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METHODS FOR ASSESSING HEALTH-RELATED COSTS OF ENVIRONMENTAL STRESSORS

The health and economic case for addressing environmental pollution

A METEOR cluster science-to-policy briefing

Introduction

Environmental pollution – air, noise, chemical, pesticides pollution - impacts people's health, reducing life expectancy and leading to the development and aggravation of chronic diseases.[1] Pollution also affects wellbeing, leads to a loss in productivity and places an additional financial burden on healthcare systems. Impacts are not felt equally - the heaviest impact is felt by those already disadvantaged due to their health status, socioeconomic background, age, and where they live.



This METEOR cluster policy brief makes the case for improving the integration of health and pollution considerations and impact assessments in EU policy deliberations. Implementing and enforcing EU environmental and climate legislation will help improve wellbeing, reduce socio-economic health costs and productivity losses, as well as protect the environment.

The cluster has developed scientific evidence and tools to calculate and predict the health and socio-economic costs of pollution in European countries. These can serve as valuable information for EU policymakers on how to deliver on current EU health priorities, e.g. Europe's Beating Cancer Plan and the EU Non-communicable Diseases Initiative, and for economic competitiveness considerations.

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Key messages

- Environmental pollution impacts people's health. Vulnerable groups including low-income communities, the elderly and children are at higher risk and more likely to experience the strongest effects.
- A healthy population is a prerequisite for economic growth and competitiveness. Health impacts of pollution, including associated costs put the EU's economic competitiveness goals at risk.
- Pursuing the EU's zero pollution objectives and enforcing EU environmental and climate legislation will reduce health and economic costs and productivity losses.
- The five Horizon Europe projects in the METEOR cluster are researching the health impacts of environmental stressors, such as air, noise, and chemical pollution. They also developed scientific evidence and tools to calculate and predict the health and socio-economic costs of pollution.
- This briefing provides a snapshot on how pollution and environmental stressors impact people's health and economies and how these costs are being calculated. It also presents METEOR tools and initial results to help EU policymakers improve people's health and well-being.



EU priorities for competitiveness and better regulation

Strengthening competitiveness is currently a top priority for the European Commission, Members of the European Parliament, and Member States alike. The EU Strategic Agenda 2024-2029[2] lists a prosperous and competitive Europe as one of its three priorities, and the EU Commission President von der Leyen has declared that doing business needs to be made easier and faster.

Reducing administrative burden was identified as a key enabler to achieve a more competitive Europe. The EU Commission President therefore tasked each Commissioner with assessing how to reduce administrative burden and simplify the implementation of EU legislation, with a view to stress-testing the whole EU legal framework. This includes a new target that aims to cut administrative burden by at least 25% for all companies, and by 35% for small and medium enterprises.[3]

These simplification initiatives tie into the EU Commission framework on better regulation.[4] This approach aims to ensure that EU actions are informed by the best available evidence with benefits for society, economy, and the environment, an aim to which the METEOR cluster contributes with new evidence and tools.

What are EU impact assessments?
Together with evaluations and fitness checks, impact assessments are key tools of the EU better regulation framework. Impact assessments evaluate the potential economic, social, and environmental consequences of proposed EU legislation. They help policymakers understand the benefits and costs of possible measures before making decisions. The impact assessment on the revised EU Ambient Air Quality Directive showed that the benefits outweigh the costs of the new law by at least seven to one.[5]

How do pollution and environmental stressors impact our health and economies?

The quality of the environment is a major determinant of people's health. The World Health Organization (WHO) estimates that about one-fifth of deaths in Europe are due to environmental factors, especially pollution.[6] Pollution can trigger new cases of illnesses and can also worsen the condition of those already living with disease– leading to hospital admissions, sick days from work, increased use of medication, and increased caring responsibilities. These so-called morbidity impacts have come into greater focus for scientists and policymakers in the past years.

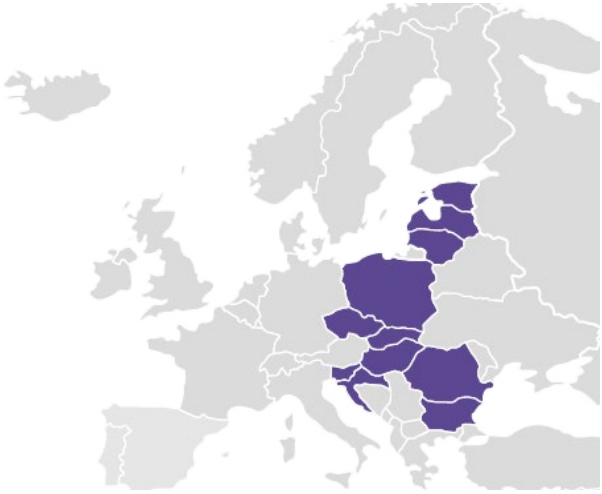
Air pollution is the leading environmental health risk in Europe, and a risk factor for major chronic diseases and health conditions including cardiovascular and respiratory disease, as well as cancer. In the past years, poor air quality has also been established as a risk factor for neurodegenerative disease (dementia), diabetes,[7] and poor mental health.[8] Air pollution has a significant economic cost: the EU Commission estimates that air pollution costs the EU €182-580 billion annually.[9]

Environmental noise, especially road traffic, is the second greatest environmental cause of disease following air pollution.[10] Impacts include annoyance and high blood pressure, sleep disturbance and impaired learning for children. The European Environment Agency (EEA) estimates that over 20% of the population in Europe are exposed to transport noise levels which are harmful to health.[11]



The body of evidence on how chemicals and pesticides pollution impact health keeps growing. Effects include interference with the body's hormone and immune systems, infertility and cancer. The cost of endocrine-disrupting chemicals (substances which interfere with the body's hormone systems) has been estimated to be €157 billion annually.[12] A recent report from the EU Commission underlines that if no action is taken on PFAS, the so-called forever chemicals, pollution costs could be approximately €440 billion by 2050.[13]

Climate change exacerbates both the health and economic costs of environmental stressors and pollution. As Europe warms up at more than twice the global average, heat is the most pressing concern: the summer of 2024 saw about 62,000 deaths due to heat and heat stress. Hospital admissions for heat are also on the rise.[14] In cities, the combination of heat and poor air quality led to an increase in premature death among people living with respiratory and cardiovascular disease. Climate and pollution-related risks already cost the EU economy over €738 billion between 1980 and 2023.[15]



The health and socio-economic costs of environmental and climate risks are not evenly distributed: in Eastern Europe, the environmental burden of disease is considerably higher than in Western Europe, which helps explain the persistence of shorter life expectancies in the East. Environmental health inequalities also persist between regions and in cities.[16] A recent WHO Europe assessment found that environmental health inequalities keep growing.[17]

The EU Zero Pollution Action Plan

Recognising the link between pollution, health and environment, the 2021 EU Zero Pollution Action Plan sets a zero-pollution vision for 2050, with nine flagship initiatives, and 33 actions, including 2030 targets for air, water, noise, and soil.[18] This includes the target to reduce the number of premature deaths from air pollution by 55% and lower the share of people chronically disturbed by transport noise by 30%.[19]

Pollution and productivity are linked

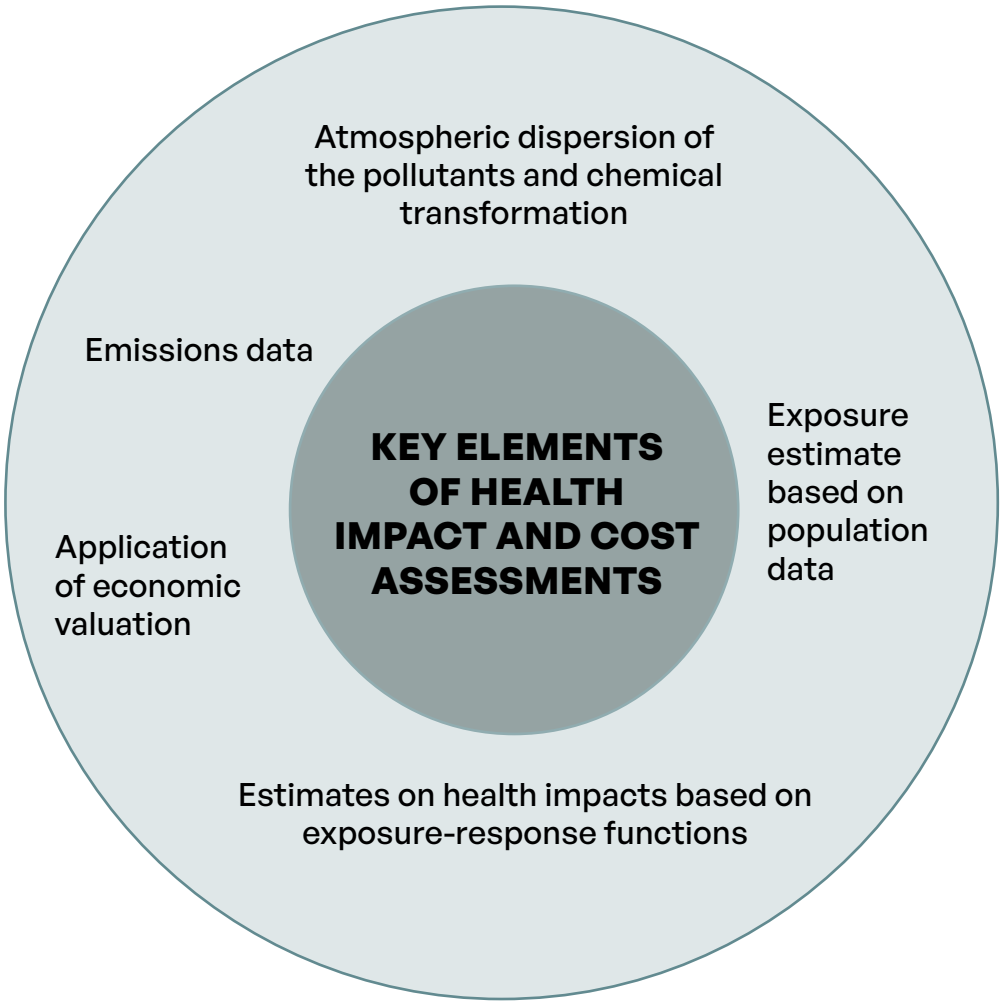
The impact of environmental stressors on productivity is a growing scientific and policy topic. A 2025 report from the Organization for Economic Co-operation and Development (OECD) analysed data from 2.5 million companies in Europe from 2000 to 2022 linking labour productivity and air pollution.[20]

According to the OECD, every 1 ug/m^3 increase in $PM_{2.5}$ pollution reduces labour productivity by 0.55% from work absence (sick leave), decreased cognitive performance and reduced work production. This effect was largely driven by days when air pollution levels exceeded 25 ug/m^3.

The sectors affected by this loss in productivity were the construction sector, companies in sectors employing a larger share of high-skilled workers, medium-sized firms, and companies with low capital intensity. The analysis suggests that cleaner air could have accounted for around one-third of Europe's productivity growth in the years 2011-2022.

How is the health cost of environmental stressors and pollution being assessed?

Health impact assessment and the monetisation of health effects are methodological approaches used to determine the disease burden of pollution and the related cost. Models vary in their scope and level of detail, but they all use the following principal elements.



Beyond healthcare expenditures and productivity losses, health costs also include welfare losses associated with pain, suffering, anxiety, and reduced quality of life. These can be valued using stated-preference methods or health-related quality-of-life measures.

The METEOR cluster of Horizon Europe funded projects has advanced methodological approaches to better assess the health and socio-economic costs of environmental stressors and pollution.

METEOR tools and initial results

Evidence from the METEOR cluster[21] can help policymakers better assess the overall health impacts and cost from environmental pollution and climate change, as well as the productivity losses, and examine and or compare the impacts of new policies being developed. This helps make the case for the EU to implement and enforce legislation to protect people's health and wellbeing.

METEOR research can support EU policymakers carrying out more comprehensive impact and cost assessments, to better understand the impacts of proposed policies and improve lawmaking.

BEST-COST

The BEST-COST project focuses on the economic impact of environmental stressors by addressing one of the most important methodological challenges in environmental health economics: the joint valuation of both mortality and morbidity deriving from environment related health issues. BEST-COST developed a novel health monetization framework that integrates both morbidity and mortality based on the monetization of disability-adjusted life years (DALYs).[22]

A key innovative step in this achievement was the estimation of the economic value of disability-adjusted life years averted through a multi-country population survey. This survey investigated how much people in Ireland, France, the Netherlands and Portugal were willing to pay to avert years living with disability and years of life lost. The novel health monetisation framework can help policymakers refine their understanding of people's preferences for living longer and healthier, and the attributed economic value.

MARCHES

The MARCHES project further developed the Economic Valuation of Air pollution (EVA) model.[23] The model relies on WHO recommendations on the health impacts of air pollutants, and values reduced life expectancy using the value of statistical life (VSL) from the recent OECD global meta-analysis. Chronic diseases impacts are converted to disability-adjusted life years (DALYs), with each life year valued on the basis of the VSL.

For use in EVA, MARCHES also provided new empirical evidence on the VSL and on the welfare loss from chronic health conditions. This came from two six-country stated preference surveys, which measured people's willingness to pay to reduce their risk of chronic health conditions and risk of premature death, respectively.

The EVA model provides unit damage cost of the health harm caused by one kilogram of a specific pollutant, differentiated by country. This in turn allows for assessments of the economic value of mitigation measures.

The EVA results were applied in regional case studies. For the Greater Copenhagen region in Denmark, the EVA results show that only three sectors – agriculture, residential wood burning and road traffic were responsible for 75% of the total health cost from local sources. The MARCHES project has expanded EVA to cover all of Europe, providing unit damage costs for up to ten sectors, spanning the EU, EFTA, UK and six west-Balkan countries. This can help policymakers understand the significant health and welfare economic benefits of clean air measures.

MISTRAL

The project investigated how social conditions, environmental exposures, cultural dynamics and economic inequalities shape the long-term wellbeing of entire communities. Taranto, Rybnik and Hasselt/Genk, three European cities shaped by heavy industry, serve as living laboratories where MISTRAL investigates how air pollution, socio-economic factors and urban policies influence population health.

The health benefits of green environments are well documented: access to parks, playgrounds and other green areas improves physical and emotional well-being and lowers the risk of illness and death. A health impact assessment on increasing green spaces in Taranto, Italy found that achieving a 30% tree cover target could prevent 123 premature deaths and 1,246 years of life lost annually.[24] Currently only 1.4% of the population enjoy this tree cover rate. MISTRAL extends this to the neighbourhood and the individual, finding for example that around 37% of stroke risk is attributable to long-term fine-particle exposure.

VALESOR

VALESOR designed a tool[25] to assess health effects and the corresponding economic damage of planned variations in chemical stressors (CHEM module) and air pollution (AIR module). The tool operates with emission reduction scenarios and for each scenario provides users with a set of outputs such as the effects on health (decreased mortality and morbidity) and the expected benefits.

The tool allows users to easily test different values for direct and indirect cost (health expenditure, productivity, and welfare loss), adjust values of key parameters and directly see resulting changes. The geographical scope of VALESOR corresponds to the United Nations Economic Commission for Europe area (UNECE) and includes subregions.

The tool can help policymakers in their cost-benefit assessments of further air or chemical pollution emission reduction efforts, for example of the EU Directive on National Emission Reduction Commitments.[26]

In addition to the tool, VALESOR developed methodological guidance and produced new willingness-to-pay values for mortality and morbidity, providing additional inputs for economic appraisal of environmental health policies.

UBDPolicy

UBDPolicy estimated the mortality burden and cost of air pollution, noise, lack of green space and extreme temperatures in more than 800 European cities and evaluated urban interventions that led to better health. These urban measures included low emission zones, superblocks, shifting transport modes and increases green spaces.

The UBDPolicy briefing paper entitled *The Economic Fallacy of Improving Air Quality in Europe*[27] provides evidence on why the social and economic costs of air pollution are greater than the cost of taking action to improve air quality. The United Nations Economic Commission for Europe (UNECE) estimated in 2021 that the cost from air pollution exceed 10% of the GPD in Bulgaria, Romania, Poland, Greece, Hungary, and Croatia. OECD estimates that those costs will be 14% lower by 2030 based on policies currently in place and could be reduced even further with additional policy measures. This UBDPolicy briefing can help policymakers understand the economic benefits of clean air action when implementing the new clean air standards of the EU Ambient Air Quality Directive.



Policy recommendations

For EU policymakers

METEOR developed new tools and provided updated data to estimate the disease and mortality burden related to current environmental conditions and any new proposed policies.

1. The results of the METEOR project demonstrate the importance of health impact assessment and economic valuation: Policymakers should continue to carry out impact assessments for any new policy initiative, including for simplification measures, to determine the health impacts, cost, and productivity losses from environmental and climate stressors, and the benefits of policy action.
2. The range of health impacts and cost are still not fully considered for the development of future policies. Policymakers should ensure that a health impact assessment considering a wide range of health impacts, inequalities and costs is carried out for any proposed new legislation or revision, to ensure that reducing regulatory burden doesn't come at the expense of public health, ultimately reducing productivity and raising health costs.
3. Pollution leads to a significant burden of disease and health cost, including productivity and competitiveness loss: Policymakers should continue implementing and enforcing EU environmental legislation, including the Zero-Pollution Action Plan to address this persistent burden. Disease prevention through addressing environmental stressors deserves more attention in future EU policy deliberations and programmes.
4. Policymakers should provide opportunities for citizens, civil society and researchers to feed into policy deliberations and share their expertise. They should also support capacity building and education for citizens on the environmental burden of disease and the cost.

For national, regional, and local policymakers

1. Use health impact assessment to assess health costs and productivity loss from pollution as part of policy deliberations, especially for urban and transport planning, and encourage cross-sectorial working together.
2. Provide opportunities for citizens, civil society and researchers to feed into policy deliberations and share their knowledge, especially from the local level. Provide opportunities for the education of citizens and civil society on the environmental burden of disease and cost.



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