacts, eutrophication limits are being exceeded in 62% of ecosystem areas across the EU territory	Impacts on the EU's international competitiveness, with innovation potential, especially for clean air technologies	7
4	Links with climate change, as higher temperature are associated with elevated ozone levels	Sensitive population groups (children, pregnant women, elderly citizens) are more susceptible to air pollution	8
11	Synergies with other EU policies, and in particular with the goals of the (upcoming) EU Zero Pollution Action Plan	Inequalities and social sustainability, as groups of lower economic status tend to be more negatively affected	9
12	Administrative burden of air quality management, in particular as relates to air quality assessment regimes	Measures to address air pollution may have effects on employment	10



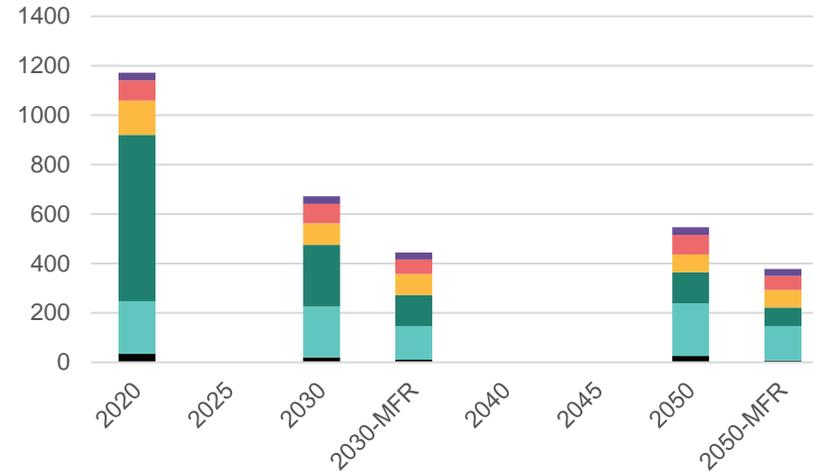
*Do not include HM

Emission trends in the EU-27

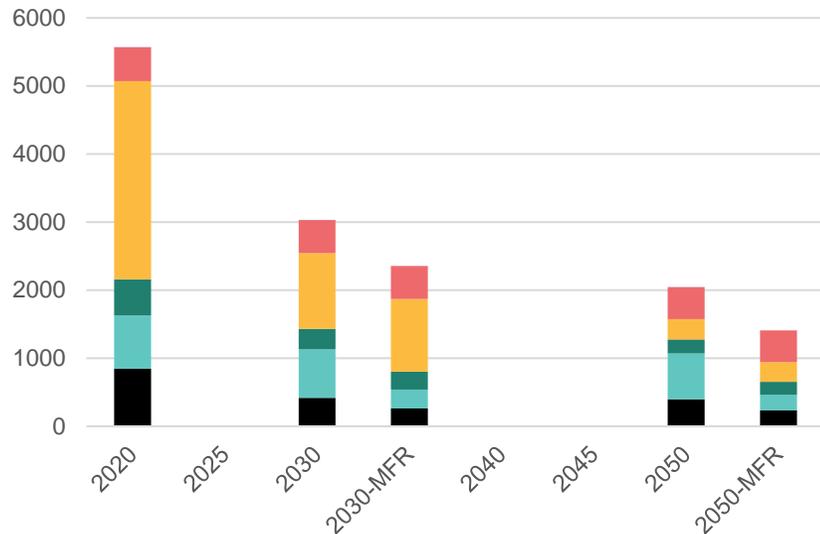
SO₂ [kt SO₂]



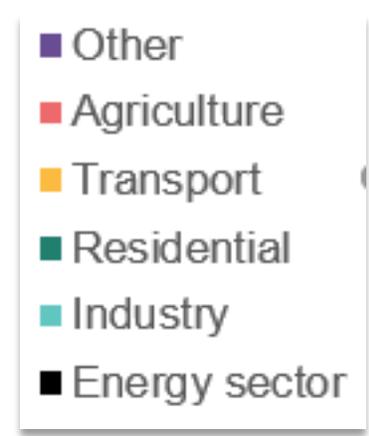
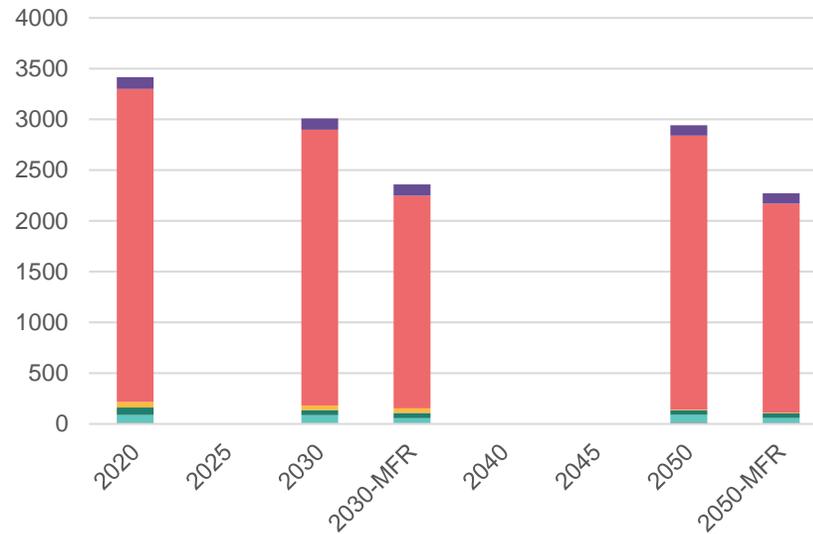
PM_{2.5} [kt]



NO_x [kt NO₂]



NH₃ [kt NH₃]



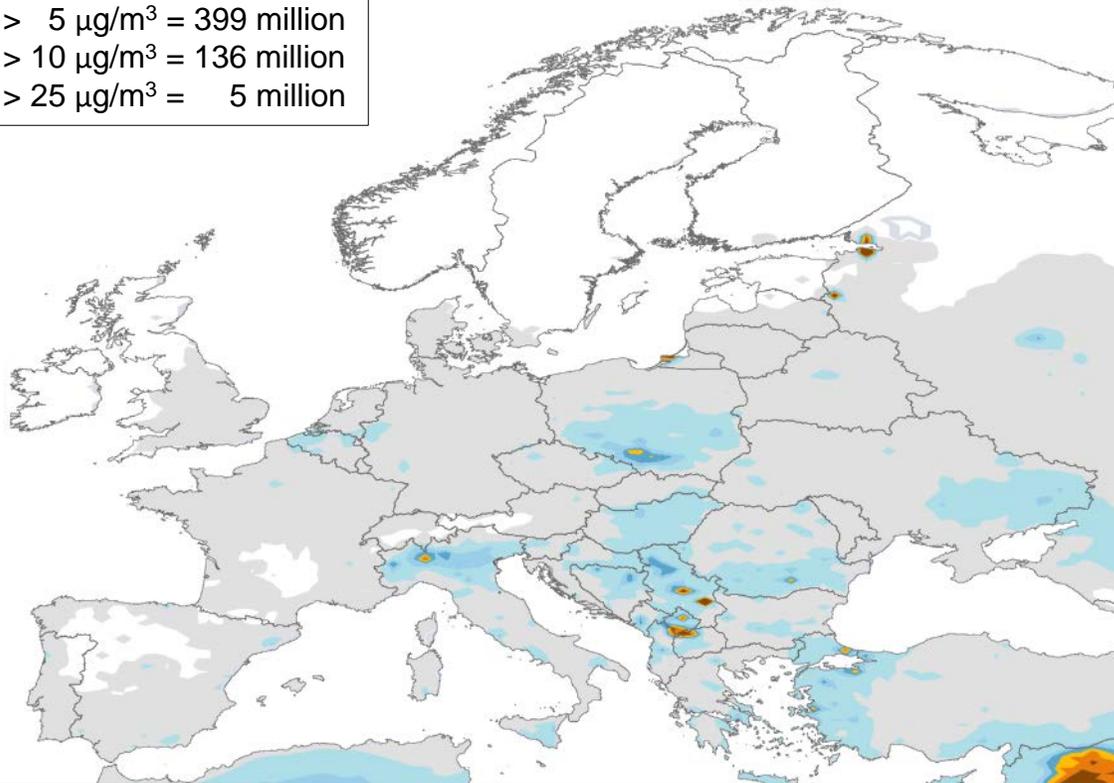
Preparatory analysis

PM_{2.5} concentrations from GAINS model (incl. natural sources)

Preparatory analysis

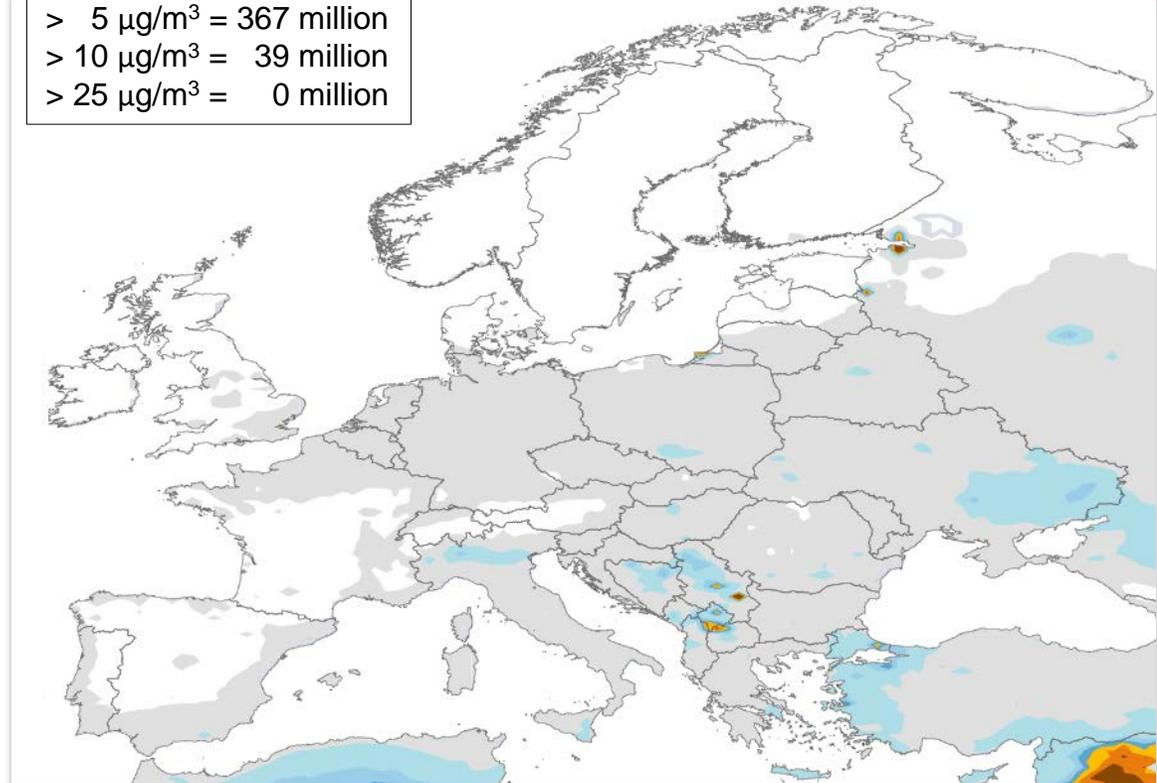
2020

Population exposure
> 5 $\mu\text{g}/\text{m}^3$ = 399 million
> 10 $\mu\text{g}/\text{m}^3$ = 136 million
> 25 $\mu\text{g}/\text{m}^3$ = 5 million

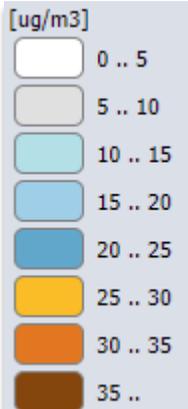


Baseline - 2030

Population exposure
> 5 $\mu\text{g}/\text{m}^3$ = 367 million
> 10 $\mu\text{g}/\text{m}^3$ = 39 million
> 25 $\mu\text{g}/\text{m}^3$ = 0 million



Map legend

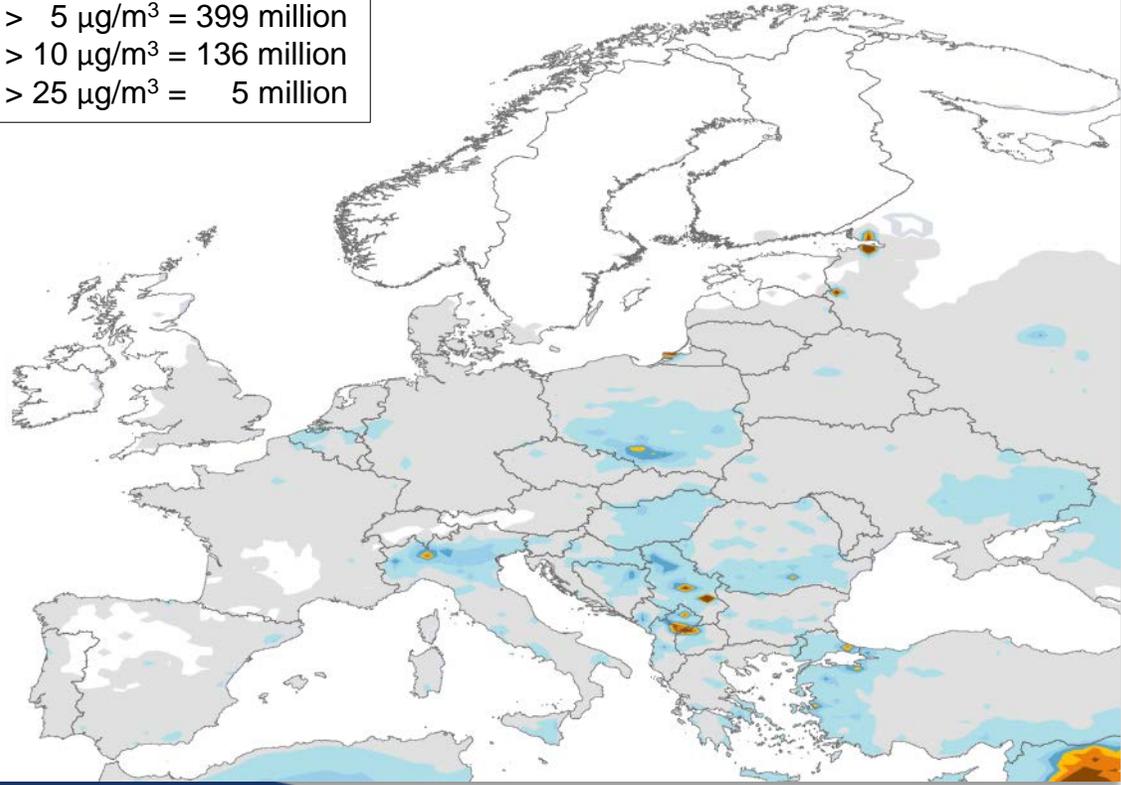


PM_{2.5} concentrations from GAINS model (incl. natural sources) *MFR for EU-27 only*

Preparatory analysis

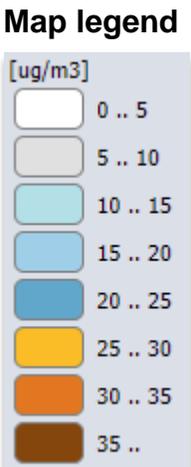
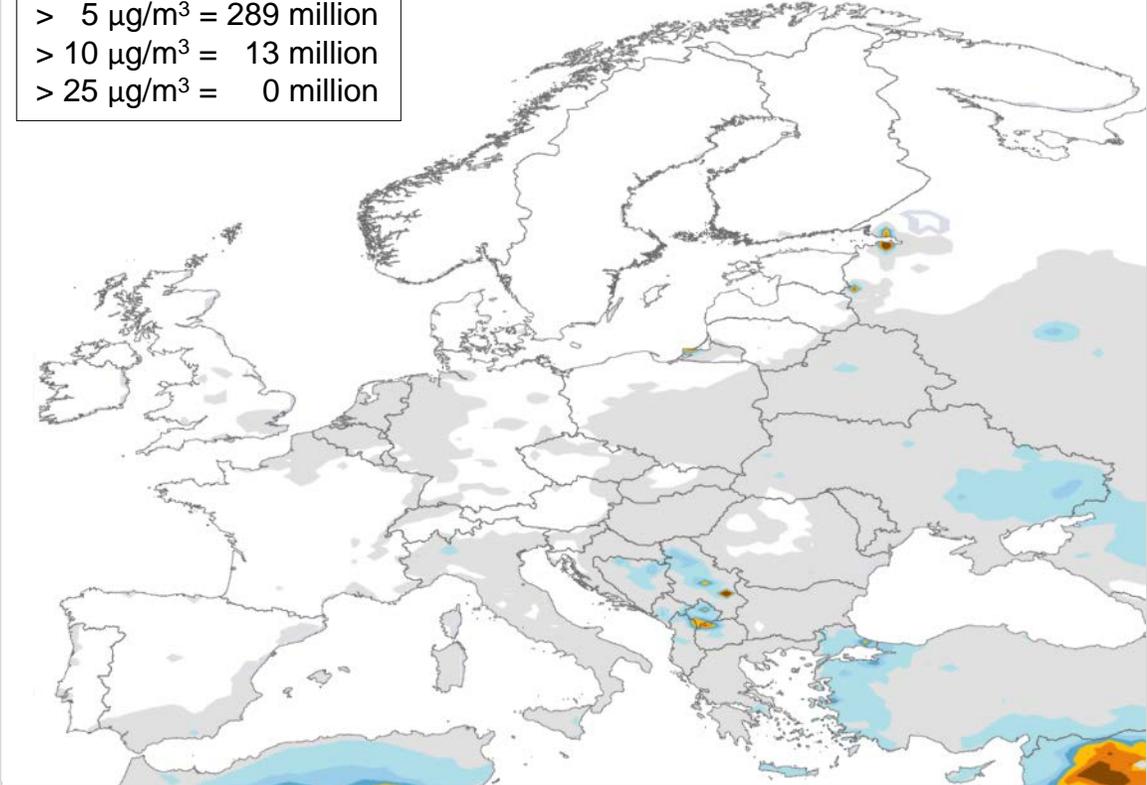
2020

Population exposure
 > 5 µg/m³ = 399 million
 > 10 µg/m³ = 136 million
 > 25 µg/m³ = 5 million



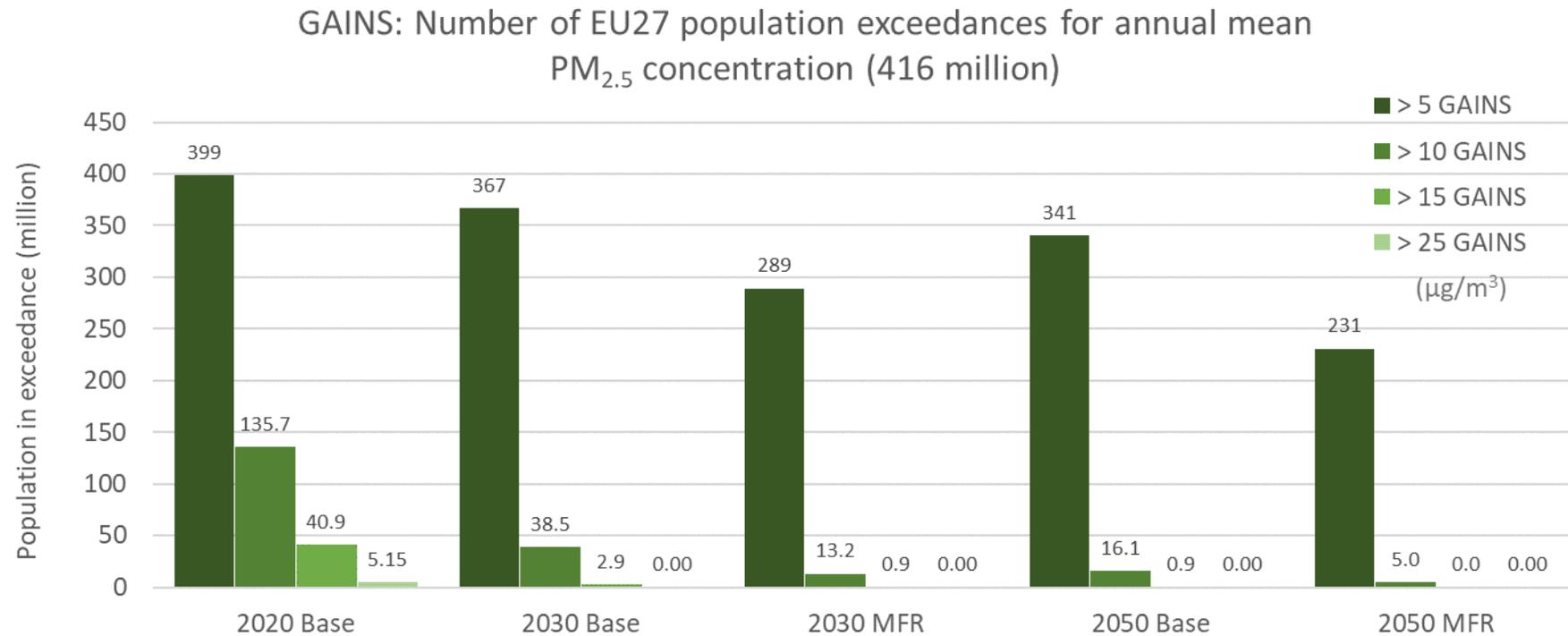
MFR (EU27) - 2030

Population exposure
 > 5 µg/m³ = 289 million
 > 10 µg/m³ = 13 million
 > 25 µg/m³ = 0 million



PM_{2.5} Population exposure - Summary of preliminary scenario calculations using the existing GAINS methodology

Preparatory analysis



Summary of preliminary analysis

- Significant reductions in exposure in Baseline and MFR scenarios, much larger than model uncertainties
- Wide-spread compliance with current AAQ limit values expected for NO_2 and $\text{PM}_{2.5}$ in the baseline
- Model slightly underestimates both $\text{PM}_{2.5}$ and NO_2 – will be taken into account
- Scale matters for exceedance calculations, particularly for NO_2
- Large reductions in traffic emissions for NO_x will lead to other sources dominating NO_2 exposure
- Residential combustion will remain a key source of $\text{PM}_{2.5}$ exposure

Interventions and policy options

Problems	Drivers	Interventions
<p>Health outcome shortcomings</p> <p>EU Standards are not fully aligned with scientific advice ...</p>	<p>Exceedances above health guidelines and negative health impacts persist</p> <p>Lack of flexibility to adapt to evolving science' and new recommendations</p>	<p>Policy Area 1 <i>'EU Standards'</i></p>
<p>AQ Implementation shortcomings</p> <p>Exceedances are not always addressed sufficiently and/or timely ...</p>	<p>Insufficient penalties and compensation linked to exceedances</p> <p>Air quality plans and measures have often proven ineffective</p>	<p>Policy Area 2 <i>'legislative frame'</i></p>
<p>AQ Governance shortcomings</p> <p>Air quality plans do not always address all sources effectively ...</p>	<p>Local air quality is impacted by emission outside control</p> <p>Some measures may seem disproportionate, ineffective</p>	
<p>AQ Monitoring shortcomings</p> <p>Flexibilities may sometimes impact the comparability of data ...</p>	<p>Monitoring rules offering flexibility are 'stretched' in instances</p> <p>Modelling ability has improved, allows for much more details</p>	<p>Policy Area 3 <i>'monitoring, modelling and plans'</i></p>
<p>AQ Information shortcomings</p> <p>Public feels under-informed about poor air quality and its impacts ...</p>	<p>Concerns about health impacts have increased, not addressed</p> <p>Public information is not always available, and not harmonised</p>	

Key Objectives

Policy Area 1 - Closer alignment of the EU air quality standards with scientific knowledge including the latest recommendations of the World Health Organization:

- to improve ambient air quality to the greatest extent possible taking into account the latest scientific advice, feasibility, costs, benefits.*

Policy area 1 – possible policy interventions

Particulate Matter (PM10)	Particulate Matter (PM2.5)	Sulphur Dioxide (SO2)	Nitrogen Dioxide (NO2) (and Nitrogen Oxides, NOx)	Carbon Monoxide (CO)	Ozone (O3)	Ultrafine particles
Based on WHO 2021	Based on WHO 2021	Based on WHO 2021	Based on WHO 2021	Based on WHO 2021	Based on WHO 2021	Based on good practice statements by WHO 2021
Arsenic	Cadmium	Nickel	Lead	Benzo(a)Pyrene	Benzene	Black carbon
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Key Objectives

Policy Area 2 - Improving the air quality legislative framework, including provisions on penalties and public information

- To improve the quality and timely implementation of air quality plans to achieve air quality objectives, and strengthen public participation in the development of air quality plans.*
- To include clearer provisions on access to justice, penalties and compensation linked to clean air in EU legislation.*

Policy area 2 – possible policy interventions

A - Adding an explicit mechanism for adjusting EU air quality standards to evolving knowledge 8 32	B - Further defining air quality standards (average exposure indicators) and exceedances actions 2 3 2 12-16 Annex	C - Expanding actions required to address exceedances (air quality plans / short-term action plans) 3 17 18 19 23 24	D - Specifying provisions to guide the development of air quality plans, incl on governance 23 Annex	E - Expanding the provision on sanctions and penalties 9 30 Annex	F - Expanding the requirements on the provision of information 7 26 27
A1. Mechanism to adjust air quality standards to new WHO guidelines / latest scientific advice;	B1. Introduce ' limit values ' for all air pollutants, replacing 'target values';	C1. Further specify the obligation for measures to keep exceedance period as short as possible ;	D1. Guidance on the information to be included in air quality plans ;	E1. Introduction of minimum penalty levels;	F1. Standardisation of necessary health related air quality information provisions
A2. Allow EU MS to adopt more stringent standards reflecting technical and scientific progress + notify EC	B2. Add short-term standards for all air pollutants with currently only long-term standards, e.g. PM2.5;	C2. Introduce obligation for effective short-term action plans to prevent / tackle air pollution events;	D2. Define requirements in terms of air quality plans vs air quality zones to ensure harmonisation;	E2. Create a fund from penalties and use proceeds to compensate for damages / fund AQ measures;	F2. Standardisation of air quality indices , timelines, or air pollutant alert thresholds.
A3. Require the priority air pollutant list to be updated periodically and add emerging pollutants to it.	B3. Require Member States to take short-term action plans in case of exceedances of short-term standards.	C3. Clearer coordination between short-term action plans and air quality plans.	D3. Introduce legislative instruments for clear responsibilities between different levels of MS governance.	E3. 'Access to justice' clause in the AAQD	

Problems	Drivers	Interventions
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Key Objectives

Policy Area 3 - Strengthening of air quality monitoring and modelling, and air quality plans

- To further improve the reliability and comprehensiveness of air quality assessments undertaken by national, regional and local authorities.*
- To ensure that the public in all Member States receive the same high quality and timely information about their air quality.*

Policy area 3 – possible policy interventions

Directive 2004/107

Directive 2008/50

G - Augment assessment regime rules 4 5-11	H - # / type of sampling points Annex Annex	I - Continuity / discontinuation / relocation of sampling points Annex	J - Micro and macro-scale siting of sampling points Annex Annex	K - Data quality Annex Annex	L - Which pollutants to measure and how Annex Annex	M - Assessment of natural / winter sanding / transboundary 20 21	N - Requirements around developed AQ plans Annex
G1. Address ambiguity around indicative measurements	H1. Redefine requirements on # sampling points	I1. Requirements on monitoring for x years after compliance	J2. Spatial representativeness to define locations	K1. Incorporate FAIRMODE Modelling Quality Objective	L1. Increased monitoring of ozone and VOCs . Changes to HM and b requirements.	M1. Clearer rules guidance on estimating contribution from winter sanding/salting	<i>N1. Guidance on: Source apportionment</i>
G2. Clarify use of models	H2. Clarify % split sampling point type		J3. Further define micro siting criteria	K2. Define how Quality Objective is applied in practice	L2. Mandatory urban supersites	M2. Clearer rules and guidance on estimating contribution from natural sources	<i>N2. Guidance on: Developing AQ plans</i>
G3. Clarify role of industrial point source monitoring	H3. Clarify use of indicative monitoring			K3. Protocol when data capture <90%	L3. Monitoring standards for emerging pollutants	M3. Mandatory estimation of transboundary contribution	<i>N3. Guidance on: Cost benefit analysis</i>

WHO Air Quality Guidelines

What are the WHO Air Quality Guidelines?

- Based on extensive scientific evidence, the AQGs identify the levels of air quality necessary to **protect public health worldwide**.
- They provide recommendations on **air quality guidelines levels** (and interim targets) for **PM_{2.5}** and **PM₁₀**, **O₃**, **NO₂**, **SO₂** and **CO**, and qualitative good practice statements for certain types of particulate matter.
- Guideline levels can be used as an **evidence-informed reference** to help decision-makers in setting legally binding standards and goals for air quality management.
- They are an **instrument to design effective measures** to achieve reduction of air pollution, and therefore, to protect human health.

The scope of the AQGs

Selection of pollutants

Scoping the guidelines involved the selection of air pollutants, and the critical health outcomes for each air pollutant in relation to durations of exposure.



The guideline development group (GDG) considered different criteria



The GDG decided to develop AQGs levels (with interim targets) for particulate matter PM₁₀ and PM_{2.5}, O₃, NO₂, SO₂ and CO, and good practice statements for black/elemental carbon, ultrafine particles and sand & duststorms

What the AQGs are not/do not include

- The WHO AQGs are not legally binding. They are a set of recommendations, which may serve a reference for setting standards or policies
- They do not apply to occupational settings, but all others (including outdoor and indoor)
- They do not include recommendations about joint effects of multiple exposures.
- They do not address specific recommendations on policies and interventions because these are largely context specific
- They do not cover all air pollutants, but all previous WHO guidelines not updated remain valid

What is new in these AQGs 2021?



- Since the last 2005 global update, there has been a marked increase in the quality and quantity of evidence that shows how air pollution affects different aspects of health.
- There are also now clearer insights about sources of emissions and the contribution of air pollutants to the global burden of disease.
- For that reason, and after a systematic review of the accumulated evidence, **several of the updated AQG levels are now lower than 15 years ago.**
- New features include new AQG levels for peak-season O₃ and 24-h NO₂ and CO, as well as new interim targets.

What the AQGs provide...

Summary of recommended AQG levels and interim targets

Pollutant	Averaging time	IT1	IT2	IT3	IT4	AQG level
PM _{2.5} , µg/m ³	Annual	35	25	15	10	5
PM _{2.5} , µg/m ³	24-hour ^a	75	50	37.5	25	15
PM ₁₀ , µg/m ³	Annual	70	50	30	20	15
PM ₁₀ , µg/m ³	24-hour ^a	150	100	75	50	45
O ₃ , µg/m ³	Peak season ^b	100	70	–	–	60
O ₃ , µg/m ³	8-hour ^a	160	120	–	–	100
NO ₂ , µg/m ³	Annual	40	30	20	–	10
NO ₂ , µg/m ³	24-hour ^a	120	50	–	–	25
SO ₂ , µg/m ³	24-hour ^a	125	50	–	–	40
CO, mg/m ³	24-hour ^a	7	–	–	–	4

Air quality guideline levels for both long- and short-term exposure in relation to critical health outcomes.

Interim targets to guide reduction efforts for the achievement of the air quality guideline levels.

Good practice statements in the management of certain types of particulate matter for which evidence is insufficient to derive quantitative air quality guideline levels, but points to their health relevance.

Good practice statements

For the management of certain type of particle

SAND AND DUST STORM



- Maintain suitable air quality management and dust forecasting programmes.
- Maintain air quality monitoring programmes and reporting procedures.
- Conduct epidemiological studies and research activities aimed at better understanding toxicity.
- Implement wind erosion control through the carefully planned expansion of green spaces.

BLACK/ELEMENTAL CARBON



- Make systematic measurements.
- Undertake production of emission inventories, exposure assessments and source apportionment.
- Take measures to reduce emissions and develop standards (or targets).

ULTRAFINE PARTICLES



- Quantify ambient UFP in terms of PNC for a size range with a lower limit of ≤ 10 nm and no restriction on the upper limit.
- Expand the common air quality monitoring strategy by integration of UFP monitoring.
- Distinguish between low and high PNC to guide decisions on the priorities of UFP source emission control.
- Utilize emerging science and technology for the assessment of exposure.

Stakeholder consultation

Have your say

On **23 September 2021**, we have launched a twelve week online public consultation – we invite you to reply to a four-part questionnaire until **16 December 2021**:

By 30 Sep:
143 replies

- **Part 1: About you** – questions about yourself and why you are answering this questionnaire.
- **Part 2: General questions section** – 19 questions on your views on air quality issues.
- **Part 3: Specialised questions section** – 8 questions on your views on air quality measures.
- **Part 4: Concluding questions & remarks** – share your thoughts on key topics not covered.

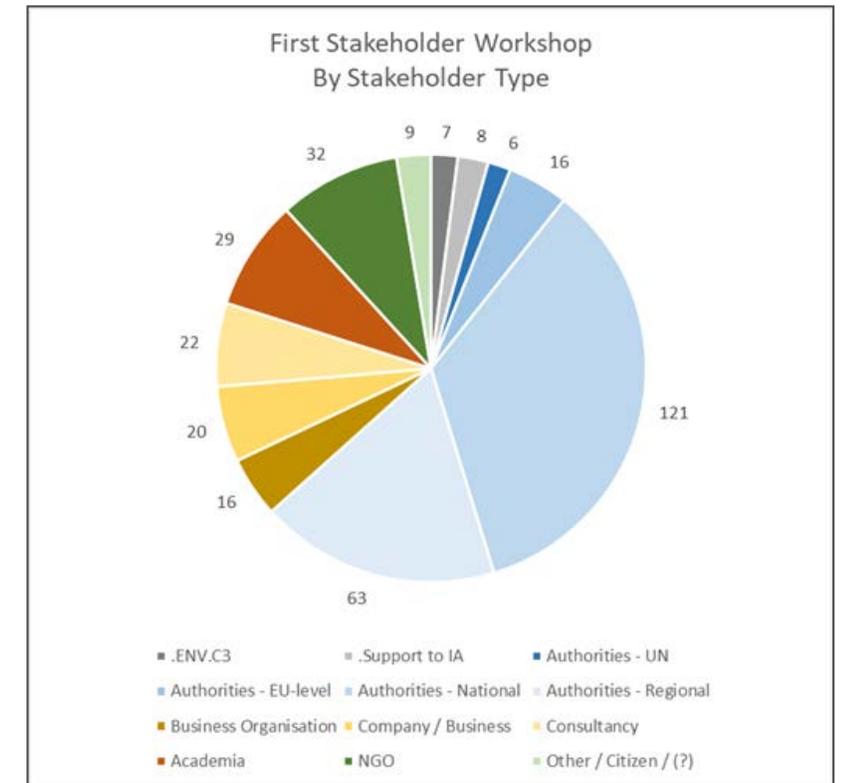
Stakeholder meeting

On **23 September 2021**, we hosted a first stakeholder meeting to inform the revision process.

In total, **349 participants**, from all MS - see charts.

Stakeholders disagreed on the **level and timing of (more closely) alignment** with the WHO recommendations (i.e. NGOs vs authorities).

Several stakeholders also stressed the merits of introducing additional standards based on a relative reduction of the **exposure of the population**.



Timeline & next steps

Clean Air Milestones 2020 to 2023 (indicative)



Contact us:

env-air@ec.europa.eu

Have your say:

<https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12677-Revision-of-EU-Ambient-Air-Quality-legislation>

Thank you / Moltes gràcies!

