

8th Environment Action Programme

Premature deaths due to exposure to fine particulate matter in Europe



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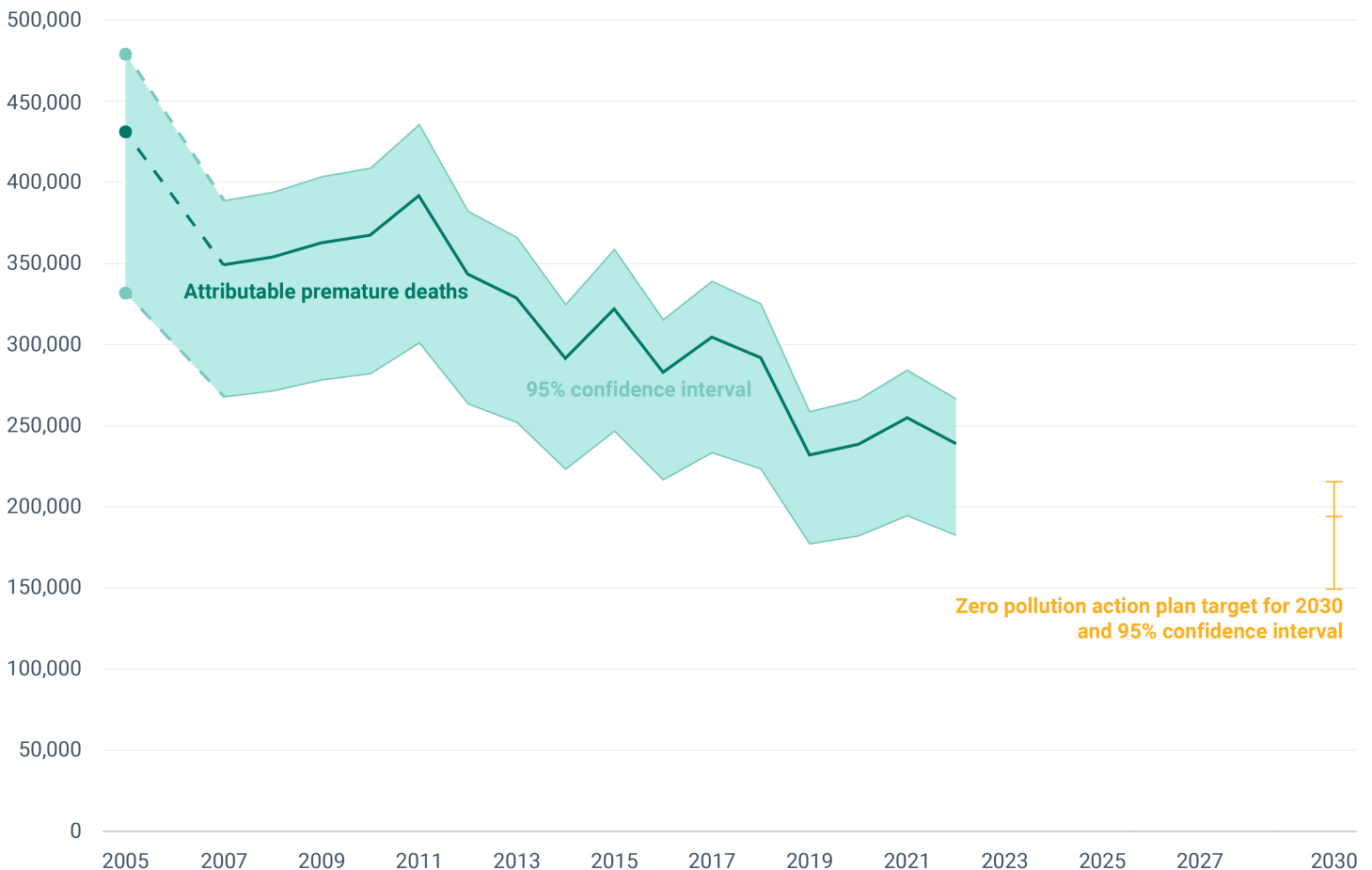
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The European Commission zero pollution action plan sets a target to reduce the health impacts of air pollution by at least 55% by 2030, compared to 2005. Between 2005 and 2022, the number of premature deaths in the EU attributable to PM_{2.5} fell by 45%. If this trend continues, the target will be achieved and likely exceeded. The European Commission has separately projected that this target will be surpassed if EU policies on air, climate and energy are adequately implemented. Despite ongoing improvement, 239,000 premature deaths attributable to PM_{2.5} occurred in the EU during 2022.

Figure 1. Premature deaths attributable to exposure to fine particulate matter (PM_{2.5}), EU

Number of premature deaths attributed to exposure to PM_{2.5}



Air pollution is a major cause of **mortality and disease** and the **largest single environmental health risk** in Europe. The air pollutant with the strongest evidence for **adverse health outcomes** is fine particulate matter (PM_{2.5}).

The **European Green Deal** calls for further improvements in air quality and to revise the **EU's air quality standards**, aligning them more closely with the World Health Organization (WHO) **recommendations on air quality**. The **target** of reducing the number of premature deaths caused by air pollution by 55% by 2030, relative to those in 2005 (based on premature deaths attributable to PM_{2.5}) is set by the **zero pollution action plan (ZPAP)**.

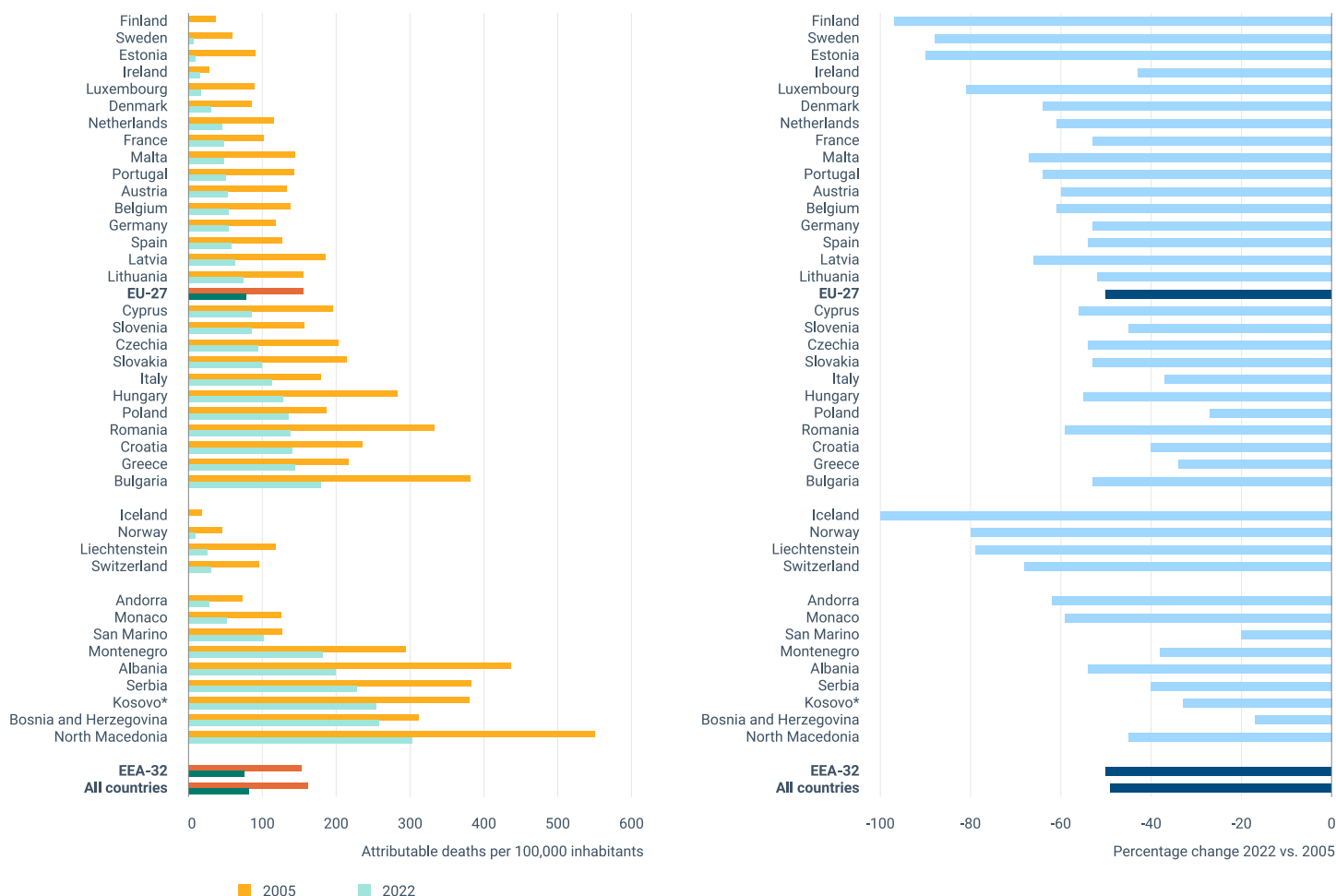
In October 2022, the European Commission **proposed a revision** of the EU Ambient Air Quality Directives. As agreed by the co-legislators and published in November 2024, the **revised Directive** introduces new standards to be attained in 2030 that align closer with WHO recommendations and an obligation to monitor additional pollutants such as ultrafine particles and ammonia.

Between 2005 and 2022, premature deaths attributable to PM_{2.5} exposure above the WHO air quality guideline level of 5µg/m³ **fell by 45%** in the EU Member States (Figure 1). The decrease was caused by a decline in concentrations of PM_{2.5}, hence a decrease in the exposure of the population to this air pollutant. Yet, more than 70% of the EU population live in urban areas and in 2022, **96% of the urban population was exposed to PM_{2.5} concentrations** above the WHO guideline level.

The **premature mortality decline** is a result of EU, national and local policy implementation to improve air quality (e.g. the EU Ambient Air Quality Directives and the plans and measures derived from them) and to reduce emissions of air pollutants, including particulate matter (e.g. **the National Emission Reduction Commitments Directive**). These policies succeeded in reducing fine particulate matter emissions from domestic heating, their **main source**, and other sources such as industry and transport. Emissions of ammonia, a secondary PM precursor, from agriculture have also been reduced to a lesser extent.

If the past 17 year trend should continue, the decline in premature mortality attributable to PM_{2.5} would reach 63% by 2030 (from 2005 levels) and the 55% zero pollution reduction target would be **exceeded**. The 2022 **Third Clean Air Outlook** also estimates that the target may be exceeded if the foreseen clean air measures, together with climate and energy policies of the **'Fit for 55' package** are implemented. It envisions a similar reduction of 66% by 2030 if the conditions are met.

Figure 2. Premature deaths normalized by population attributable to exposure to PM_{2.5} at country level in 2005 and 2022, and percentage of change



The ZPAP target is set at EU level and there are many differences in the change of mortality due to exposure to PM_{2.5} at country level during 2005 to 2022. Mortality per capita has **decreased** in all EU Member States, by more than half in 21 countries (Figure 2).

A decrease in mortality can also be seen in non-EU member countries. Seven have reduced the number of premature deaths attributable to exposure to PM_{2.5} by more than half. The country level decrease partly reflects the reduction in PM_{2.5} concentrations over the years.

For comparison of the impact of air pollution on human health across the different NUTS3 regions of Europe, [this map](#) shows the number of premature deaths attributable to PM_{2.5} (per 100,000 inhabitants aged above 30 years). The highest relative number of attributable deaths in 2022 within the EU were in the regions of Sofia and Vidin (Bulgaria), and Miasto Kraków (Poland). In contrast, several Finnish and Swedish regions and one Austrian region had very low attributable deaths (i.e. below one per 100,000 inhabitants aged above 30 years).

The **highest** number of relative attributable deaths for European countries outside the EU in 2022 were in the regions of Skopski, Vardarski and Pelagoniski (North Macedonia) and Nišavska oblast (Serbia). The **lowest** numbers were seen in all Icelandic and four Norwegian regions with less than one attributable death per 100,000 inhabitants aged above 30 years.

Supporting information

Definition

This indicator provides information on the number of premature deaths in the EU-27 attributable to long-term exposure to fine particulate matter (PM_{2.5}) since the year 2005.

It also shows a comparison in the mortality attributable to PM_{2.5} between years 2005 and the most recent year with available data, at country level, for 40 European countries.

Furthermore, it provides European [NUTS3](#) regional-level information on the number of premature deaths adjusted for the number of inhabitants aged above 30 years attributable to long-term exposure to PM_{2.5} for the most recent year with available data. Nomenclature of territorial units for statistics, or NUTS classification, is a system for dividing up the European territory for the collection of regional statistics, where NUTS3 corresponds to small regions.

Methodology

The EEA has been estimating the mortality attributable to air pollution in the last years. Until year 2021 (when the mortality for year 2019 was estimated), it used the recommendations provided by the WHO Europe in its 2013 report. This methodology has been explained in several documents, among them:

- the EEA briefing '[Assessing the risks to health from air pollution](#)';
- ETC/ATNI (2019, 2021) .

After the publication of the new **WHO global air quality guidelines in 2021**, and to reflect the updated recommendations, there has been some changes in the data used in that methodology; those changes were implemented for the first time in 2022 (to estimate the mortality in year 2020):

- The relative risk has been updated from the previous 0.062 to 0.08; this implies that the risk of dying prematurely increases by 8% per each increase in 10µg/m³ in the PM_{2.5} concentrations (previously the increment in the risk was 6.2%).
- The concentration from which the effect of exposure to PM_{2.5} is considered has changed from 0µg/m³ to 5µg/m³; in this way the EEA estimates the mortality attributable to not reaching the air quality guideline level recommended by **WHO**, and considers in this way the concentrations for which the form of the concentration-response function is linear and for which this function is more certain. Nevertheless, it should be considered that there is no evidence of a threshold below which air pollution does not impact on health. (Please see additional information at the **EEA's briefing *Health impacts of air pollution in Europe, 2022***).

Finally, in the 2024 update, the mortality per number of inhabitants has been calculated considering only the population aged above 30 years, since this is the population for which the total mortality is calculated, following the concentration-response functions recommended by **WHO**.

Mortality calculations for all years back from 2005 have been recalculated using this updated methodology.

The aggregations are either at European, EU, country or at NUTS3 level.

Policy/environmental relevance

The [zero pollution action plan](#), adopted in the context of the [European Green Deal](#), has, among other things, set the goal to reduce by 2030 the number of premature deaths in the EU caused by air pollution by at least 55%, relative to 2005 levels and specified that this will be monitored via the premature deaths attributed to PM_{2.5}.

This indicator is a headline indicator for monitoring progress towards the 8th Environment Action Programme. It mainly contributes to monitoring aspects of the 8th EAP priority objective Article 2.2.d that shall be met by 2030: 'pursuing zero pollution, including in relation to harmful chemicals, in order to achieve a toxic-free

environment, including for air, water and soil, as well as in relation to light and noise pollution, and protecting the health and wellbeing of people, animals and ecosystems from environment-related risks and negative impacts', ([European Union Decision on the 8th EAP](#)). In line with the zero pollution action plan, the [European Commission's Communication on the 8th EAP monitoring framework](#) specifies that this indicator monitors progress towards reducing 'premature deaths from air pollution by 55% (from 2005 levels) by 2030', ([European Commission Communication on the 8th EAP monitoring framework](#)).

Accuracy and uncertainties

The main uncertainties are those derived from the health risk calculations. They are described at the EEA briefing '[Assessing the risks to health from air pollution](#)'.

Data sources and providers

- [Burden of disease of air pollution \(Countries & NUTS\)](#), European Environment Agency (EEA)

▼ Metadata

DPSIR

Impact

Topics

Environmental health impacts # Air pollution # Pollution

Tags

mortality by exposure to PM2.5 # health impacts # Zero pollution # 8th EAP # Particulate matter
PM2.5 # AIR007 # environmental burden of disease

Temporal coverage

2005-2022

Geographic coverage

Albania

Belgium

Bulgaria

Cyprus

Denmark

Finland

Germany

Hungary

Ireland

Kosovo (UNSCR 1244/99)

Liechtenstein

Luxembourg

Montenegro

North Macedonia

Austria

Bosnia and Herzegovina

Croatia

Czechia

Estonia

France

Greece

Iceland

Italy

Latvia

Lithuania

Malta

Netherlands

Norway

Poland
Principality of Andorra
Romania
Serbia
Slovenia
Sweden
Türkiye

Portugal
Principality of Monaco
San Marino
Slovakia
Spain
Switzerland

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

SDG11: Sustainable cities and communities

Unit of measure

FIG1: Number of attributable premature deaths

FIG2: Attributable deaths per 100,000 inhabitants and percentage change 2022 vs. 2005

Frequency of dissemination

Once a year

✓ References and footnotes
