AIR & MERCURY

CUTTING MERCURY EMISSIONS, IMPROVING PEOPLE'S HEALTH

Emissions of mercury travel long distances and pose a significant risk to humans, animals and ecosystems. The EU has recently signed the Minamata convention on mercury, which is a legally-binding treaty to cut mercury emissions, and should therefore limit its emissions of mercury in the atmosphere. The current overhaul of EU air policy is a timely opportunity to do so.

HEALTH IMPACTS

Nervous, immune, reproductive & respiratory systems / Brain / Heart / Kidney / Thyroid

1 TONNE OF MERCURY CAUSES

€910,000

IN DAMAGE MOSTLY DUE TO IQ LOSSES

UP TO €9 BLN PER YEAR

BENEFIT FROM EXPOSURE PREVENTION

ENVIRONMENTAL IMPACT

54%

OF EU ECOSYSTEMS ARE AFFECTED BY EXCESSIVE MERCURY DEPOSITIONS

SOURCES OF EMISSIONS

Mercury is a highly toxic metal, in particular when it turns into methylmercury, its most dangerous form. Methylmercury (MeHg) has the capacity to accumulate in organisms and concentrate in food chains, especially in fish. Even at low doses, it can seriously affect the nervous system and harm immune and reproductive systems. MeHg exposure also has serious effects on brain development and can pass through both the placental and blood-brain barriers. Children and women of child-bearing age are therefore most at risk.

MeHg may also cause adverse effects on the cardiovascular system and lead to increased mortality. MeHg compounds have been classified as possible carcinogens to humans according to the World Health Organisation (WHO). Inhalation of elemental mercury vapour can lead to symptoms such as tremors, insomnia, memory loss, neuromuscular changes, and headaches. It can also affect the kidneys and the thyroid glands.

Over half of all European Economic Area countries (there are 33 of them) have exceedances of critical loads for mercury across nearly 90% or more of their ecosystem area. In total, 54% of the total EU ecosystem area is affected by excessive mercury depositions.[1]

Each tonne of mercury emitted into the air is estimated to cause on average €910,000 in damage, mostly due to IQ losses.[2] Damage costs vary from country to country and depend on various factors such as population density and location of emissions. Belgium and the Netherlands show the highest damage costs in the whole of Europe, followed closely by Germany, France and the UK.

A recent study shows that within the EU, more than 1.8 million children are born every year with MeHg exposures above the limit of 0.58 microgram(µg)/g[3], and about 200,000 births exceed the higher WHO limit of 2.5 µg/g. The total annual benefits of exposure prevention within the EU were estimated at more than 600,000 IQ points per year, corresponding to a total economic benefit of between €8 billion and €9 billion per year.[4]

The main source of mercury emissions in the air in the EU is coal-burning. Other sources include non-ferrous metal industries, waste incineration, pig iron and steel, chlor-alkali and cement productions, oil refining, and product waste. In 2010, the EU was responsible for 87.5 tonnes of mercury emissions in the air, with around 50% being released from coal combustion plants.[5]

SOLUTIONS

Together with energy savings, the replacement of coal with alternative forms of electricity and heat production (e.g. renewables) is the most effective way of preventing further emissions of mercury in the atmosphere.

There are also abatement techniques to reduce mercury. Significant reductions can be achieved through the use of mercury-specific pollution abatement techniques, such as activated carbon injection, a now widely used technique in the United States. Measures to control other air pollutants such as sulphur dioxide (SO_x), nitrogen oxides (NOx) and particulate matter (PM) also offer some co-benefits in terms of mercury removal.

EXISTING EU POLICY

"Despite being the main source of mercury emissions in Europe, coal burning-related mercury emissions are not directly regulated at EU level."

- **Horizontal policy**

  Globally, mercury emissions will be addressed by the 2013 Minamata Convention on Mercury once it enters into force and is effectively implemented. The Convention's objective is to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. It requires parties to control their emissions through measures addressing both new and existing sources of pollution.[6]

  In 2005, the EU adopted a Community Strategy on Mercury which aims at reducing mercury levels in the environment, thereby cutting human exposure. The strategy led to the adoption of a Mercury Export Ban and Safe Storage Regulation as well as the prohibition of placing measuring devices containing mercury on the market. A study supporting the review of the Strategy was published in 2010 and considered options for setting mercury emission limits for medium and large combustion plants.[7] However, the EU review of the strategy did not include any such actions.[8]

- **Air pollution policy**

  Despite being the main source of mercury emissions in Europe, coal burning-related mercury emissions are not directly regulated at the EU level. This contrasts with regulation in other parts of the world where mercury emission standards for large combustion plants have been introduced. Germany has recently updated its long-standing Emission Limit Value (ELV) of 30 mg/Nm^3 to 10 µg /Nm^3 for all coal-fired plants from 2019.[9] In the United States, all combustion plants with a size exceeding 25MWth are required to meet an approximate mercury limit of 1,5 µg/Nm3 (converted) for hardcoal and 4,8 µg/Nm^3 (converted) for lignite as from 2016.[10]

  The EU only limits mercury emissions from waste incineration and co-incineration.[11] The EU's legislation on ambient air quality does not set mercury limits either and only makes monitoring requirements.[12]

  As part of its review of the Thematic Strategy on Air Pollution (TSAP) which took part between 2011 and 2013, the European Commission considered possible emission reduction commitments for mercury in the revised National Emission Ceilings (NEC) Directive.[13] But the Commission decided not to propose these requirements, despite the significant health and environmental benefits that could accrue.

RECOMMENDATIONS

To be consistent with the recent adoption of the Minamata Convention, the EU should now follow through by adopting new air pollution laws which can help reduce mercury levels in the environment and associated human exposure.

- **Inclusion of mercury in the revised NEC Directive**

  Putting a cap on overall amounts of mercury is essential to stop mercury from continuously accumulating in the environment - particularly in the food chain. This is best done through the NEC Directive which is currently being revised and is expected to set Emission Reduction Commitments (ERCs) for several air pollutants for the years 2020, 2025 and 2030. Including mercury in the list of pollutants and setting ambitious ERCs in annex II would help reduce Europeans' exposure to mercury.

- **Mercury emission limits for large combustion plants (LCPs)**

  State of the art abatement techniques must therefore become mandatory on all existing and new large coal-fired power plants. This can be done by adopting the Best Available Techniques (BATs) and Best Available Techniques Associated Levels (BAT-AELs) in the Reference Document (so-called BREF) for Large Combustion Plants which is currently being revised and will enter into force four years after its publication, i.e. around 2020. Comprehensive data collection within this review has shown that mercury emissions of 3 µg/Nm^3 are already being achieved by some EU coal-fired plants without any additional abatement. Mercury specific abatement techniques are available and would reduce emissions even further.

- **Mercury emission limits for medium combustion plants (MCPs)**

  The new MCP Directive provides the opportunity to set emission limits for Medium Combustion Plants (MCP). As for large combustion plants, best available techniques can result in monthly average emissions below 3 µg/Nm^3.

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1 EEA air quality report 2014, page 65
2 Costs of air pollution from European industrial facilities 2008-2012, EEA, 2014
3 With regard to background exposures and the possible existence of a threshold, the U.S. EPA's Reference Dose (RfD) of 0.1 µg/kg body weight/day corresponds to a hair-Hg concentration of about 1 µg/g hair. Updated calculations resulted in an adjusted biological limit about 50 % below the recommended level, corresponding to 0.58 µg/g hair. The validity of this lower cut-off point below the RfD is supported by recent studies of developmental neurotoxicity at exposure levels close to the background. The study assumed that, below the 0.58 µg/g cut-off point, only negligible adverse effects would exist. http://www.ehjournal.net/content/12/1/3/abstract
4 Environment Health 2013, Economic benefits of methylmercury exposure control in Europe: Monetary value of neurotoxicity prevention, http://www.ehjournal.net/content/12/1/3/abstract
5 UNEP Global Mercury Assessment 2013, p.11-12
6 See http://www.mercuryconvention.org/Home/tabid/3360/Default.aspx
7 Review of the Community Strategy for Mercury, Final Report, 4 October 2010 http://ec.europa.eu/environment/chemicals/mercury/pdf/review_mercury_strategy2010.pdf
8 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52010DC0723&from=EN
9 Art 11(2) and 30(1) point 2 of the new 13th Ordinance to the Bundes-Immissionsschutzgesetzes (13. BImSchV)
10 2012 Mercury and Air Toxics Standards (MATS) http://www.epa.gov/airquality/powerplanttoxics/actions.html
The original standard is expressed in 1,2 E0 lb/TBtu (hardcoal) and 4,0E0 lb/TBtu (lignite). The following conversion rates have been used: 1.0 lb Hg/TBtu = 429.92 µgHg/GJ. Default flue gas volume used by the EEA in its technical report 2008/04 i.e. 337.1 Nm3/GJ for hard coal and 360.6 Nm3/GJ for lignite under EU reference conditions for coal (@6% O2, 25oC, 1atm) resulting in the following: 1.0 lb Hg/Tbtu ~ 1.275 µgHg/Nm3 for hard coal and 1.0 lb Hg/Tbtu ~ 1.192 µgHg/Nm3 for lignite.
11 Directive 2000/76/EC of 4 December 2000 on the incineration of waste, annexes IV and V. This directive covers solid or liquid waste incineration plants as well as co-incineration plants but does not cover biomass incineration plants.
12 Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air.
13 IIASA TSAP report number 10, page 42