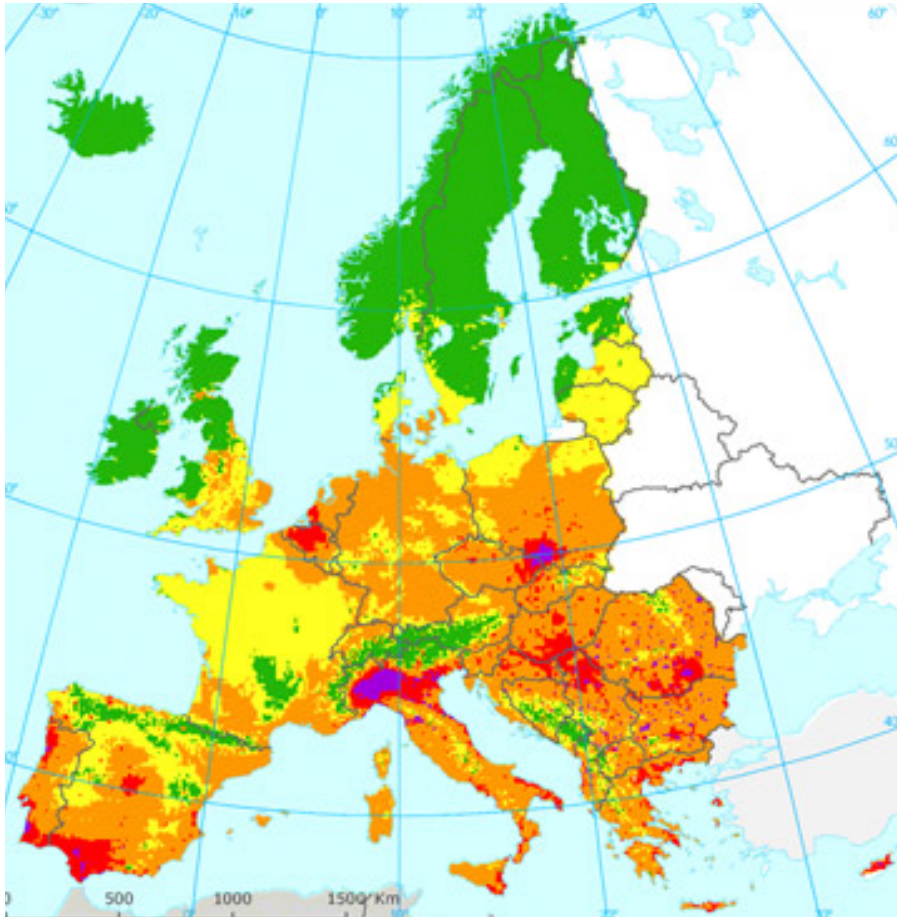



# Health based air quality standards and objectives in the EU
# 欧盟空气质量健康标准和目标

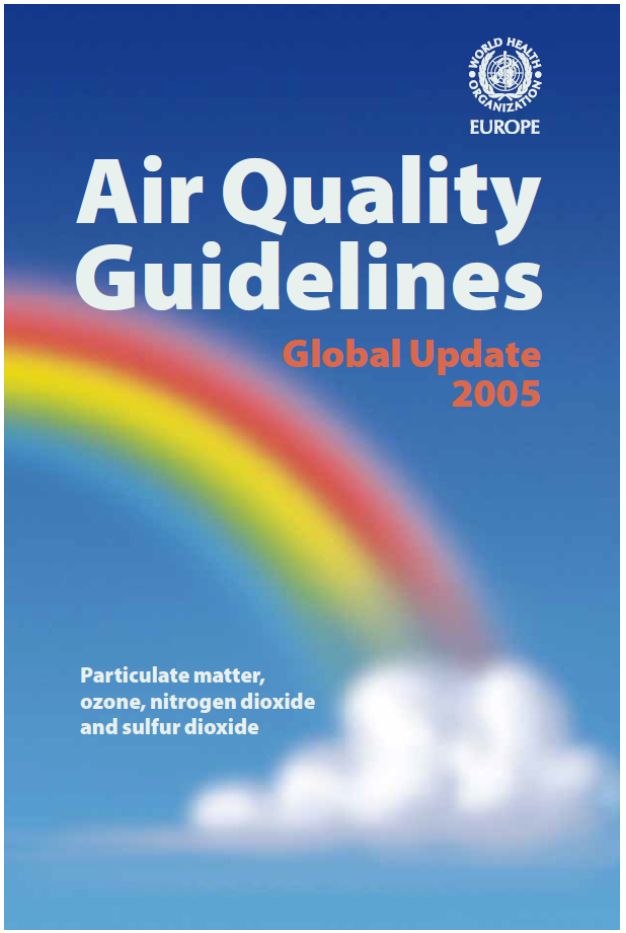
Kristin Aunan, CICERO

# Air pollution policies in the EU
# 欧盟空气污染治理政策

- Air quality standards and targets are core elements in EU air pollution policies (Air Quality Directive).
- 空气质量标准和目标是欧盟空气污染治理政策的核心（空气质量方针）
- The other two pillars are:
- 其他两个核心政策是：
  - Emission standards and control for specific sources (Directives regulating emissions from specific sources)
  - 设定特定污染源的排放标准和控制（对特定污染源的排放量进行控制）
  - Total emission control (regional/national/ international emissions ceilings) (NEC Directive, International Treaties)
  - 总量控制（区域/国家/国际排放量限额）（国家排放限额方针、国际条约）

# The basis for standards and targets: WHO Air Quality Guidelines
# 世界卫生组织的空气质量指南是标准和目标设置的基础

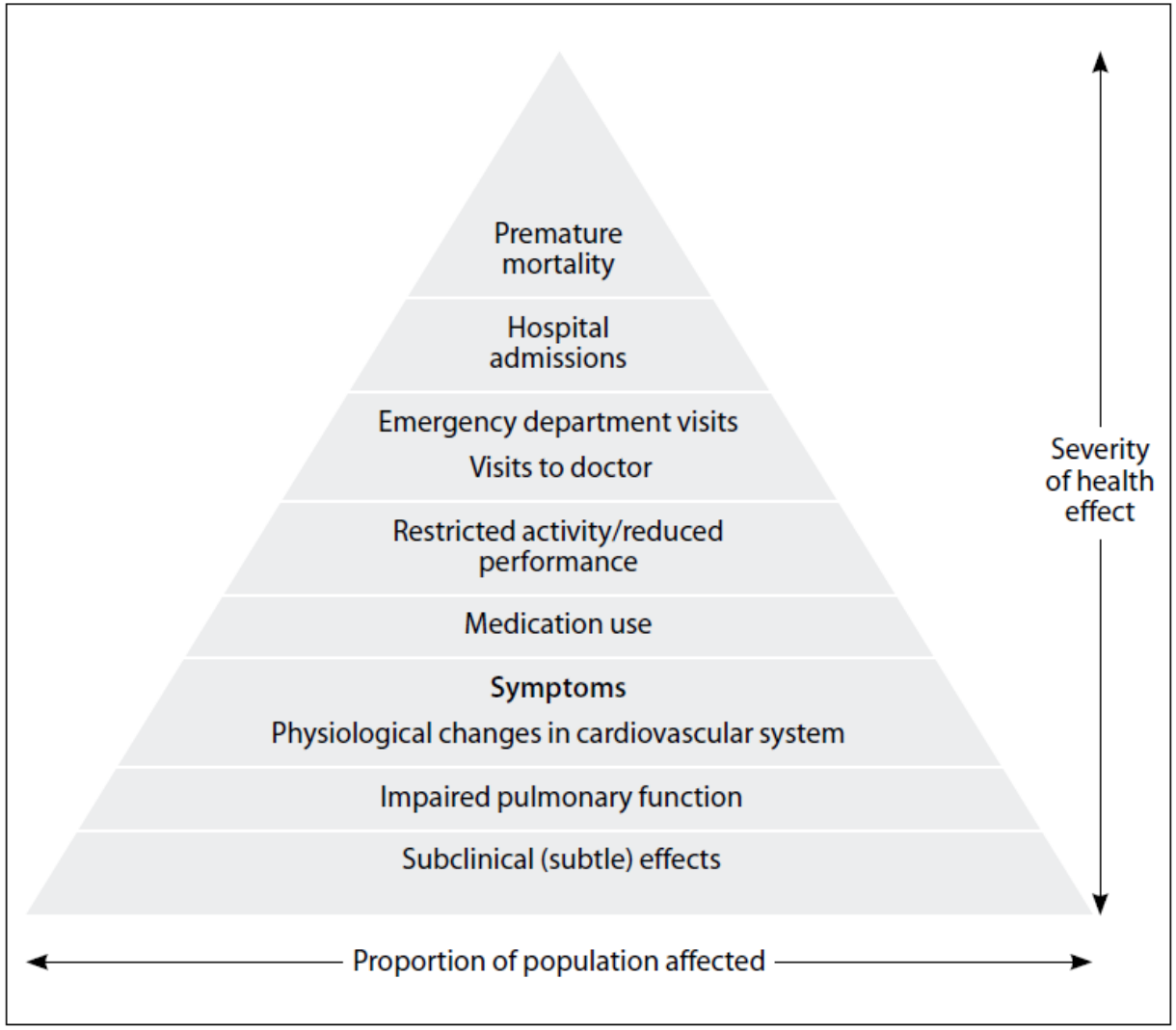
- Based on the extensive body of scientific evidence on health effects of air pollution
- 以大气污染对人体健康影响的科学依据为基础
- Updated reviews provided by WHO
- 对世界卫生组织提供的文献综述进行更新
- WHO 2005 (last update)
- 世界卫生组织2005（最新版本）



# Main pollutants for which AQG are given by WHO
# 世界卫生组织的空气质量指南中的主要污染物

- Particulate matter (PM): $PM_{2.5}$ and $PM_{10}$\颗粒物（PM）:$PM_{2.5}$ and $PM_{10}$
- Sulphur dioxide ($SO_2$)\二氧化硫
- Nitrogen dioxide (NOx)\氮氧化物
- Volatile organic compounds (VOC)\可挥发性有机物
- Ozone ($O_3$)\臭氧
- Carbon monoxide (CO)\一氧化碳
- Heavy metals and other inorganic pollutants\重金属和其他无机污染物
- Toxic organic compounds (such as PAH)\有毒有机化合物

# Pyramid of health end-points
# 大气污染对人体健康结局影响的金字塔




Source: American Thoracic Society (6).

# Acute and chronic effects
# 急性和慢性健康效应

**Effects attributed to short-term exposure:/**

**短期暴露的健康效应**

- Daily mortality/日死亡人数
- Respiratory and cardiovascular hospital admissions, emergency room visits etc./呼吸系统和心血管疾病住院人数和急症人数等
- Use of respiratory and cardiovascular medications/呼吸系统和心血管疾病的药物使用量
- Days of restricted activity/日常活动的限制
- Work and school absenteeism/工作和学校的旷工
- Acute symptoms (wheezing, coughing, phlegm, respiratory infections)/急性症状、（哮喘、咳嗽、呼吸道感染）
- Physiological changes (e.g. lung function)/生理改变/如肺功能衰竭

**Effects attributed to long-term exposure /长期暴露的健康效应**

- Mortality due to cardiovascular and respiratory disease/心血管和呼吸系统疾病导致的死亡
- Chronic respiratory disease (asthma, COPD, chronic/慢性呼吸系统疾病（哮喘、慢性阻塞性肺病、慢性疾病
- pathological changes/病变
- Chronic changes in physiologic functions /生理功能的慢性病变
- Lung cancer/肺癌
- Chronic cardiovascular disease/心血管疾病
- Low birth weight/低出生体重儿

# Criteria used in setting AQG
# 设置空气质量指南的准则

- Lowest-observed-adverse-effect level (***LOAEL***). Lowest concentration which causes an adverse effect (used whenever possible).
- 有害效益的最低剂量：引起不良反应的最低浓度值
- No-observed-adverse-effect level (***NOAEL***). Greatest concentration which causes no detectable adverse effect.
- 最大无毒性反应剂量：引起无毒反应的最大浓度。
- Uncertainty factor (***UF***) by which the NOAEL or LOAEL of the ***critical effect*** is divided to derive the AQG. Accounts for interspecies extrapolation, inter-individual variability in humans, nature of toxicity, etc).
- 空气质量指南对NOAEL和LOAEL引起的不确定性因素进行了划分：考虑了种间外推、人体和毒性的个体差异等
- Carcinogenic substances: Excess lifetime ***cancer risk*** per 1 mg/m$^3$ lifetime exposure (no threshold)
- 致癌物质：每1 mg/m$^3$浓度导致暴露人群癌症风险的增加率（不是阈值）

# 表4 人体研究基础上的致癌风险评估

**Table 4. Carcinogenic risk estimates based on human studies[a]**

| Substance | IARC Group | Unit risk[b] | Site of tumour |
|---|---|---|---|
| Acrylonitrile[c] | 2A | $2 \times 10^{-5}$ | lung |
| Arsenic | 1 | $1.5 \times 10^{-3}$ | lung |
| Benzene | 1 | $6 \times 10^{-6}$ | blood (leukaemia) |
| Butadiene | 2A | — | multisite |
| Chromium (VI) | 1 | $4 \times 10^{-2}$ | lung |
| Nickel compounds | 1 | $4 \times 10^{-4}$ | lung |
| Polycyclic aromatic hydrocarbons (BaP)[d] | — | $9 \times 10^{-2}$ | lung |
| Refractory ceramic fibres | 2B | $1 \times 10^{-6}$ (fibre/l)$^{-1}$ | lung |
| Trichloroethylene | 2A | $4.3 \times 10^{-7}$ | lung, testis |
| Vinyl chloride[c] | 1 | $1 \times 10^{-6}$ | liver and other sites |

[a] Calculated with average relative risk model.

[b] Cancer risk estimates for lifetime exposure to a concentration of 1 µg/m$^3$.

[c] Not re-evaluated for the second edition of the guidelines.

[d] Expressed as benzo[*a*]pyrene (based on a benzo[*a*]pyrene concentration of 1 µg/m$^3$ in air as a component of benzene-soluble coke-oven emissions).

**E.g., for PAH the guideline says:** The concentrations of BaP producing excess lifetime cancer risks of 1/10 000, 1/100 000 and 1/1 000 000 are 1.2, 0.12 and 0.012 ng/m$^3$, respectively.

# WHO Interim targets (IT-1 and IT-2)
# 世界卫生组织的过渡目标

- Proposed as incremental steps in a progressive reduction of air pollution, intended for use in areas where pollution is high
- 在高污染地区，提出了逐步减少大气污染的渐进步骤
- Aim to promote a shift from high air pollution to lower air pollutant concentrations, e.g. by targeting one major source at a time
- 通过设定主要污染源目标，促进高污染地区向低污染浓度转变
- If achieved, significant reductions in risks for acute and chronic health effects from air pollution are expected
- 如果实现，将会降低急性和慢性健康效应的健康风险。
- Progress towards the guideline values should be the ultimate objective of air quality management and health risk reduction in all areas
- 指南的最终目标是对所有地区的空气质量进行管理，并降低其健康风险

# PM

**WHOair quality guidelines and interim targets for particulate matter: annual mean concentrations[a]**

| | $PM_{10}$ ($\mu g/m^3$) | $PM_{2.5}$ ($\mu g/m^3$) | Basis for the selected level |
|---|---|---|---|
| Iinterim target-1 (IT-1) | 70 | 35 | These levels are associated with about a 15% higher long-term mortality risk relative to the AQG level. |
| Interim target-2 (IT-2) | 50 | 25 | In addition to other health benefits, these levels lower the risk of premature mortality by approximately 6% [2–11%] relative to theIT-1 level. |
| Interim target-3 (IT-3) | 30 | 15 | In addition to other health benefits, these levels reduce the mortality risk by approximately 6% [2-11%] relative to the -IT-2 level. |
| Air quality guideline (AQG) | **20** | **10** | These are the lowest levels at which total, cardiopulmonary and lung cancer mortality have been shown to increase with more than 95% confidence in response to long-term exposure to $PM_{2.5}$. |

[a] The use of $PM_{2.5}$ guideline value is preferred.

**WHO air quality guidelines and interim targets for particulate matter: 24-hour concentrations[a]**

| | $PM_{10}$ ($\mu g/m^3$) | $PM_{2.5}$ ($\mu g/m^3$) | Basis for the selected level |
|---|---|---|---|
| Interim target-1 (IT-1) | 150 | 75 | Based on published risk coefficients from multi-centre studies and meta-analyses (about 5% increase of short-term mortality over the AQG value). |
| Interim target-2 (IT-2) | 100 | 50 | Based on published risk coefficients from multi-centre studies and meta-analyses (about 2.5% increase of short-term mortality over the AQG value). |
| Interim target-3 (IT-3)* | 75 | 37.5 | Based on published risk coefficients from multi-centre studies and meta-analyses (about 1.2% increase in short-term mortality over the AQG value). |
| Air quality guideline (AQG) | **50** | **25** | Based on relationship between 24-hour and annual PM levels. |

[a] 99th percentile (3 days/year).

* For management purposes. Based on annual average guideline values; precise number to be determined on basis of local frequency distribution of daily means. The frequency distribution of daily $PM_{2.5}$ or $PM_{10}$ values usually approximates to a log-normal distribution.

# $SO_2$

**WHO air quality guidelines and interim targets for $SO_2$: 24-hour and 10-minute concentrations**

| | 24-hour average ($\mu g/m^3$) | 10-minute average ($\mu g/m^3$) | Basis for selected level |
|---|---|---|---|
| Interim target-1 (IT-1)[a] | 125 | – | |
| Interim target-2 (IT-2) | 50 | – | Intermediate goal based on controlling either motor vehicle emissions, industrial emissions and/or emissions from power production. This would be a reasonable and feasible goal for some developing countries (it could be achieved within a few years) which would lead to significant health improvements that, in turn, would justify further improvements (such as aiming for the AQG value). |
| **Air quality guideline (AQG)** | **20** | **500** | |

[a] Formerly the WHO Air Quality Guideline (WHO, 2000).

# Ozone

**WHO air quality guideline and interim target for ozone: 8-hour concentrations**

| | Daily maximum 8-hour mean ($\mu g/m^3$) | Basis for selected level |
|---|---|---|
| High levels | 240 | Significant health effects; substantial proportion of vulnerable populations affected. |
| Interim target-1 (IT-1) | 160 | Important health effects; does not provide adequate protection of public health. Exposure to this level of ozone is associated with:<br>• physiological and inflammatory lung effects in healthy exercising young adults exposed for periods of 6.6 hours;<br>• health effects in children (based on various summer camp studies in which children were exposed to ambient ozone levels).<br>• an estimated 3–5% increase in daily mortality[a] (based on findings of daily time-series studies). |
| **Air quality guideline (AQG)** | **100** | Provides adequate protection of public health, though some health effects may occur below this level. Exposure to this level of ozone is associated with:<br>• an estimated 1–2% increase in daily mortality[a] (based on findings of daily time-series studies).<br>• Extrapolation from chamber and field studies based on the likelihood that real-life exposure tends to be repetitive and chamber studies exclude highly sensitive or clinically compromised subjects, or children.<br>• Likelihood that ambient ozone is a marker for related oxidants. |

[a] Deaths attributable to ozone. Time-series studies indicate an increase in daily mortality in the range of 0.3–0.5% for every 10 $\mu g/m^3$ increment in 8-hour ozone concentrations above an estimated baseline level of 70 $\mu g/m^3$.

# Setting Air Quality Standards
# 设定空气质量标准

- In setting legally binding standards, the following considerations are taken into account:
- 设定具有法律约束的标准，需考虑以下要素：
  - Prevailing exposure levels: Risk characterization
  - 主要的暴露浓度：风险特征
  - Acceptable risk levels
  - 可接受的风险水平
  - Protection of sensitive groups
  - 要保护的敏感人群
  - Technical feasibility and costs of control measures
  - 技术的可行性和成本控制策略
  - Abatement strategies (incl. legal aspects)
  - 减排策略（包括法律方面）
  - Social, economic, and cultural conditions
  - 社会、经济和文化环境

(WHO 2000)

# Key elements of EU air quality legislation :
# 欧盟空气质量法规的关键要素

- **Limit values:** Legally binding concentration thresholds that must not be exceeded
- 限值：不得超过具有法律约束力的浓度阈值
- **Target values** — are to be attained where possible by taking all necessary measures not entailing disproportionate costs. Target values are not legally binding
- 目标值：目标值是通过必要的措施实现的，而不是通过不相称的高成本实现，目标值不具有法律约束力。
- **Exposure reduction obligation** — concentrations are to be reduced by a given per cent depending on the mean 3 y mean $PM_{2.5}$ urban background concentrations from 2008–2010 to 2018–2020
- 降低暴露义务-浓度的降低是依据3年平均浓度降低的百分比进行设定，如PM2.5浓度从2008-2010年三年平均浓度降低到到2018-2020年三年平均浓度的百分比。

# Air Quality Standards in the EU: Target values and limit values
# 欧盟空气质量标准：目标值和限值

| 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<br>Limit value enters into force 1.1.2015 | - |
| Sulphur dioxide (SO2) | 350 µg/m3 | 1 hour | Limit value entered into force 1.1.2005 | 24 |
| | 125 µg/m3 | 24 hours | Limit value entered into force 1.1.2005 | 3 |
| 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* | - |
| 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* | - |
| Lead (Pb) | 0.5 µg/m3 | 1 year | Limit value entered into force 1.1.2005 (or 1.1.2010 in the immediate vicinity of specific industrial sources | - |
| Carbon monoxide (CO) | 10 mg/m3 | Maximum daily 8 h mean | Limit value entered into force 1.1.2005 | - |
| Benzene | 5 µg/m3 | 1 year | Limit value entered into force 1.1.2010* | - |
| Ozone | 120 µg/m3 | Maximum daily 8 h mean | Target value entered into force 1.1.2010 | 25 days averaged over 3 years |
| Arsenic (As) | 6 ng/m3 | 1 year | Target value enters into force 31.12.2012 | - |
| Cadmium (Cd) | 5 ng/m3 | 1 year | Target value enters into force 31.12.2012 | - |
| Nickel (Ni) | 20 ng/m3 | 1 year | Target value enters into force 31.12.2012 | - |
| PAH | 1 ng/m3 (as concen-tration of B(a)P) | 1 year | Target value enters into force 31.12.2012 | - |

* Member States can apply for extension in a specific zone

# Legal status of the standards
# 标准的法律地位

- A limit value is legally binding from the date it enters into force subject to any exceedances permitted by the legislation
- 限值从生效日起，就具有法律约束力
- A target value is to be attained as far as possible by the attainment date and so is less strict than a limit value
- 目标值是尽可能达到的实现日期，目标值的法律约束没有限值严格。

# $PM_{2.5}$ objectives targeting population exposure
# PM2.5 暴露人群的目标值

**Average exposure indicator (AEI):** 3-year running annual mean PM2.5 concentration averaged over selected monitoring stations in the zones, set in urban background locations to best assess the PM2.5 exposure to the general population.

平均暴露指标（AEI）：以监测站所在区域$PM_{2.5}$的3年平均浓度作为评估城市$PM_{2.5}$暴露浓度

| Title | Metric | Averaging period | Legal nature |
|---|---|---|---|
| PM2.5 Exposure concentration obligation | 20 µg/m3 (AEI) | Based on 3 year average | Legally binding in 2015 |
| PM2.5 Exposure reduction target | Percentage reduction (x%) + all measures to reach 18 µg/m3 (AEI) | Based on 3 year average | Reduction (x%) to be attained where possible in 2020, determined on the basis of the value of exposure indicator in 2010 |

# Implementation of EU AQ legislation
# 欧盟空气质量法规的实施

- Member States divide their territory into a number of zones. In these zones, they should assess the air pollution situation
- 成员国领土被划分成多个区域的，在这些区域，他们必须评估空气污染现状。
- Where levels are elevated, the Member States should prepare an air quality plan to ensure compliance with the limit value before it enters into force
- 当空气污染水平被评估后，成员国应准备一个空气质量计划，使其与即将实施的限值相符合。
- Information on air quality to the public
- 空气质量信息公开
- Reporting of assessment and information about plans to the Commission
- 空气质量计划的信息和评估报告需提交欧盟委员会

# EU Common air quality index
# 欧盟共同的空气质量指数

| Pollution | Index Value |
|---|---|
| Very low | 0/25 |
| Low | 25/50 |
| Medium | 50/75 |
| High | 75/100 |
| Very high | >100 |

| Index Class | Grid | ROADSIDE INDEX | | | | | | BACKGROUND INDEX | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mandatory pollutant | | | Auxiliary pollutant | | | Mandatory pollutant | | | | Auxiliary pollutant | | | |
| | | | PM10 | | PM2.5 | | | | PM10 | | | PM2.5 | | | |
| | | NO2 | 1 hour | 24 hours | 1 hour | 24 hours | CO | NO2 | 1 hour | 24 hours | O3 | 1 hour | 24 hours | CO | SO2 |
| Very High | >100 | >400 | >180 | >100 | >110 | >60 | >20000 | >400 | >180 | >100 | >240 | >110 | >60 | >20000 | >500 |
| High | 100 | 400 | 180 | 100 | 110 | 60 | 20000 | 400 | 180 | 100 | 240 | 110 | 60 | 20000 | 500 |
| | 75 | 200 | 90 | 50 | 55 | 30 | 10000 | 200 | 90 | 50 | 180 | 55 | 30 | 10000 | 350 |
| Medium | 75 | 200 | 90 | 50 | 55 | 30 | 10000 | 200 | 90 | 50 | 180 | 55 | 30 | 10000 | 350 |
| | 50 | 100 | 50 | 30 | 30 | 20 | 7500 | 100 | 50 | 30 | 120 | 30 | 20 | 7500 | 100 |
| Low | 50 | 100 | 50 | 30 | 30 | 20 | 7500 | 100 | 50 | 30 | 120 | 30 | 20 | 7500 | 100 |
| | 25 | 50 | 25 | 15 | 15 | 10 | 5000 | 50 | 25 | 15 | 60 | 15 | 10 | 5000 | 50 |
| Very Low | 25 | 50 | 25 | 15 | 15 | 10 | 5000 | 50 | 25 | 15 | 60 | 15 | 10 | 5000 | 50 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Status exposure

## % of urban population exposed to levels > EU standards and WHO Guidelines (2009-2011)

## 暴露情况

## 暴露浓度大于欧盟标准和世界卫生组织指南的城镇人口百分比（2009-2011）

| Pollutant | EU reference value | Exposure estimate ( %) | WHO AQG | Exposure estimate ( %) |
|---|---|---|---|---|
| $PM_{2.5}$ | Year (20) | **20–31** | Year (10) | **91–96** |
| $PM_{10}$ | Day (50) | **22–33** | Year (20) | **85–88** |
| $O_3$ | 8-hour (120) | **14–18** | 8-hour (100) | **97–98** |
| $NO_2$ | Year (40) | **5–13** | Year (40) | **5–13** |
| BaP | Year (1) | **22–31** | Year (0.12) | **76–94** |
| $SO_2$ | Day (125) | **< 1** | Day (20) | **46–54** |
| CO | 8-hour (10) | **< 2** | 8-hour (10) | **< 2** |
| Pb | Year (0.5) | **< 1** | Year (0.5) | **< 1** |
| Benzene | Year (5) | **< 1** | Year (1.7) | **12–13** |

| Colour coding: | < 5 % | 5–50 % | 50–75 % | > 75 % |
|---|---|---|---|---|

**Note:** The pollutants are ordered in terms of their relative risk for health damage — highest on top.

# Exposure trends

% of EU urban population above standards and guidelines

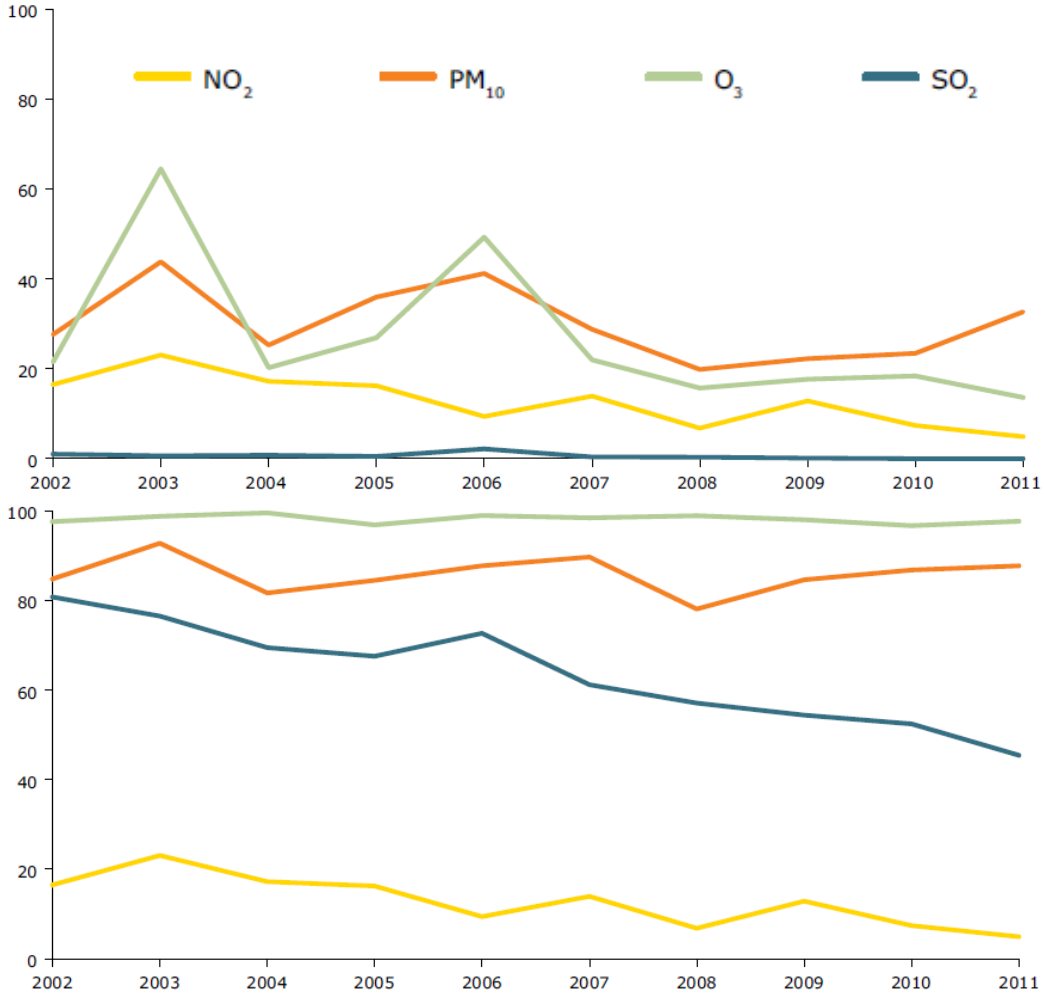
暴露趋势-大于标准和指南的欧盟城镇人口百分比

>EU air quality standards:

>欧盟空气质量标准

>WHO air quality guidelines:

>世界卫生组织空气质量指南



# Several EU countries fail to meet the Air Quality Directive
# 没有实现空气质量方针的几个欧盟国家

In case of non-compliance:

对不符合要求的国家

- The European Commission send written warnings to the country
- 欧盟委员会将对这些国家发出书面警告
- Unsatisfactory responses: The European Court of Justice imposes fines on the country
- 不满意的反应：欧洲法院对这些国家进行罚款

## Air pollution: European commission launches legal action against the UK

Britain faces fines and court appearances for failing to reduce 'excessive' levels of nitrogen dioxide fumes from traffic

John Vidal
theguardian.com, Thursday 20 February 2014 12.47 GMT
Jump to comments (204)

St Paul's Cathedral is seen shrouded in smog in central London in April 2011. Air pollution limits are regularly exceeded in 16 zones across the UK. Photograph: Carl De Souza/AFP/Getty Images

The UK faces fines of up to £300m a year and embarrassing court appearances after the European commission launched legal proceedings against it for failing to reduce "excessive" levels of nitrogen dioxide ($NO_2$) air pollution from traffic, despite 15 years of warnings and several extensions and postponements granted to the government.

Other European countries have also failed to meet the air quality directive – that should have been adopted in 2008 – but the EU environment commissioner, Janez Potočnik, has singled Britain out for its "persistent" breaches of the air quality directive. The government has been sent a letter of formal notice of the intention to take Britain to court. The UK has been given two months to respond.

In a statement, the commission said that: "Nitrogen dioxide is the main

# China
# 中国

The new ambient AQS for China build on WHO Interim Targets, e.g. $PM_{2.5}$（GB3095-2012）:

中国新修订的空气质量标准（GB3095-2012）是建立卫生组织制定的过渡目标（如$PM_{2.5}$)

- New Class II (annual) = IT-1 (annual)
- New Class II (24h) = IT-1 (24h)

**WHOair quality guidelines and interim targets for particulate matter: annual mean concentrations[a]**

| | $PM_{10}$ ($\mu g/m^3$) | $PM_{2.5}$ ($\mu g/m^3$) | Basis for the selected level |
|---|---|---|---|
| Iinterim target-1 (IT-1) | 70 | 35 | These levels are associated with about a 15% higher long-term mortality risk relative to the AQG level. |
| Interim target-2 (IT-2) | 50 | 25 | In addition to other health benefits, these levels lower the risk of premature mortality by approximately 6% [2–11%] relative to theIT-1 level. |
| Interim target-3 (IT-3) | 30 | 15 | In addition to other health benefits, these levels reduce the mortality risk by approximately 6% [2-11%] relative to the -IT-2 level. |
| Air quality guideline (AQG) | **20** | **10** | These are the lowest levels at which total, cardiopul-monary and lung cancer mortality have been shown to increase with more than 95% confidence in response to long-term exposure to $PM_{2.5}$ |

[a] The use of $PM_{2.5}$ guideline value is preferred.

**WHO air quality guidelines and interim targets for particulate matter: 24-hour concentrations[a]**

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| Interim target-1 (IT-1) | 150 | 75 | Based on published risk coefficients from multi-centre studies and meta-analyses (about 5% increase of short-term mortality over the AQG value). |
| Interim target-2 (IT-2) | 100 | 50 | Based on published risk coefficients from multi-centre studies and meta-analyses (about 2.5% increase of short-term mortality over the AQG value). |
| Interim target-3 (IT-3)* | 75 | 37.5 | Based on published risk coefficients from multi-centre studies and meta-analyses (about 1.2% increase in short-term mortality over the AQG value). |
| Air quality guideline (AQG) | **50** | **25** | Based on relationship between 24-hour and annual PM levels. |

[a] 99th percentile (3 days/year).

* For management purposes. Based on annual average guideline values; precise number to be determined on basis of local frequency distribution of daily means. The frequency distribution of daily $PM_{2.5}$ or $PM_{10}$ values usually approximates to a log-normal distribution.

# Different systems may cause confusion
# 不同空气质量评估体系的差异及问题

| Air Quality Index and PM2.5 concentration levels (24 h) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **USA** | | | **China** | | | **Europe** | | |
| AQI | Index value | PM2.5 range (ug/m3) | AQI | Index value | PM2.5 (ug/m3) | AQI | Index value | PM2.5 range (ug/m3) |
| Good | 0-50 | 0-12 | Excellent | 0-50 | 35 | Very low | 0-25 | 0-10 |
| Moderate | 51-100 | 12-35 | Good | 51-100 | 75 | Low | 25-50 | 10-20 |
| Unhealthy for sensitive groups | 101-150 | 35-55 | Lightly polluted | 101-150 | 115 | Medium | 50-75 | 20-30 |
| Unhealthy | 151-200 | 55-150 | Moderately polluted | 151-200 | 150 | High | 75-100 | 30-60 |
| Very unhealthy | 201-300 | 150-250 | heavily polluted | 201-300 | 250 | Very high | >100 | >60 |
| Hazardous | 301-400 | 250-350 | > 300 Severely polluted | 301-400 | 350 | | | |
| Hazardous | 401-500 | 350-500 | | 401-500 | 500 | | | |