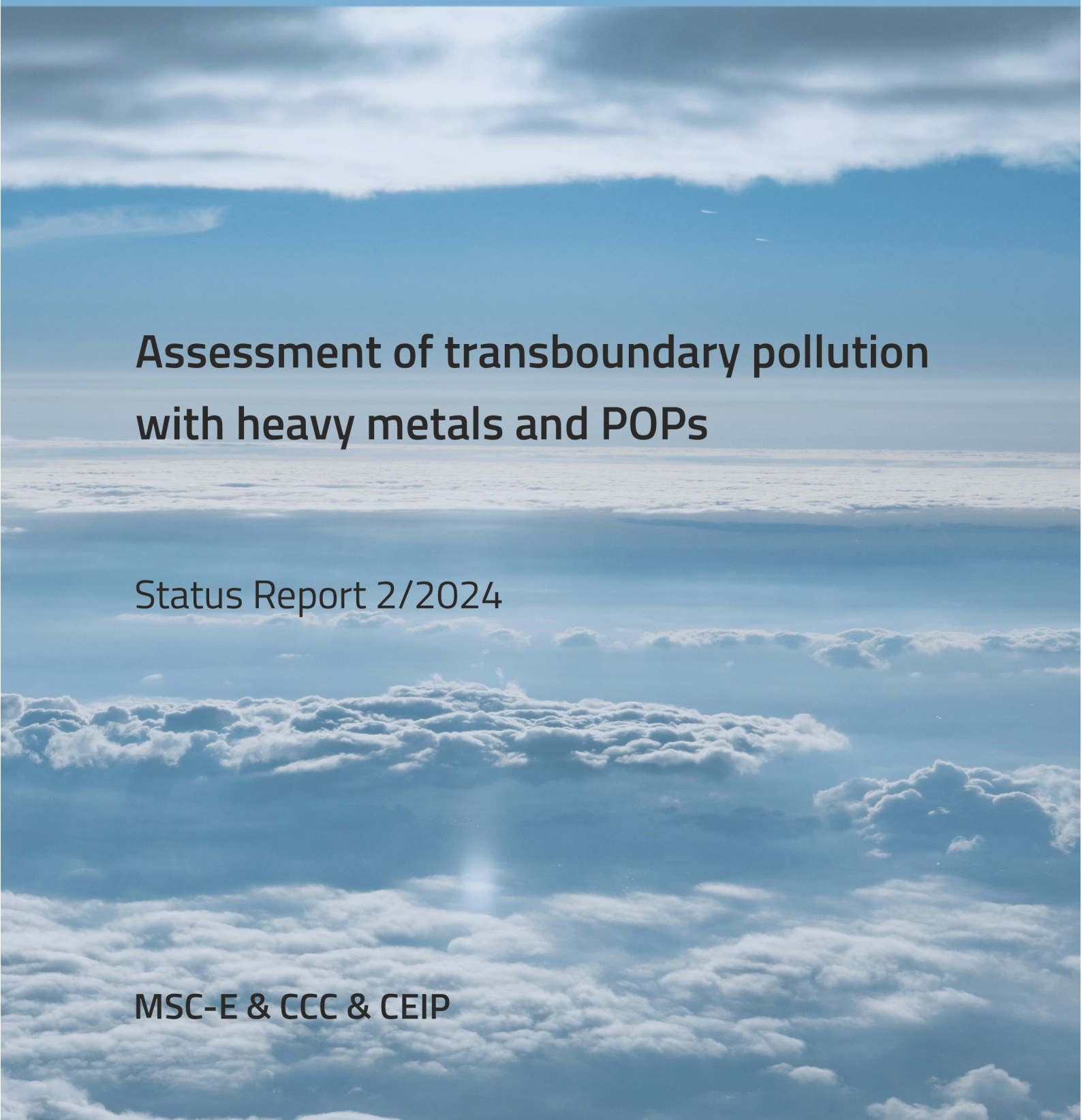
Convention on Long-range Transboundary Air Pollution

emep

Co-operative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe

STATUS REPORT 2/2024



Assessment of transboundary pollution with heavy metals and POPs

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MSC-E & CCC & CEIP

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Assessment of transboundary pollution with heavy metals and POPs

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Executive summary

Heavy metals and persistent organic pollutants (POPs) are toxic substances that pose significant risks to human health and ecosystems. The issue of environmental pollution by these contaminants is a focus of various international organizations, including the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP or the Air Convention). The Air Convention's Protocols on Heavy Metals and POPs prioritize several hazardous substances, including lead (Pb), cadmium (Cd), mercury (Hg), polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs), hexachlorobenzene (HCB), and polycyclic aromatic hydrocarbons (PAHs). Among the PAHs, the priority pollutants are benzo(a)pyrene (B(a)P), benzo(b)fluoranthene (B(b)F), benzo(k)fluoranthene (B(k)F), and indeno(1,2,3-cd)pyrene (IP).

Scientific support for the implementation of the Protocols on Heavy Metals and POPs under the Air Convention is provided by the Co-operative Programme for Monitoring and Evaluation of Long-range Transmission of Air Pollutants in Europe (EMEP). EMEP offers critical information on emission inventories, monitoring, and modelling of transboundary pollution. The research and operational assessment of heavy metal and POP pollution are conducted by specialized EMEP Centres, including the Centre on Emission Inventories and Projections (CEIP), the Chemical Coordinating Centre (CCC), and the Meteorological Synthesizing Centre - East (MSC-E).

In accordance with the decision of the Executive Body at its forty-third session (Geneva, 11-14 December 2023), MSC-E, the international Centre of EMEP, is hosted by the Jožef Stefan Institute (Ljubljana, Slovenia) as of 1 January 2024. Since its inception at the beginning of the year, the new Centre has made significant efforts to prepare for the EMEP operational modelling tasks. This includes arranging sufficient computer resources at institutional and national supercomputer clusters, installing and adapting the necessary software and modelling tools, and engaging scientific staff. A full set of input data was generated for this year's simulations, and the most recent stable open-source version of the GLEMOS model was used for operational modelling. Additionally, the development of a new website for the Centre (www.msc-east.org) has been initiated to disseminate assessment results and other relevant information online.

This Status Report provides an overview of the 2022 activities carried out by three EMEP Centres – CEIP, CCC, and MSC-E – focused on the research and assessment of heavy metal and POP pollution. The first-year operational simulations conducted by MSC-E in 2024 included three heavy metals (Pb, Cd, Hg) and four PAHs (B(a)P, B(b)F, B(k)F, IP), reflecting substantial preparatory and capacity-building efforts within a restricted timeframe. Persistent organic pollutants not covered in this year's simulations (PCBs, PCDD/Fs, HCB) are scheduled for inclusion in the operational modelling for 2025. The report details emissions, monitoring, model assessments of heavy metal and POP

pollution, their transboundary transport among the Convention Parties, research activities, and other relevant information.

Emissions

The completeness and consistency of emissions data submitted to EMEP have notably improved over time. In 2024, 96% of the Parties (49 out of 51) submitted data to CEIP. Data on priority heavy metals (Cd, Hg, and Pb) were reported by 47 Parties, with 45 providing a complete time series. Additionally, 41 Parties reported data on five other heavy metals (As, Cr, Cu, Ni, Se, and Zn), and 46 Parties reported data on POPs, including total PAHs, PCDD/Fs, HCB, and PCBs, with all 46 also reporting on additional PAH compounds. However, the quality of the submitted data varies significantly among countries, and many still rely on outdated versions of the EMEP/EEA emission inventory guidebook, leading to considerable uncertainty and incomplete data across different pollutants and sectors.

The emission trends and data reporting quality for priority heavy metals and POPs vary notably between the EMEP-West and EMEP-East regions. The EMEP-West region, which includes EU27 countries and several non-EU European nations, demonstrates a consistent downward trend in heavy metal emissions, with a notable dip in 2009 due to the economic recession that affected industrial production. Conversely, the EMEP-East region, comprising EECCA countries and Türkiye, displays an unstable trend in heavy metal emissions from 2000 to 2007, largely attributable to incomplete data reporting. For POPs, the EMEP-West region shows significant emission reductions: PCDD/F emissions dropped by 74% from 2000 to 2022, with most reduction occurring between 2000 and 2010. HCB emissions decreased by 96% from 2000 to 2020, mainly between 2000 and 2002. PCB emissions were reduced by 69% and PAH emissions by 20% over the same period. However, in the EMEP-East region, the reporting of POPs is largely incomplete, resulting in high fluctuations and inconsistent data across the years.

The emissions of heavy metals and POPs are largely attributed to different industrial and combustion processes. Industry production is a significant source, emitting about 34% of Cd and 48% of Pb emissions. Energy industries, primarily coal power plants, account for approximately 39% of Hg emissions. Road transport also contributes notably to Pb emissions. The ‘other stationary combustion’ sector, which includes coal and wood stoves/boilers in households, is the primary source of PAH emissions, contributing 77% to their total. This sector also contributes 38% to PCDD/F emissions, with additional significant contributions from industry production (33%) and the waste sector (23%). The ‘other stationary combustion’ sector is also the leading source of HCB emissions (30%), followed by public electricity, heat production, and industry production. The industrial sector dominates PCB emissions, contributing 81% to the total.

Monitoring

In 2022, EMEP reported a total of 67 measurement sites for various pollutants, with 40 sites monitoring heavy metals in both aerosols and precipitation. Mercury was measured at 29 sites, 15 of which conducted concurrent measurements in both air and precipitation. For POPs, there were 37 sites reporting data, 30 of which tracked measurements in both aerosol form and precipitation or deposition. Regarding reporting to EMEP, 21 Parties submitted data on heavy metals, 15 on mercury, and 16 on POPs.

Around 30 different trace elements were reported to EMEP, with the highest aerosol concentrations typically found around the British Channel, high-traffic maritime areas, and Eastern Europe, notably in Slovakia and Hungary. Elevated levels in precipitation were also prominent in Eastern Europe, with significant measurements in Spain and Ireland. Mercury concentrations were highest in Germany and the UK, followed by an Arctic site in Norway, with the major emitters being Türkiye, Germany, Poland, and Italy. Higher concentrations of mercury were generally noted in central Europe close to emission sources, compared to lower levels in northern Europe. Precipitation showed the highest mercury concentrations in The Netherlands, Spain, Germany, and Sweden, with a noticeable north-south gradient indicating higher levels in central Europe and lower levels further from emission sources.

The observations indicate significant declines in Hg concentrations in both air and precipitation from 2000 to 2022 and from 2010 to 2022. Hg concentrations in air decreased by 0.6% per year from 2000 and by 1.3% per year from 2010, while in precipitation, they dropped by 1.8% per year from 2000 and 3.2% per year from 2010. Seasonal trends show a faster decline in winter than in summer for precipitation. While European emissions of Hg have decreased rapidly, concentrations measured are also influenced by stable global emissions. Despite some sites showing significant decreasing trends, variability in trends, especially in shorter time frames, points to the need for continued long-term monitoring. Changes in meteorological conditions also affect these trends, indicating a complex interplay of factors influencing Hg deposition in Europe.

The spatial distribution of POP monitoring sites across Europe varies significantly by component. PAHs have the most extensive coverage, measured at 35 sites across 14 Parties. In contrast, legacy POPs like PCBs, HCHs, and DDTs are monitored at only 13 sites from 7 Parties, and newer chemicals of concern (e.g., dechlorane plus and PFOA) are reported even less frequently, predominantly by Nordic countries. Generally, POP concentrations in Europe show a decreasing gradient from the south/southeast to the north. Specifically for PCB-153, its spatial distribution is linked to high historical usage in Central Europe. Unlike other POPs, the highest concentrations of HCB are found in Norway and the Arctic.

PAHs have been tracked for over a decade at approximately twenty sites within EMEP. This long-term monitoring has enabled trend analysis. In some cases, no significant trends in PAH

concentrations have been identified, indicating stability. At other EMEP sites, despite varying rates of decrease, the concentrations have generally remained stable, suggesting that sources of PAH emissions are still active. This consistent stability aligns with findings from the Arctic Monitoring and Assessment Programme (AMAP), highlighting ongoing environmental exposure to PAHs across Europe.

The EMEP monitoring strategy for 2020-2029 places a strong emphasis on tracking both regulated POPs and contaminants of emerging concern (CECs) such as polybrominated diphenyl ethers (PBDEs) and per- and polyfluorinated alkyl substances (PFAS). These emerging contaminants, continuously entering the market, often replace regulated chemicals but may still impact ecosystems significantly. In November 2023, EMEP held a workshop in cooperation with the Arctic Monitoring Program (AMAP) and the Global Monitoring Plan (GMP) to discuss atmospheric monitoring strategies for CECs, focusing on expanding monitoring networks, harmonizing methods, and including a broader range of pollutants in assessments. The workshop highlighted the need for consistent and standardized approaches across regions, the expansion of target analytes, and the adoption of new measurement techniques to better detect and analyse these pollutants. The emphasis was also on enhancing data accessibility and preventing contamination during sampling and analysis, with a particular focus on sensitive areas like the Arctic.

Status of HM and POP air pollution in 2022

Assessment of heavy metal and POP pollution of the EMEP region is performed using both modelling results and measurement data and includes evaluation of spatial patterns of pollution levels as well as transboundary transport in 2022.

In 2022, the spatial variability of Pb, Cd, Hg, and PAH deposition across the EMEP countries showed distinct patterns. Pb deposition ranged from 0.1 to 1 kg km^{-2} y^{-1}, with the highest levels in Central Europe and notably lower levels in Scandinavia and Northern Russia. Cd showed its greatest deposition in Western and Central Europe, with annual fluxes ranging from 2 to 70 g km^{-2} y^{-1}. Hg deposition was highest in Central and Southern Europe, peaking over 25 g km^{-2} y^{-1} in parts of the Caucasus and Central Asia, influenced by significant precipitation and atmospheric conditions; it also spiked in the high Arctic during springtime Atmospheric Mercury Depletion Events. PAHs exhibited the highest deposition in Central Europe, particularly in Poland, Czechia, Slovakia, and the Balkans, with much lower levels observed in Western and Northern European countries.

The peak deposition for Pb and Cd occurred in spring, primarily due to dust intrusions from African and Central Asian deserts in March and subsequent wind resuspension from arable lands in April and May. Pb and Cd also experienced elevated deposition during late autumn and winter due to increased anthropogenic emissions. Hg deposition peaked during the spring and summer months (March to August), with a significant peak attributed to Atmospheric Mercury Depletion Events

(AMDEs) in the Arctic, and showed lower values during autumn and winter. Conversely, PAHs experienced their highest deposition fluxes during the winter, driven by increased emissions from domestic heating, and a noticeable spike from April to June, linked to high dry deposition onto vegetation during the growing season.

The relative contributions of different pollution sources to deposition in EMEP countries in 2022 varied by pollutant and region. For Pb, the primary anthropogenic sources within EMEP countries, particularly in Central and Southern Europe, were significant. Non-EMEP sources notably affected Southern European and Central Asian countries, with contributions especially from Northern Africa and the Middle East. Cd deposition also revealed a notable influence from external non-EMEP sources, particularly affecting Southern European countries with contributions ranging from 30% to 40%, and Central Asian countries affected by sources in the Middle East and East Asia. Secondary sources played a substantial role, especially in Central Asian and Caucasus countries, impacting Cd deposition through wind resuspension of desert dust. For Hg, global and intercontinental transport from non-EMEP countries was the dominant contributor, accounting for more than 50% of total deposition in most EMEP countries. PAH deposition, on the other hand, primarily came from primary anthropogenic sources within EMEP countries, with non-EMEP and secondary sources contributing less due to PAHs' shorter atmospheric residence times.

Transboundary transport significantly influences pollutant deposition across EMEP countries, with variations noted among different pollutants. For Pb and Cd, larger countries with robust industrial outputs such as Poland and Germany predominantly see deposition from domestic sources, accounting for 65-75% of total deposition. In contrast, countries with smaller national emissions such as Czechia and Slovakia rely more on transboundary contributions. In the case of Hg, the scenario shifts; despite some larger countries having substantial domestic contributions, transboundary transport overwhelmingly dominates in most EMEP countries (over 75%). The impact is even more pronounced for PAHs, short-lived pollutants where transboundary contributions are substantial, particularly in Central and Eastern European countries adjacent to high-emission nations. This highlights the complex and significant impact of transboundary pollution on regional air quality across EMEP countries.

The model demonstrates good performance in simulating air concentrations and wet deposition of Pb, Cd, Hg, and PAHs. For Pb and Cd, air concentrations show high spatial correlations (0.73 and 0.76, respectively) with measurements, and over 80% of Pb and 77% of Cd modelled values align with observed levels within a factor of two. However, Cd is somewhat overestimated, particularly in Central Europe, likely due to uncertainties in wind re-suspension. PAH concentrations generally align well with observations, with a high spatial correlation (0.97), though the model slightly underestimates these by about 10%. In terms of wet deposition, Pb and Cd show alignment with measured values within a factor of two at nearly half of the sites, despite some underestimation

issues. Hg simulations show good agreement with measured concentrations of Hg0, with unbiased average levels and minor discrepancies. However, Hg wet deposition is slightly overestimated by the model, with 60% of observations agreeing within a factor of two. PAH wet deposition is often underestimated by the model, with relative biases between -45% and -51%, though more than half the measurements still align within a factor of two.

Research and developments

MSC-E has continued and initiated new research activities aimed at improving model parameterizations and evaluating model performance. The ongoing research primarily focuses on updating the model's chemical scheme for Hg by incorporating the latest findings on oxidation and reduction mechanisms from the literature. Additionally, we are refining air-vegetation and air-water exchange processes to improve predictions of pollution in sensitive terrestrial and aquatic ecosystems. A detailed analysis and model evaluation of PAH pollution are being conducted at the country level as part of a newly initiated pilot study for Slovenia and other Balkan countries. Furthermore, a new visualization system has been developed for plotting pollution maps and other graphical products.

A new experimental version of the GLEMOS model (v2.3) was developed as part of a joint study with researchers from the Institute of Physical Chemistry Blas Cabrera, Spanish National Research Council (Spain), and the Institute of Environment and Ecology, Tsinghua University (China). The model incorporates a novel chemical mechanism for Hg transformations in the atmosphere and simulates Hg0 and nineteen oxidized Hg species in both gaseous and particulate forms. The updated model was evaluated against observations of Hg0 concentrations and Hg wet deposition demonstrating good agreement with measurements. The model, incorporating an updated chemical mechanism, was used to quantify the impact of anthropogenic emissions of short-lived halogens (chlorine-, bromine-, and iodine-containing species with lifetimes below six months) on the Hg chemical cycle in the atmosphere and human exposure to Hg contamination (*Fu et al.*, 2024).

Evaluating simulated oxidized Hg is challenging due to the well-recognized high uncertainties and the issue of biased low values in most of the currently available oxidized Hg measurement databases. To address these limitations, an empirically derived posterior correction approach was developed and applied for the model evaluation and analysis. The evaluation revealed a significant positive bias in the modelling results, despite unbiased traditional model evaluations against Hg^0 and wet deposition measurements. This discrepancy may stem from several factors, including uncertainties in the speciation of anthropogenic emissions in available inventories, missing reactive Hg redox mechanisms in near-ground air, and uncertainties in reactive Hg dry deposition. In all cases, currently available model estimates of Hg deposition to ecosystems can be significantly

biased high or low depending on prevailing factors. Further analysis and refinement of these processes will enhance model performance and reduce uncertainties in the simulations.

Additionally, the model was evaluated against estimates of foliar Hg^0 uptake obtained using the bottom-up quantification method. It was found that the model accurately reproduces deposition fluxes in Northern Scandinavia, it generally underestimates the bottom-up estimates in Central Europe. Additionally, the model does not differentiate Hg^0 deposition across different tree species, resulting in reasonable agreement with measurement-based estimates for pines but underestimating deposition to spruces, oaks, and beeches. Future improvements will focus on updating the model parameterizations for Hg^0 dry deposition and conducting more detailed evaluations, potentially in collaboration with ICP-Forests.

The country-scale pilot studies are a long-term research and assessment initiative successfully conducted by MSC-E in cooperation with TFMM. These studies focus on a detailed assessment of heavy metal and POP pollution in individual countries, including fine-resolution modelling, evaluation and refinement of national emission inventories, and improvement of modelling tools. The new study proposed by the Centre will investigate the pollution of the Balkan region with polycyclic aromatic hydrocarbons (PAHs). The first phase of the study will concentrate on country-scale pollution in Slovenia and explore the possibility of extending the study to other Balkan countries. Various types of observational data will be involved, including regular EMEP and AQ e-Reporting atmospheric measurements, campaign measurements of PAH stable isotope composition, as well as moss and lichen archives. The program of the study will include analysis of spatial patterns and source attribution of PAH pollution, involving both fine-resolution simulations and a variety of measurement data.

Cooperation

MSC-E resumes scientific collaboration with various international and national bodies, aiming to enhance research and assessment approaches applied by the Centre and to disseminate the scientific knowledge gained within the Convention. These bodies include EMEP Task Forces, International Cooperative Programmes of the Working Group on Effects (WGE), and other international conventions and programmes such as the Minamata and Stockholm Conventions, HELCOM, OSPAR, and AMAP.

The Centre contributed to the work of the Task Force on Measurements and Modelling (TFMM) by participating in the Task Force's twenty-fifth meeting (Warsaw, 6-7 May 2024). MSC-East presented its ongoing research and development activities, results of the preliminary simulations conducted for 2022, as well as updates of the GLEMOS model, including further development of the chemical scheme for Hg, air-surface exchange fluxes, and POP multi-media processes. MSC-E confirmed its plans to continue country-scale studies of heavy metal and POP pollution and

announced a new pilot study for Slovenia and other Balkan countries. Future activities of the Centre will also include contributions to the cooperative EMEP activities on contaminants of emerging concern and participation in the analysis of BaP health-related effects.

MSC-East continues its long-term collaboration with the Task Force on Hemispheric Transport of Air Pollution (TF HTAP). Currently, The Centre participates in the multi-model research initiative, the Multi-Compartment Mercury Modelling and Analysis Project (MCHgMAP), launched within TF HTAP in cooperation with the Minamata Convention for assessing the effectiveness of current and future mitigation policies. The project assessment consists of a series of model experiments using off-line coupled atmospheric, ocean, and multi-media mass balance models to account for changes in primary anthropogenic and secondary Hg sources as well as environmental conditions in the Hg cycling between land, ocean, and atmosphere. The first phase of MCHgMAP multi-model simulations and the analysis of Hg spatial and temporal trends is currently in progress and is expected to be completed by the spring of 2025. MSC-E will also contribute to another modelling initiative recently started under TF HTAP to study multi-pollutant effects of wildfires and biomass burning. The contributions and plans of MSC-E were highlighted at the recent virtual Task Force meeting held on April 22-25, 2024.

In addition, MSC-E prioritises its cooperation with other international bodies. As part of the MCHgMAP project, the Centre actively contributes to the work of the Open-ended Scientific Group for the effectiveness evaluation of the Minamata Convention on Mercury (item 1.3.4). Cooperation with the Marine Conventions (HELCOM and OSPAR) on the assessment of heavy metal and POP pollution in the Baltic Sea and Northern Atlantic waters is currently being renewed as part of multilateral or bilateral contracts. The Centre also considers opportunities for cooperation and data exchange with the Stockholm Convention on Persistent Organic Pollutants (item 1.3.3) and the Arctic Monitoring and Assessment Programme (AMAP).

Future directions

Future research and development work at MSC-E, in accordance with the revised mandate (ECE/EB.AIR/144/Add.1) and the 2024–2025 workplan for implementing the Convention (ECE/EB.AIR/154/Add.1), will include consecutive updates to the GLEMOS model, focusing on key physical and chemical processes governing the dispersion of heavy metals and POPs in the atmosphere and other media, with particular emphasis on the multi-media aspects of POP modelling. Additionally, an updated GLEMOS code will be distributed, making it available to the wider scientific community and experts from the Parties through an open-source repository (https://github.com/).

The work will also involve conducting a country-scale assessment and analysis of PAH pollution as part of a pilot study for Slovenia and other Balkan countries, in cooperation with TFMM. MSC-E will

participate in TFMM cooperative activities, focusing on contaminants of emerging concern and the analysis of B(a)P health-related effects. Collaboration with TF HTAP will continue, focusing on the assessment and attribution of Hg pollution trends as part of the MCHgMAP project, along with contributing to the multi-pollutant, multi-effects study of wildfires.

Renewed collaboration with ICP Vegetation is planned, involving a joint analysis of temporal trends and changes in spatial patterns of heavy metal and POP deposition, utilizing both model simulations and moss measurements. Furthermore, cooperation with the Marine Conventions (HELCOM and OSPAR) will focus on assessing heavy metal and POP pollution in the Baltic Sea and Northern Atlantic waters through multilateral or bilateral contracts.

Contents

Introduction

Heavy metals and persistent organic pollutants (POPs) are toxic substances that pose significant risks to human health and ecosystems. The issue of environmental pollution by these contaminants is a focus of various international organizations, including the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP or the Air Convention). The Air Convention's Protocols on Heavy Metals and POPs prioritize several hazardous substances, including lead (Pb), cadmium (Cd), mercury (Hg), polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs), hexachlorobenzene (HCB), and polycyclic aromatic hydrocarbons (PAHs). Among the PAHs, the priority pollutants are benzo(a)pyrene (B(a)P), benzo(b)fluoranthene (B(b)F), benzo(k)fluoranthene (B(k)F), and indeno(1,2,3-cd)pyrene (IP).

Scientific support for the implementation of the Protocols on Heavy Metals and POPs under the Air Convention is provided by the Co-operative Programme for Monitoring and Evaluation of Long-range Transmission of Air Pollutants in Europe (EMEP, www.emep.int). EMEP offers critical information on emission inventories, monitoring, and modelling of transboundary pollution. The research and operational assessment of heavy metal and POP pollution are conducted by specialized EMEP Centres, including the Centre on Emission Inventories and Projections (CEIP), the Chemical Coordinating Centre (CCC), and the Meteorological Synthesizing Centre - East (MSC-E).

In accordance with the decision of the Executive Body at its forty-third session (Geneva, 11-14 December 2023), MSC-E, the international Centre of EMEP, is hosted by the Jožef Stefan Institute (Ljubljana, Slovenia) as of 1 January 2024. The Jožef Stefan Institute (JSI) is the largest research institute in Slovenia. The main research areas are physics, chemistry, molecular biology, biotechnology, information technologies, reactor physics, energy, and the environment. Currently, the institute has 1200 employees, over half of whom are PhD scientists. The mission of JSI is the accumulation and dissemination of knowledge in science and technology to benefit society through education, research, and high-tech development at top international standards.

According to the revised mandate (ECE/EB.AIR/144/Add.1), MSC-East is responsible for providing scientific support to the Convention with model assessment of heavy metal and POP transboundary pollution. This operational activity involves preparing various input data for modelling, including a complete set of anthropogenic and geogenic emissions, meteorological parameters, atmospheric concentrations of chemical reactants and particulate matter; global and regional simulations of pollution levels and transboundary transport of the pollutants; and evaluating the modelling results against observations.

Since its inception at the beginning of the year, the new Centre has made significant efforts to prepare for the EMEP operational modelling tasks. This includes arranging sufficient computer resources at institutional and national supercomputer clusters, installing and adapting the necessary software and modelling tools, and engaging scientific staff. A full set of input data was generated for this year's simulations, and the most recent stable open-source version of the GLEMOS model was used for operational modelling. Additionally, the development of a new website for the Centre (www.msc-east.org) has been initiated to disseminate assessment results and other relevant information online.

Due to the substantial preparatory and capacity-building efforts and the restricted timeframe, the first-year operational simulations conducted by MSC-E in 2024 cover a limited set of pollutants, including three heavy metals (Pb, Cd, Hg) and four PAHs (B(a)P, B(b)F, B(k)F, IP) among the POPs. Persistent organic pollutants not covered in this year's simulations (PCBs, PCDD/Fs, HCB) will be included in the operational modelling in 2025. The model assessment results of pollution levels, transboundary transport of pollution among the Parties to the Convention, research activities, and other pertinent information are discussed in the current report.

This report provides an overview of the activities carried out by three EMEP Centres – CEIP, CCC, and MSC-E – focusing on the research and assessment of heavy metal and POP pollution in 2022, in accordance with the 2024-2025 workplan for implementing the Air Convention (ECE/EB.AIR/154/Add.1). Organized into six chapters, the report details various aspects of this work: Chapter 1 reviews the current status of heavy metal and POP emissions reporting by EMEP countries and the preparation of emissions data for modelling. Chapter 2 describes observations of these pollutants within the EMEP monitoring network. Chapter 3 presents the results of the assessment of heavy metal and POP pollution levels in 2022. Chapter 4 discusses research and model development activities. Chapter 5 explores on-going and planed cooperation of MSC-E with EMEP Task Forces and other international bodies. Finally, Chapter 6 outlines the directions for future research activities.

1. Reporting of heavy metal and POP emissions

Parties are formally only required to report on the substances and for the years set forth in the Air Convention and the protocols and their amendments that they have ratified and that have entered into force (*UNECE*, 2022). Parties that have obligations to report emission inventories under protocols that they have ratified and that are in force shall annually report emission inventories (*UNECE*, 2022). The substances for which there are existing reporting obligations in the Convention and the protocols include: SO_x, NO_x, NMVOCs, NH_3, CO, heavy metals, POPs, particulate matter (PM). Substances for which emission reporting is encouraged include: Black carbon (BC), total suspended particulate matter (TSP), As, Cr, Cu, Ni, Se and Zn (*UNECE*, 2022). Parties are strongly encouraged to submit the Informative Inventory Report (IIR). The IIR should be submitted annually (*UNECE*, 2022). Every four years from 2017 onward, Parties shall report for the year x-2 updated aggregated sectoral (GNFR) gridded emissions and LPS emissions (*UNECE*, 2022). Parties are encouraged to update their gridded and LPS data and report annually where changes in spatial patterns have occurred, so that the EMEP models can represent the most up-to-date information (*UNECE*, 2022).

1.1. Reporting of emission inventories in 2024

The completeness and consistency of submitted data have improved significantly since EMEP began collecting information on emissions (Fig. 1.1). Forty-nine (96%) Parties submitted data to CEIP in 2024[1], Forty-seven Parties reported data on priority heavy metals (Cd, Hg, Pb), from which 45 Parties provided the full time series. Forty-one Parties reported data on five additional heavy metals (Arsenic (As), chromium (Cr), copper (Cu), nickel (Ni), selenium (Se), zinc (Zn) and their compounds) (Fig.1.2). Forty-six Parties reported data on POPs (total PAHs, PCDD/Fs, HCB, PCBs), out of which all also reported data on additional PAHs (B(a)P, B(b)F, B(k)F, IP).

The quality of submitted data across varies significantly from country to country. When compiling the inventories, countries have to use the latest available version of the EMEP/EEA air pollutant emission inventory guidebook, which is the version of 2023 (*EMEP/EEA*, 2023). However, several countries still use the Guidebook 2019 (*EMEP/EEA*, 2019) or older versions. Uncertainty of reported data (national totals, sectoral data) is considered to be relatively high (*CEIP*, 2021). The completeness of reported data is not satisfactory for all pollutants and sectors either. Detailed information on recalculations, completeness and key categories, plus additional review findings, can be found in the annual CEIP technical inventory review reports and its Annexes (*CEIP*, 2024)[2,3].

1 The original submissions from the Parties can be accessed via the CEIP homepage on https://www.ceip.at/status-of-reporting-and-review-results/2024-submission

2 https://www.ceip.at/ceip-reports

3 https://www.ceip.at/status-of-reporting-and-review-results/2024-submission

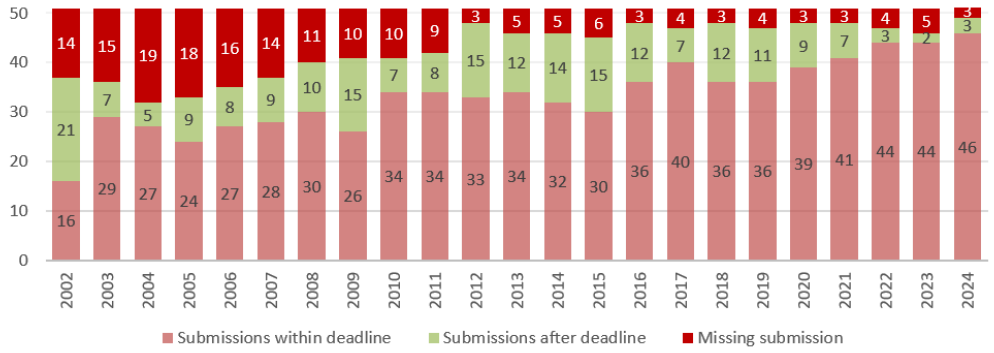


Fig. 1.1. *Number of Parties reporting emission data to EMEP since 2002, as of 11 June 2024.*

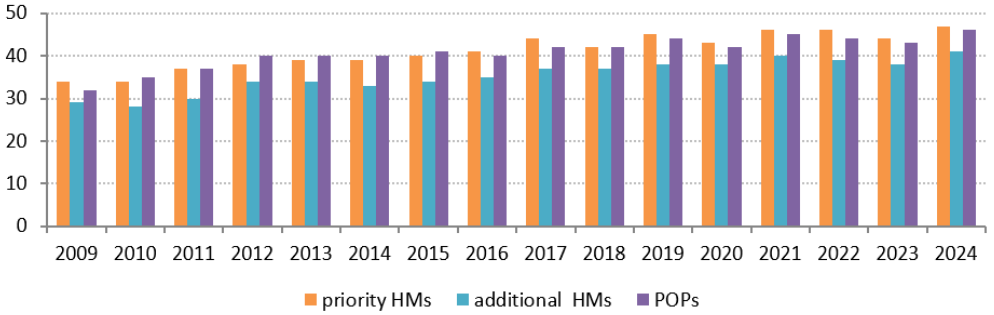


Fig. 1.2. *Number of Parties reporting of heavy metals and POPs to EMEP since 2009, as of 11 June 2024*

1.2. Emission trends in the EMEP area – reported data

For priority heavy metals and POPs the emission trends and completeness of reported data show a different picture for the EMEP-East and EMEP-West regions. The EMEP-West region includes the EU27 countries, Monaco, Albania, Bosnia & Herzegovina, North Macedonia, Montenegro, Serbia, Iceland, Liechtenstein, Norway, Switzerland and the United Kingdom. The EECCA countries and Türkiye are summarized in the EMEP-East region.

1.2.1 EMEP West area – POPs

The large fluctuations in emission trends of POPs for the EMEP-West region (Figure 3) are mostly due to individual countries. The high reductions of HCB from 2001 to 2002 are due to the strong decrease in emissions reported by Germany. Liechtenstein does not report PCB. Bosnia & Herzegovina does not report any data.

Table 1.1 shows reported data, and Fig. 1.3 demonstrates the indexed trend (year 2000 = 100%) for POPs 2000 to 2022 in the EMEP WEST area.

Table 1.1. *POPs 2000-2022 in the EMEP West area (reported data)*

	B(a)P (t)	B(b)F (t)	B(k)F (t)	IP (t)	PAHs (t)	PCDD/F (g I-TEQ)	HCB (kg)	PCBs (kg)
2000	285	311	148	149	971	8 160	4 040	9 628
2001	290	315	151	150	981	7 253	4 161	8 920
2002	285	308	147	146	987	7 014	878	8 207
2003	291	312	148	149	978	6 872	433	7 602
2004	290	310	147	147	977	6 642	373	6 994
2005	299	316	150	150	997	6 046	330	6 554
2006	309	323	153	153	1 023	5 389	333	6 220
2007	300	315	149	153	1 005	4 674	312	5 790
2008	314	330	156	160	1 037	4 092	274	5 397
2009	309	319	149	158	987	2 700	247	4 800
2010	332	342	159	169	1 066	2 823	277	4 646
2011	303	312	146	154	981	2 716	294	4 414
2012	317	327	152	163	1 018	2 730	283	4 179
2013	310	322	150	161	1 000	2 581	346	3 954
2014	282	292	137	145	914	2 448	389	3 781
2015	283	293	138	147	921	2 493	272	3 645
2016	289	298	141	149	937	2 418	341	3 531
2017	281	292	137	145	932	2 412	361	3 459
2018	282	297	142	147	931	2 427	283	3 347
2019	257	272	131	138	856	2 287	255	3 215
2020	252	264	126	134	823	2 214	179	3 033
2021	257	270	129	139	854	2 283	162	3 106
2022	233	247	119	128	776	2 161	151	2 940
Relative change 2000 to 2022	-18%	-21%	-20%	-14%	-20%	-74%	-96%	-69%
Change 2000 to 2022	-52	-65	-29	-20	-195	-5 999	-3 889	-6 688

From 2000 to 2022, **PCDD/F** emissions have been reduced by 74% (-5999 g I-TEQ) with major reductions between 2000 and 2010 (-65%). Major reductions are reported by Bulgaria(-2 726 g I-TEQ), France (-458 g I-TEQ), Slovakia (- 916 g I-TEQ), Romania (- 576 g I-TEQ) and Portugal (-306 g I-TEQ). All countries except Serbia (+35%) reported decreasing emissions since the year 2000. The strongest PCDD/F emissions reductions occurred in GNFR-sectors *D_Fugitive* (-2717 g I-TEQ) *A_PublicPower* (-1167 g I-TEQ), *J_Waste* (-1365 g I-TEQ) and *B_Industry* (-459 g I-TEQ). PCDD/F emissions from *C_OtherStationaryComb* have the highest share (37%) in 2022 but have been reduced by only -165 g I-TEQ since 2000.

From 2000 to 2020, **HCB** emissions have been reduced by 96% (-3889 kg) with major reductions between 2000 and 2002 (-78%, -3163 kg) which is mainly due to the reporting of Germany for G-NFR sector *B_Industry* (-2860 kg). All countries except Bulgaria, Latvia, Montenegro and Malta reported decreasing emissions since the year 2000. From 2002 to 2022, HCB emissions decreased by 83% (-727kg) with the largest decreases reported by Czechia (-224 kg), Hungary (-119 kg) and

Portugal (-102 kg). In 2022, HCB emissions from *A_PublicPower* have the highest share (35%, 53 kg), followed by *B_Industry* (31%, 47 kg).

From 2000 to 2022, **PCB** emissions have been reduced by 69% (-6688 kg) with major reductions in sector *B_industry* (-5312g) and *J_Waste* (-937 kg). All countries except Albania, Greece and Norway reported decreasing emissions since the year 2000.

From 2000 to 2022, **PAH** emissions have been reduced by 20% (-195 t) with major reductions in sector *B_Industry* (-74 t) and *C_OtherStationaryComb* (-85 t). All countries except Czechia, Germany, Finland, Italy, Luxembourg and Montenegro reported decreasing emissions since the year 2000.

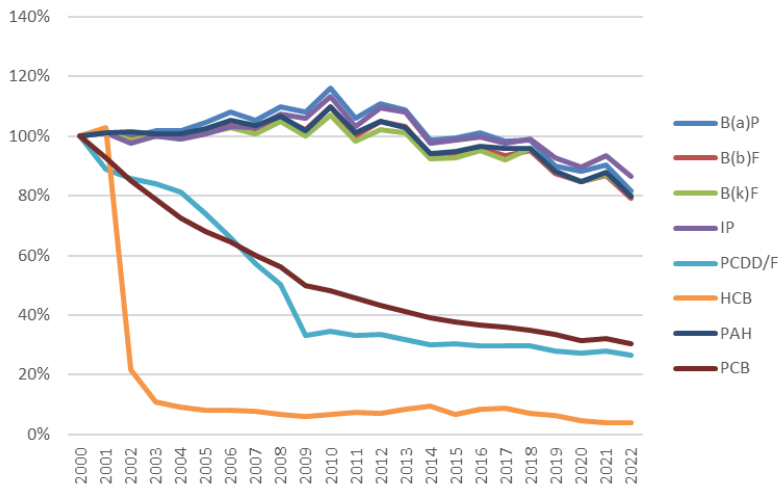


Fig. 1.3. *Emission trends of POPs 2000-2022 in the EMEP West area (reported data)*

1.2.2. EMEP East area – POPs

Reporting of POPs in the EMEP East region is quite incomplete and shows high peaks and inconsistent time series. The Russian Federation reported some POPs for the year 2000 and 2005 only and Türkiye did not report any POPs at all. Belarus did not report PAH for the year 2000. Ukraine did not report PAH for 2000 to 2003 and no PCCD/F, HCB and PCB for 2021 and 2022 as well as very high levels of HCB for 2004. Georgia reported complete time series but comparatively high values of HCB for 2014-2017 and 2020-2022 and unreasonably high levels of PCBs for 2000-2022 in G-NFR sector *B_Industry*. Kazakhstan reported complete time series but comparatively high values of PAH. Armenia reported incomplete data for 2007 and 2016 and complete data for 2018 to 2022. Moldova did not report data for 2021 and 2022.

Figure 1.4 shows emission trends of POPs 2002-2021 in the EMEP East area (reported data) excluding the Russian Federation, Ukraine, HCB from Kazakhstan, HCB from Georgia and PCDD/F from Kazakhstan. The trend and absolute values of PCDD/F emissions until 2020 are dominated by the reporting of Moldova and the strong drop in 2021 is due to missing data from Moldova. The trend and absolute values of B(a)P emissions and other PAH components, including the drop in

2021 B(k)F and IP emissions, are dominated by the reporting of Kazakhstan. The up/down trend of HCB emissions 2016 to 2019 and the drop in 2022 is dominated by the reporting of Belarus. The peak of PCB emissions 2021 is due to the reporting of Kazakhstan.

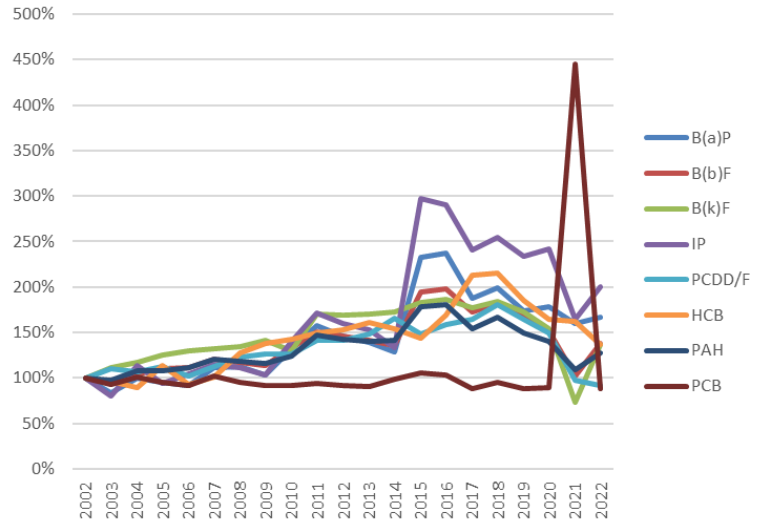


Fig. 1.4. *Emission trends of POPs 2002-2022 in the EMEP East area (reported data) excluding the Russian Federation, Ukraine, HCB from Kazakhstan, HCB from Georgia and PCDD/F from Kazakhstan.*

1.2.3. EMEP West area – priority heavy metals

Priority heavy metals of the EMEP West area show a rather smooth downwards trend and a dip in the year 2009, which reflects the economic recession leading to lower industrial production in that year (Fig. 1.5). The strong decrease of Pb emissions from 2000 to 2002 is mainly due to lower emissions in the transport sector in Italy and Spain.

The continuous decrease of Hg emissions since the year 2010 is mainly due to decreases reported by France, Germany, Italy, Poland and the United Kingdom. The downward and upward trends in Hg emissions 2019 to 2021 are dominated by Germany, Italy, Poland and Spain. The drop in 2022 Hg emissions (-8%) is dominated by Italy (-13%), Poland (-17%) and the United Kingdom (-10%).

The decreasing Pb emissions trend 2019 to 2020 (-12%) is mainly due to lower emissions reported by France (-13%), Germany (-9%), Spain (-16%), United Kingdom (-16%), Italy (-12%), Poland (-7%) and Serbia (-31%). The increase in 2021 Pb emission (+10%) is mainly due to the United Kingdom (+27%), Italy (+19%), Spain (+16%) and Germany (+9%).

The decreasing Cd emissions trend 2018 to 2020 (-9%) is mainly due to lower emissions reported by Germany (-9%), Spain (-13%), Poland (-9%), the Netherlands (-21%), Italy (-11%), Greece (-24%) and the United Kingdom (-9%).

Table 1.2 and Fig. 1.5 show reported data and trends for priority heavy metals 2000 to 2022 in the EMEP West area.

Table 1.2. *Priority heavy metals 2000-2022 in the EMEP West area (reported data).*

	Cd (t)	Hg (t)	Pb (t)
2000	122	105	4 500
2001	115	98	3 444
2002	112	98	2 889
2003	106	94	2 749
2004	101	90	2 521
2005	97	88	2 353
2006	96	85	2 298
2007	92	81	2 228
2008	88	77	2 086
2009	79	66	1 734
2010	80	68	1 795
2011	79	68	1 509
2012	74	65	1 445
2013	71	61	1 405
2014	70	60	1 410
2015	70	57	1 379
2016	70	54	1 320
2017	70	54	1 355
2018	70	53	1 344
2019	68	49	1 306
2020	64	44	1 154
2021	65	46	1 274
2022	62	42	1 262
Relative change 2000 to 2022	-49%	-60%	-72%
Change 2000 to 2022	-60	-63	-3 238

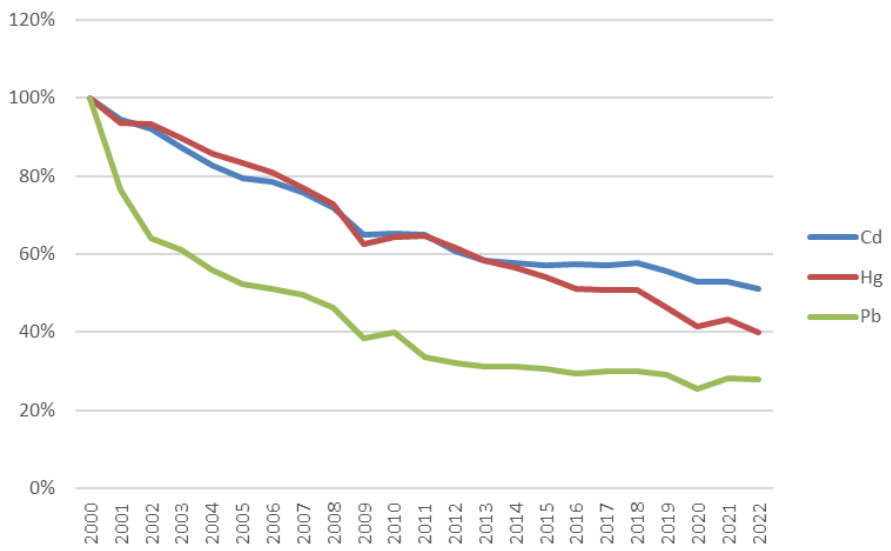


Fig. 1.5. *Emission trends of priority heavy metals 2000-2022 in the EMEP West area (reported data).*

1.2.4. EMEP East area – priority heavy metals

Unlike EMEP West, priority heavy metals of the EMEP East area show an unstable trend from 2000 to 2007, which is mainly due to incomplete reporting (Fig. 1.6). The Russian Federation has been excluded from Figure 6 because reported data for heavy metals is only available for the years 2000, 2002 to 2006 and 2009 with a high contribution to the EMEP East area for those years.

Belarus did not report heavy metals for 2000. Moldova did not report for 2021 and 2022 and Armenia did not report for 2000-2015 except for the years 2007 and 2014.

The increase in Cd emissions from 2000 to 2004 is mainly due to reporting of Ukraine for GNFR sector *B_Industry*. The drop from 2020 to 2022 Cd emissions is mainly due to reporting of Ukraine for GNFR sectors *B_Industry* and *A_PublicPower*.

The peak in Hg emissions in the period 2016-2017 and the drop in 2021 is mainly due to the reporting of Kazakhstan and the peak in the period 2019-2020 is due to the reporting of Ukraine, both for the GNFR sector *B_Industry*. The high level of Hg emissions from 2018 is due very high emissions reported by Armenia for 2018 (GNFR sector *E_Solvents*, the value is about 400 times higher than for 2017 and 2019).

The upward and downward trend in Pb emissions for the period 2004 to 2020 and the drop in 2022 is mainly due to very high emissions reported by Ukraine (factor of 3 higher than for previous years).

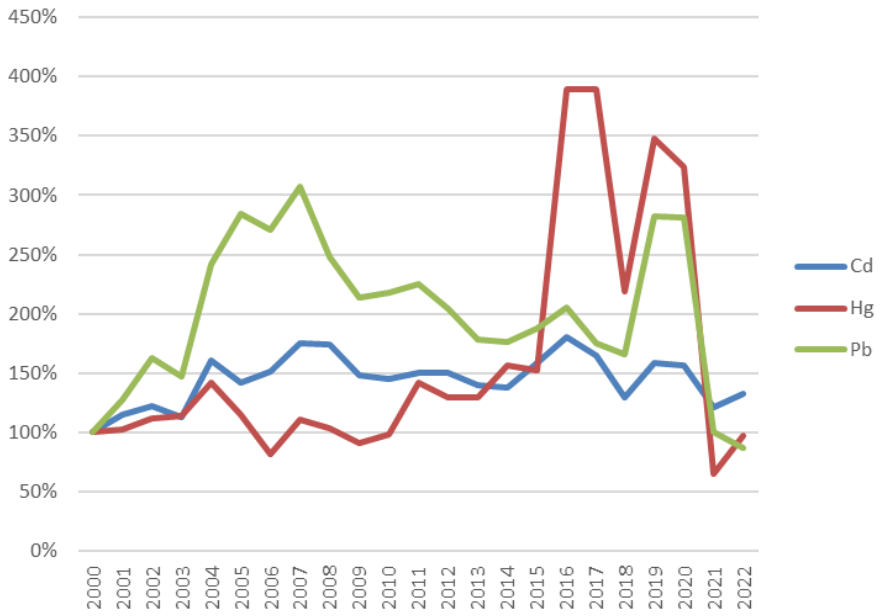


Fig. 1.6. *Emission trends of priority heavy metals 2000-2022 in the EMEP East area (reported data) excluding the Russian Federation.*

1.3. Comparison of 2021 data reported in 2023 and in 2024

Emission data for 2021 reported in 2024 were compared with 2021 emissions reported in 2023. For 20 countries, data changed by more than ±15 % for at least one pollutant (see Figure 7 and Appendix 2). Georgia was the only country which did not revise heavy metals or POPs emissions for 2021.

Iceland reported recalculations for Cd by more than 250% (see right part of Fig. 1.7, which is displayed in logarithmic scale).

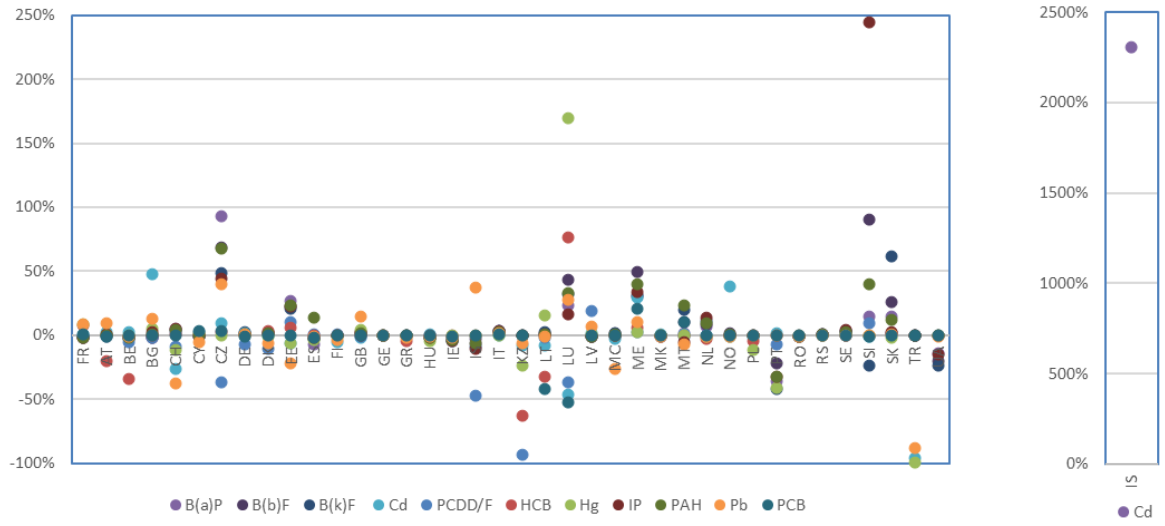


Fig. 1.7. *Recalculations between the 2024 and 2023 submission for 2021 values (reported data). The separate chart on the right shows countries and pollutants with recalculations > 250%, expressed as factors in logarithmic scale.*

1.4. Data sets for modellers in 2022

Data used by CEIP were reported by the Parties to the Air Convention as sectoral emissions (NFR19) and National Total emissions according to the UNECE guidelines for reporting emissions and projections data under the LRTAP Convention, Annex I (*UNECE*, 2022).

Reported (NFR[4]) sector data were aggregated to 13 GNFR sectors. In several cases, no data were submitted by the countries, or the reporting was not complete or contained errors. Before modellers can use such emission data, missing or erroneous information has to be filled in or replaced by expert estimates. To gap-fill missing/erroneous data, CEIP typically applies different methods. The gap-filling procedure is fully documented every year in the technical reports which can be

4 NFR – Nomenclature for Reporting

downloaded from the CEIP website[5]. After the gap-filling, sector emissions are used for spatial distribution (mapping) to the EMEP grids.

The Parties for which reported data were (partly) replaced are listed in Annex A.3.

1.4.1. Contribution of individual sectors to total EMEP heavy metals and POPs emissions

Figure 1.8 shows the contribution of each GNFR sector to the total emissions of individual air pollutants (Cd, Hg, Pb, B(a)P, B(b)F, B(k)F, IP, PAHs, PCDD/F, HCB, PCB). To provide as complete a picture as possible of the share of the individual sectors in total EMEP emissions, data as used for EMEP models (i.e. gap-filled data) were used for the calculations. The analysis does not include sea regions.

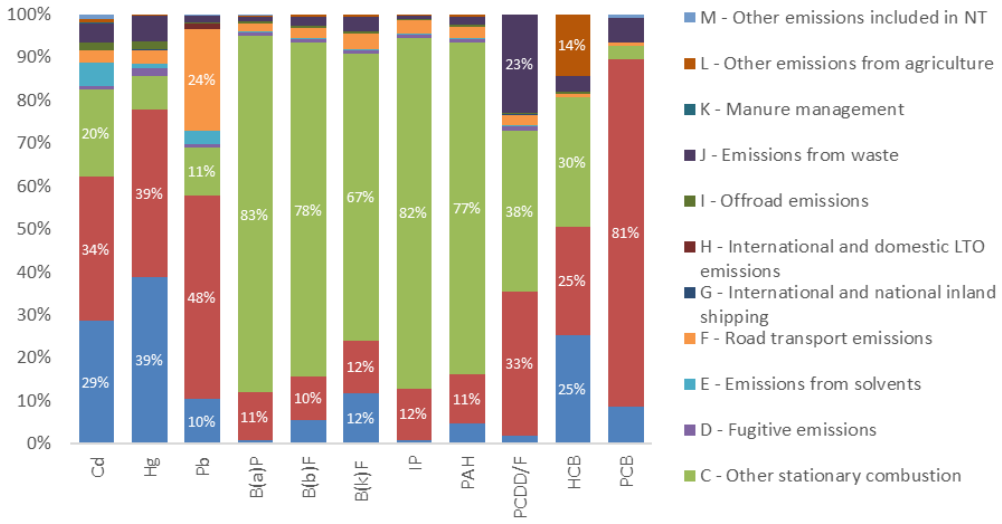


Fig. 1.8. *GNFR sector contribution to national total emissions in 2022, EMEP area without sea regions (only percentages above 10% are labelled).*

It is evident that the combustion of fossil fuels and processing of raw materials is responsible for a significant part of heavy metals and POPs emissions. Industry production emits about 34 % of **Cd** emissions, followed by 29% from public power and heat plants. Energy industries (mainly from coal power plants) emit about 39% of total **Hg** emissions, followed by manufacturing industries, which also released about 39% of total emissions. About 48% of **Pb** emissions are released by the industry production sector and road transport (leaded gasoline) contributes 24%.

The largest source of **PAHs** and its compounds (B(a)P, B(b)F, B(k)F, IP) is the 'other stationary combustion' sector, which contributes 77% of total PAH emissions. The main source of PAH emissions are coal and wood stoves/boilers in households. About 11% of PAH emissions are related to the industry production sector. Sector 'other stationary combustion' sector contributes 38% to

5 https://www.ceip.at/ceip-reports

total **PCDD/F** emissions, mainly from coal and wood stoves/boilers in households and Industry production plants (metal industries) contribute 33%. The waste sector contributes 23% to **PCDD/F** emissions of which Spain contributes to about 26%. With 30% of total emissions, 'Other stationary combustion' contributes most to HCB emissions, followed by public electricity and heat production with a share of 25% and industry production with a similar share. Another large source of **HCB** emissions is the agriculture sector with a share of 14%. The dominating sector for **PCB** emissions is the industrial sector, which contributes 81% to total emissions.

Figure 1.9 illustrates the sector contribution for the EMEP West region and the EMEP East region. North Africa is included in the EMEP East region. The comparison of both graphs highlights some significant differences between West and East.

The continuous revision of inventory data for many countries shows that POPs emissions have the highest uncertainties of all pollutant groups. In addition, data for MSC-E is subject to incomplete reporting or delays in reporting. Especially for POPs, one should therefore draw conclusions carefully when comparing the shares between MSC-E and MSC-W.

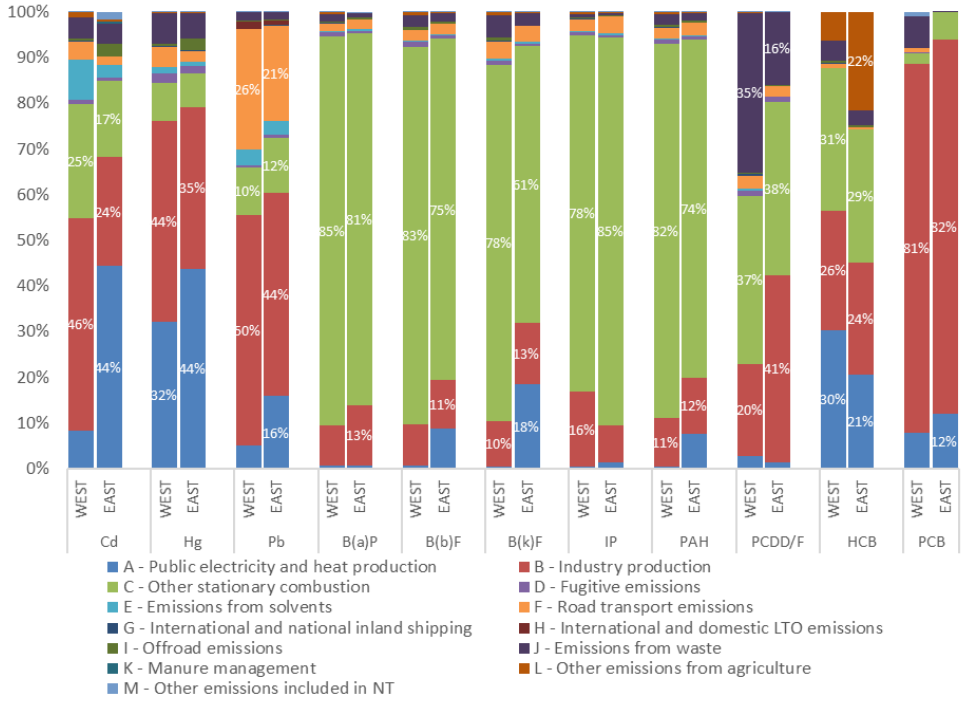


Fig. 1.9. *GNFR sector contribution to national total emissions in 2022 for the EMEP West and EMEP East areas (Only percentages above 10% are labelled. 'Remaining Asian Areas' are included in the EMEP East region and North Africa is included in the EMEP West region).*

1.4.2. Reporting of gridded data

After the first round of submissions in 2017, 2021 was the second year for which EMEP countries were obliged to report gridded emissions in the grid resolution of 0.1°x0.1° (long/lat). 36 of the 48

countries which are considered as a part of the EMEP area reported sectoral gridded emissions in the new resolution until June 2024. In 2024 only four countries provided new information about their gridded emissions.

The majority of gridded sectoral emissions in 0.1°x0.1° (long/lat) resolution have been reported for the year 2015 and 2019 (33 countries). For 2016, 2018 and 2020 by five countries as well as for 2017, 2021 and 2022 by four countries. Compared to the 2017 reporting, gridded data are available for 13 additional countries in 2024.

Reported gridded sectoral data in 0.1°x0.1° (long/lat) resolution, which can be used for the preparation of gridded emissions for modellers, covers less than 50% of the grid cells of all reporting Parties. For the remaining areas missing emissions are gap-filled and spatially distributed using expert estimates. Reported grid data can be downloaded from the CEIP website[6]. An overview of gridded data in 0.1°x0.1° (long/lat) resolution reported in 2017, 2021 and 2024 is provided in Table 1.3.

Table 1.3. *Gridded emissions reported until 2017, 2021 and 2024*

Country	**2017** Gridded data available for the years…	**2021** Gridded data available for the years…	**2024** Gridded data available for the years…	**Comments**
Austria	2015	2000, 2005, 2010, 2015, 2019	2000, 2005, 2010, 2015, 2019	
Belgium	2015	2015, 2019	2015, 2019	
Belarus		2019	2019	
Bulgaria	2015	2015, 2019	2015, 2019	
Croatia	1990, 1995, 2000, 2005, 2010, 2015	1990, 1995, 2000, 2005, 2010, 2015, 2019	1990, 1995, 2000, 2005, 2010, 2015, 2019	
Cyprus		1990, 1995, 2000, 2005, 2010, 2015, 2019	1990, 1995, 2000, 2005, 2010, 2015, 2019	
Czechia	2015	2015, 2019	2015, 2019	
Denmark	2015	2015, 2019	2015, 2019	
Estonia		1990, 1995, 2000, 2005, 2010, 2015, 2019	1990, 1995, 2000, 2005, 2010, 2015, 2019	

6 https://www.ceip.at/status-of-reporting-and-review-results/2024-submission

Country	2017 Gridded data available for the years…	2021 Gridded data available for the years…	2024 Gridded data available for the years…	Comments
Finland	2014, 2015	1990, 1995, 2000, 2005, 2010, 2014, 2015, 2016, 2017, 2018, 2019	1990, 1995, 2000, 2005, 2010, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022	
France		2015, 2019	2015, 2019	
North Macedonia		2015, 2019	2015, 2019	
Georgia		2015	2015	
Germany		1990, 1995, 2000, 2005, 2010, 2015, 2019	1990, 1995, 2000, 2005, 2010, 2015, 2019	
Greece		2015, 2019	2015, 2019	
Hungary	2015	2015, 2019	2015, 2019	
Iceland		2015, 2019	2015, 2019	Gridded data was reported only for POPs
Ireland	2015	2015, 2019	2015, 2019	
Italy		2015, 2019	2015, 2019	Reported gridded data was replaced by Copernicus Atmospheric Monitoring Service (CAMS) and EDGAR proxies
Latvia	2015	2015, 2019	2015, 2019	
Lithuania	2015(b)	2015, 2019	2015, 2019	(b) Reported gridded emissions only on national total level, which could not be used for the gridding, which is done on sectoral level
Luxembourg	2015	2015, 2019	2015, 2019	
Malta		2016, 2019	2016, 2019	
Monaco	2014, 2015	2014-2019	2014 - 2022	
Netherlands		1990, 1995, 2000, 2005, 2010, 2015, 2019	1990, 1995, 2000, 2005, 2010, 2015, 2019	
Norway	1990, 1995, 2000, 2005, 2010, 2015	1990, 1995, 2000, 2005, 2010, 2015, 2019	1990, 1995, 2000, 2005, 2010, 2015, 2019	
Poland	2014, 2015	2014, 2015, 2018, 2019	2014, 2015, 2018, 2019	

Country	2017 Gridded data available for the years…	2021 Gridded data available for the years…	2024 Gridded data available for the years…	Comments
Portugal	2015	2015, 2019	2015, 2019	The spatial disaggregation of sector 'F – Road Transport' was replaced by CAMS proxies
Romania	2005	2005, 2015	2005, 2015	
Serbia			2020	Reported gridded data was replaced by CAMS proxies
Slovakia	2015	2015, 2019	2015, 2019	
Slovenia	2015	2015, 2019	2015, 2019	
Spain	1990-2015	1990-2019	1990-2022	The spatial disaggregation of sector 'F – Road Transport' was replaced by CAMS proxies
Sweden		1990, 2000, 2005, 2010, 2015, 2019	1990, 2000, 2005, 2010, 2015, 2019	
Switzerland	1980-2015	1980-2019	1980-2022	
United Kingdom	2010, 2015	2010, 2015, 2019	2010, 2015, 2019	

1.4.3. Gridded data of 2022 in resolution 0.1° x 0.1° (long/lat)

This year, gap-filling and gridding was done for the year 2022 in 0.1° x 0.1° longitude/latitude resolution on GNFR sector level.

The 0.1° x 0.1° GNFR grids of heavy metals (Cd, Hg, Pb) and POPs (B(a)P, B(b)F, B(k)F, IP, PCDD/Fs, HCB) were spatially distributed based on the gridding system developed by CEIP. A map of total Pb emissions in 2022 is shown in Fig. 1.10 as an example. The system is module based and uses as a first step reported gridded emission data for each country and sector where it is available and usable. If no reported gridded data in the 0.1° x 0.1° (long/lat) resolution is available, Global unintentional POP Emissions data from the Emission Database for Global Atmospheric Research (EDGAR v6.0) (JRC, 2021) is used as a proxy for spatial disaggregation of POP emissions. In case of HM emissions reported gridded PM data is used as a proxy for spatial disaggregation if no reported gridded data in the 0.1° x 0.1° (long/lat) resolution is available. If reported PM data or POP data from EDGAR v6.0 is not available either, PM data from the Copernicus Atmospheric Monitoring Service (CAMS-81, CAMS-REG-AP) and EDGAR 5.0 (JRC 2019) is used as a proxy.

Reported gridded data in 0.1° x 0.1° (long/lat) resolution was used from Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Latvia, Luxembourg, Malta, Monaco, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Spatial distributions of anthropogenic emissions in 2022 of heavy metals and PAHs considered in the report are shown in Figs. 1.11 and 1.12, respectively.

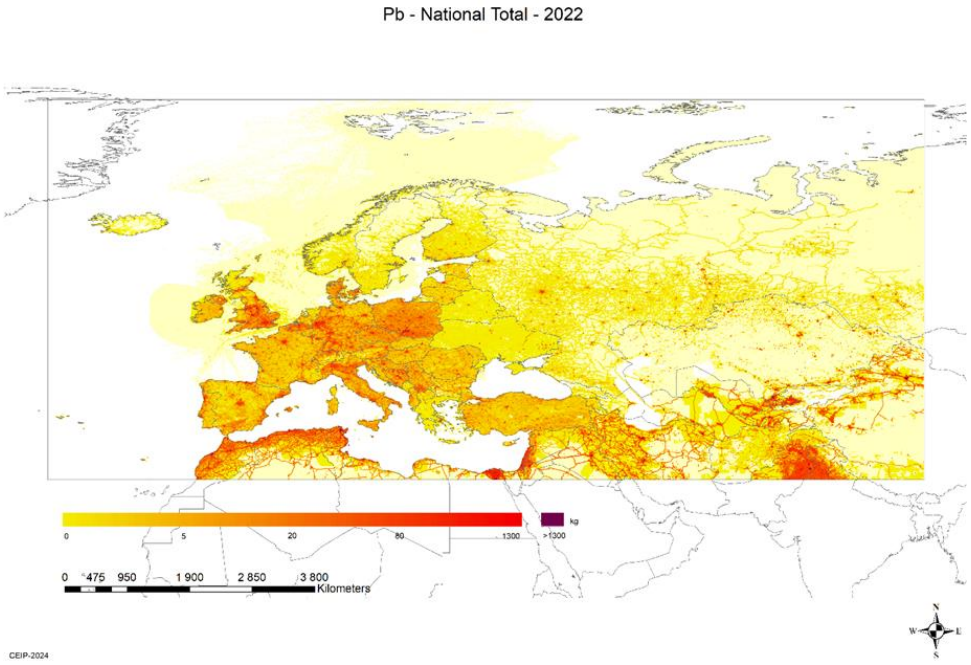


Fig. 1.10. *Visualized gap-filled and gridded Pb emissions in 0.1 °x0.1 ° long-lat resolution.*

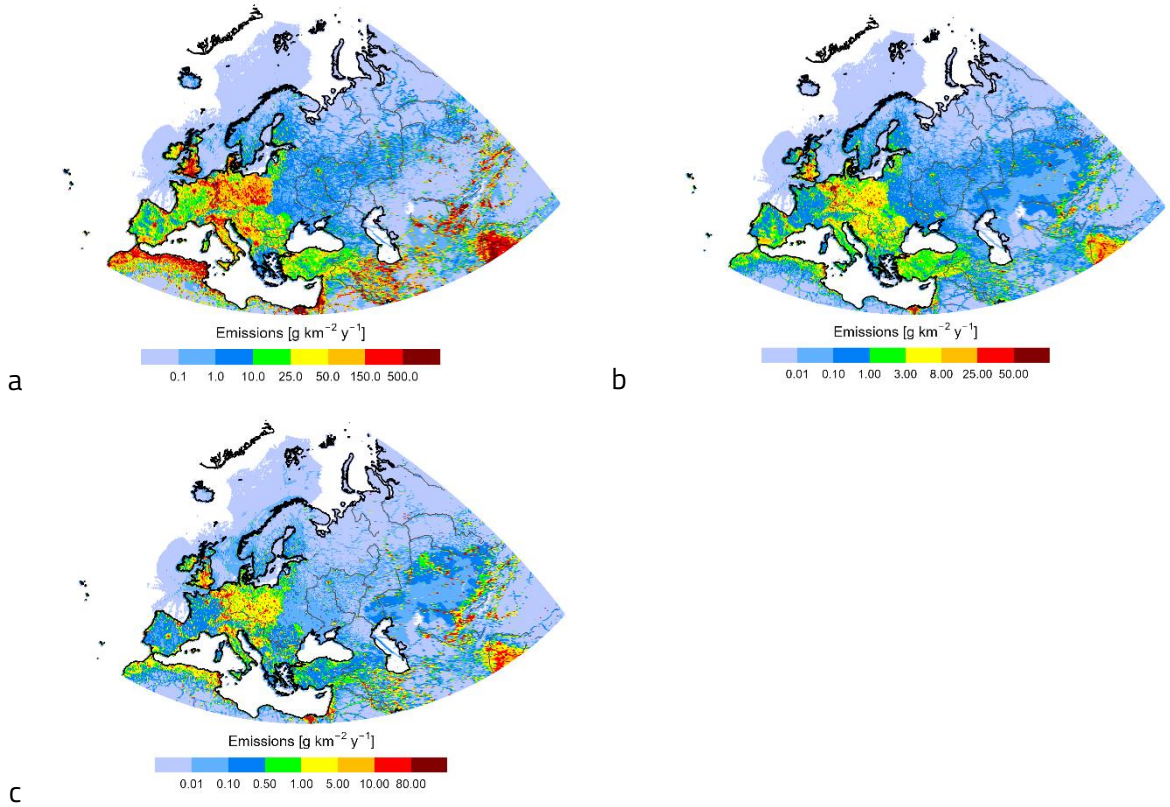


Fig. 1.11. *Annual anthropogenic emissions of Pb (a), Cd (b), and Hg (c) in 2022*

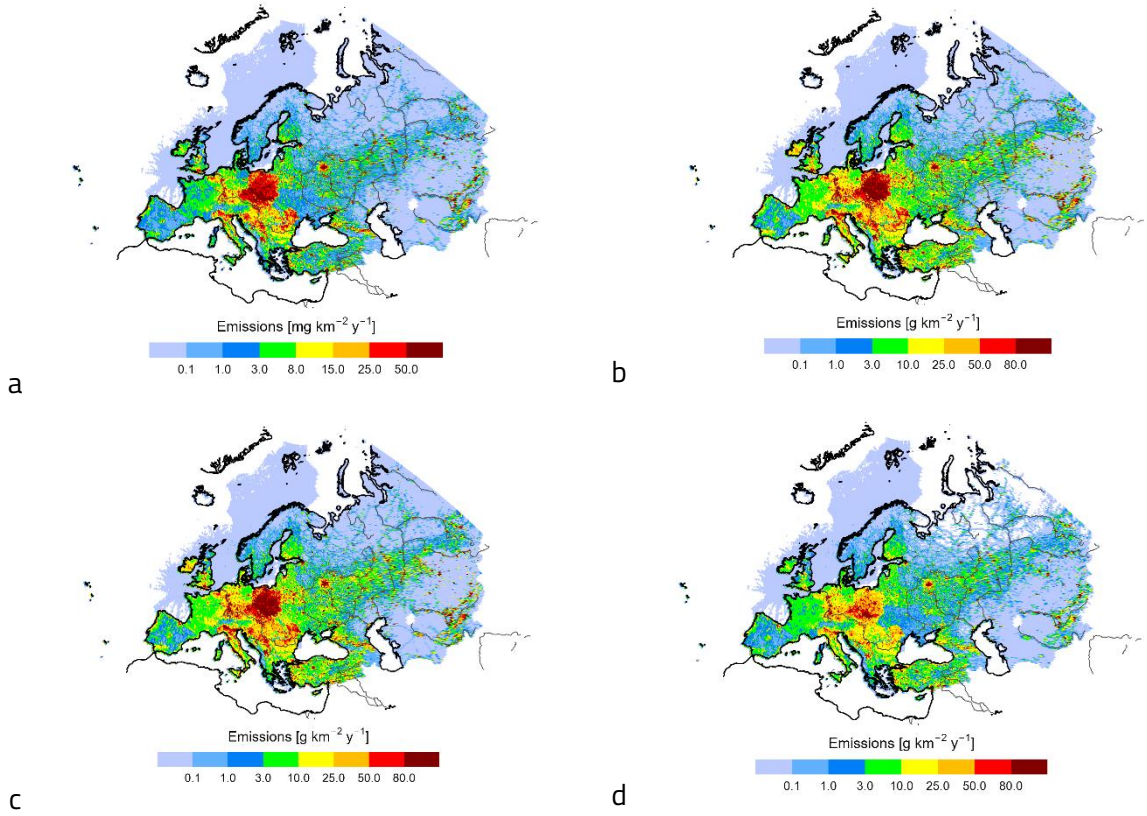


Fig. 1.12. *Annual anthropogenic emissions of B(a)P (a), B(b)F (e), B(k)F (c), and IP (d) in 2022*

1.4.3. Significant changes in data set for modellers between 2022 and 2021

National totals of gap-filled data used in models in the year 2024 are compared with national totals of gap filled-data used in 2023 (for more details see Annex A.2).

Table 1.4 shows countries and substances for which gap-filled data changed by more than ± 15%. Cases, where PAH has been calculated by adding up the four individual (reported) compounds are not listed because changes are mainly a matter of reported data.

Table 1.4. *Changes in gap-filled data for 2022 from 2021 greater than ± 15%.*

Country	Pollutant	Change	Comment[7]
Albania	HCB	-88%	new reported
	PAH	-88%	
	PCDD/F	-100%	
Armenia	PAH	74%	reported (with minor gap filling for industry)
Kazakhstan	Hg	-46%	new reported
	PAH	24%	
	Pb	-85%	

7 'New reported' means, that 2021 data has been gap-filled and 2022 data has been reported.

Country	Pollutant	Change	Comment[7]
Spain	PAH	53%	reported (including gapfilling of iron and steel industries)
Türkiye	Cd	83%	reported (with some gapfilling)
	Hg	-43%	
Iceland	PAH	29%	reported (with minor gapfilling)
Poland	PAH	-15%	reported (with minor gapfilling)
Portugal	PAH	-32%	reported (with minor gapfilling)
Czech Republic	PAH	55%	reported (with minor gapfilling)
Malta	PAH	124%	new reported
Azerbaijan	Cd	77%	new reported
	HCB	272%	
	Hg	-28%	
	PAH	20%	
	Pb	-72%	
	PCB	-97%	
	PCDD/F	-34%	
Kyrgyzstan	Cd	-50%	new reported
	HCB	-72%	
	Hg	-66%	
	PAH	54%	
	Pb	-58%	
	PCB	55%	
	PCDD/F	96%	
Luxembourg	PAH	33%	reported (with minor gapfilling)
	PCB	-53%	reported (with correction of National total)
Croatia	HCB	-36%	new reported
	Pb	33%	
	PCB	-99%	
Austria	PAH	-21%	reported (with minor gapfilling)
Estonia	PAH	27%	reported (with minor gapfilling)
Lithuania	PCB	-44%	new reported

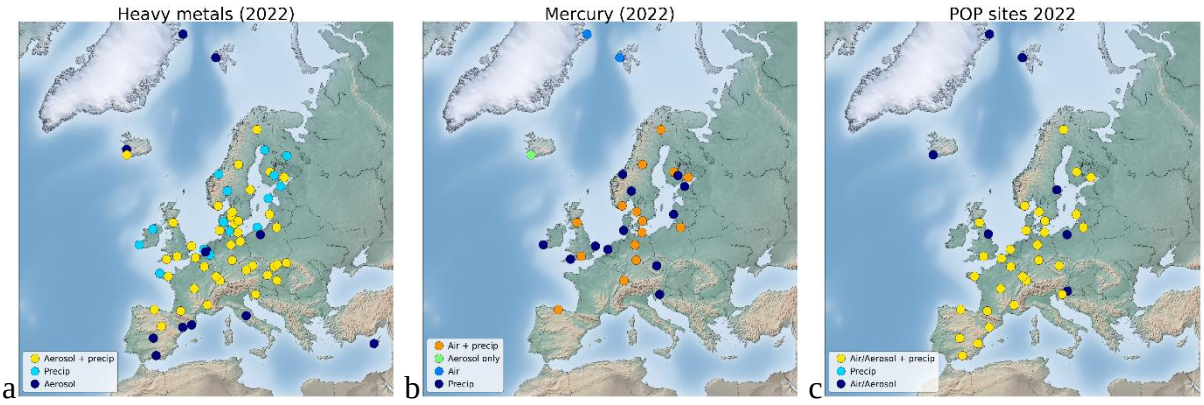
2. Monitoring of heavy metals and POPs

Heavy metals and persistent organic pollutants (POPs) were included in EMEP's monitoring program in 1999. However, earlier data have been reported and are available. The EMEP database, especially for heavy metals, thus also includes older data, even back to 1976 for a few sites. A number of countries have been reporting heavy metals and POPs within the EMEP area in connection with different national and international programmes such as HELCOM, AMAP and OSPARCOM.

The EMEP monitoring strategy (UN/ECE, 2019) defines the monitoring obligations for the Parties. For POPs, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), hexachlorobenzene (HCB), chlordanes (CHLs), lindane/γ-hexachlorohexane (γ-HCH), -HCH, and DDT/DDE are part of the compulsory monitoring programme, while for heavy metals, Hg, Cd and Pb are 1st priority elements while Cu, Zn, As, Cr, Ni are 2nd priority. In addition to these compounds several Parties report other POPs and trace elements. In addition to regulated POPs, it is recommended to increase the attention on organic contaminants of emerging concerns (CECs). A specific chapter is devoted to this topic.

All the data are available from the EBAS database (http://ebas.nilu.no/), and more detailed information about the sites and the measurement methods, these are found in EMEP/CCC's data report on heavy metals and POPs (Aas et al., 2024a).

Figure 1 shows an overview of which sites have reported data to EMEP in 2022. In 2022, there were 40 sites measuring heavy metals in both aerosols and precipitation, and altogether there were 67 measurement sites. 29 sites were measuring mercury in either air and precipitation, 15 of these with co-current measurements in air and precipitation. For POPs it was in total 37 sites reporting data in 2022, of these 30 sites measured in both aerosol and in precipitation or deposition. In total, respectively 21,15 and 16 Parties to the Convention report heavy metals, mercury and POP data to EMEP.



a b c

Fig. 2.1. *Overview of sites measuring heavy metals (a), mercury (b) and POPs (c) in 2022*

2.1. Monitoring of heavy metals

There are about 30 different trace elements that have been reported to EMEP in 2022. The most common elements are Pb, Cd, As, Ni measured at more than 50 sites while Zn, Cr, Cu Mn, V, Co and Fe at 20 or more sites. Annual averages of As, Cd, and Pb concentrations in aerosols in 2022 are presented in Figure 2 and in precipitation in Figure 3. The highest concentrations for these elements in aerosols are generally observed around the British Channel and areas with high ship traffic, as well as in Eastern Europe, specifically in Slovakia and Hungary. For precipitation, the highest levels are seen in Eastern Europe, but elevated levels are also observed at other sites, such as in Spain and Ireland, depending on the component.

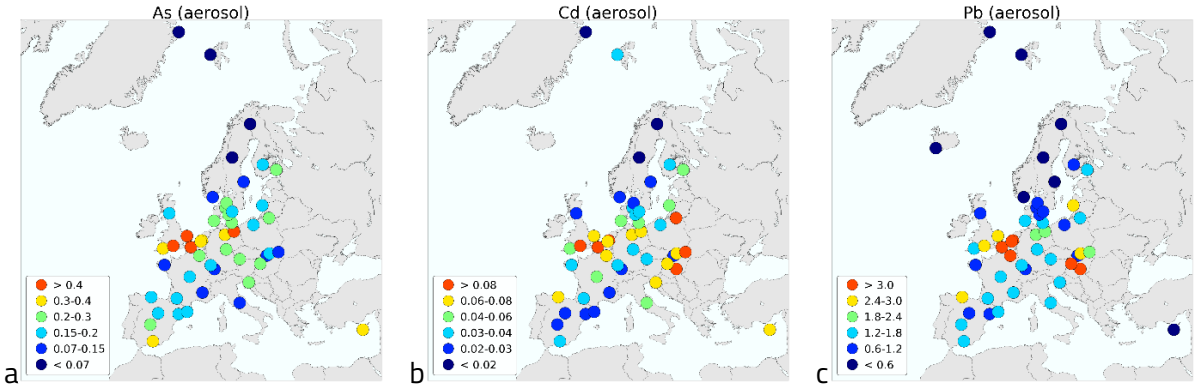


Fig. 2.2. *Annual mean concentrations of As (a), Cd (b), and Pb (c) in aerosols (ng/m^3) in 2022.*

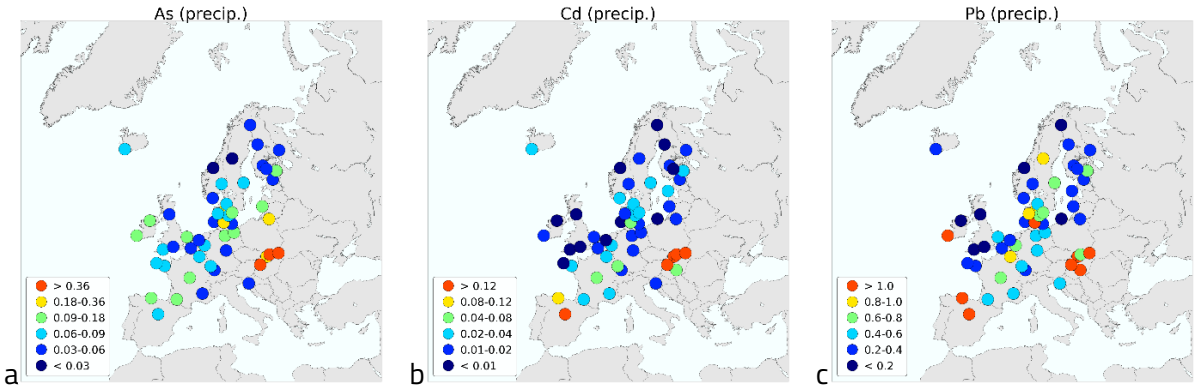


Fig. 2.3. *Volume weighted annual mean concentrations of As (a), Cd (b), and Pb (c) in precipitation (mg/L) in 2022.*

2.2. Monitoring of Hg

For total gaseous and elemental mercury, the highest concentration in 2022 is seen in Germany and UK, followed by the arctic Norwegian site, whereas the largest mercury emitters are Türkiye, Germany, Poland and Italy. Except for the site in Spain and in southern Germany, there is a tendency of higher Hg in concentrations in central Europe close to the emissions sources compared to northern Europe. In precipitation, the highest concentrations are observed in The Netherlands, Spain, Germany and Sweden, if excluding the sites with high detection limits in Ireland. Lowest concentrations are observed in Czechia, Estonia, Slovenia and Finland, if excluding the extremely low concentrations in Latvia. As for Hg in air, there seems to be a north-south gradient of Hg in precipitation, with higher concentrations in central Europe and lower concentrations far from the emissions sources.

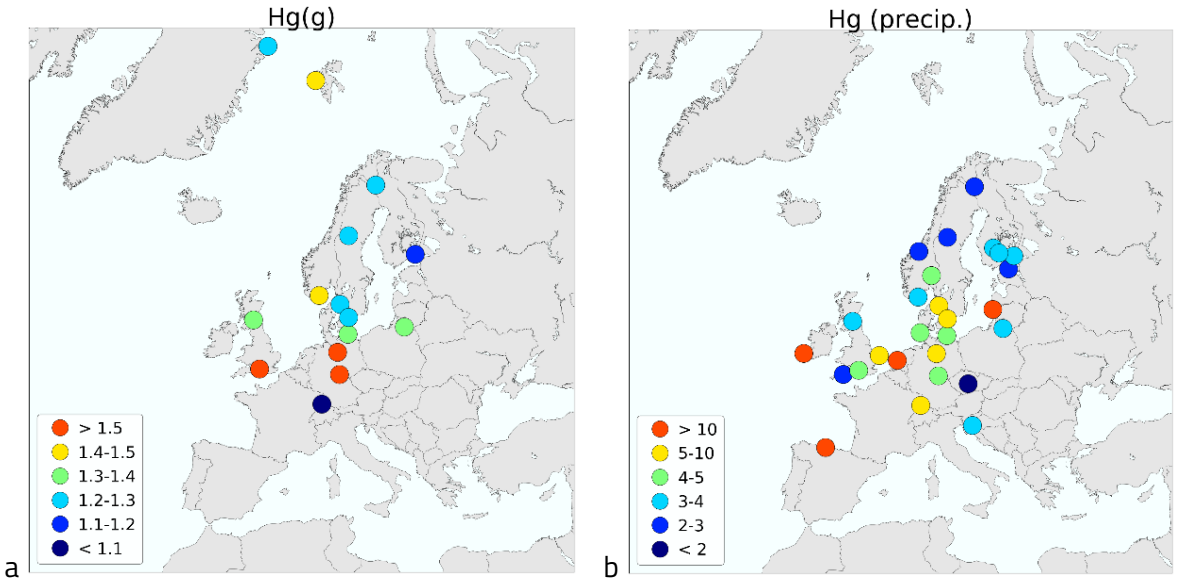


Fig. 2.4. *Annual mean concentrations of total- or gaseous elemental mercury in air (a, ng/m3) and volume weighted average concentrations of mercury in precipitation (b, ng/L) in 2022*

2.3. Trend analysis of Hg concentrations in air and precipitation

Since 2000, 13 countries and in total 36 sites have reported concentration data for total gaseous and elemental Hg in air, and 15 countries and in total 33 sites have reported concentration data for Hg in precipitation. To calculate trends, the Mann-Kendall test for trends and the related Theil-Sen slope calculation analysis was applied to annual and seasonal mean concentration data for total gaseous and elemental mercury in air and in precipitation. To assess statistical significance in temporal trends, at least 8 – 10 years of measurements are needed. Because trends may change over time, comparison of trend magnitudes between sites with different temporal coverages should be avoided. Therefore, in this trend evaluation the concentration data need to fulfil the following

three criteria: 1) data must be reported for minimum nine months within a year, 2) data must be reported for minimum 75% of the total number of years and 3) data must be reported in 2022. If these criteria are not met, the site is left out of the trend calculation. Further, the sites where most of their measurements are below the analytical detection limits are excluded, i.e. the measurements in precipitation from IE0001R, CZ0003R and LV0010R. Trend calculations have been done for two time periods; from 2000 to 2022 and from 2010 to 2022.

The average temporal trends within EMEP for total gaseous and elemental Hg in air and in precipitation have significantly declined between 2000 and 2022 (Figure 5) and between 2010 and 2022 (Figure 6). The mean concentration decline of Hg in air was -0.6% pr year between 2000 and 2022, whereas -1.3% pr year between 2010 and 2022. The mean concentration decline for Hg in precipitation was -1.8% pr year between 2000 and 2022, whereas -3.2% pr year between 2010 and 2022.

Furthermore, for Hg in air there is hardly any difference in the median seasonal trends whereas for Hg in precipitation, there is a tendency of a faster decline in the Hg concentration during winter compared to summer for the time period between 2000 and 2022. For both Hg in air and precipitation, the mean seasonal trends are obscured by some extreme values. Looking at the time period between 2010 and 2022, the average seasonal change is somewhat similar, although the variability in the trend pr season is larger, which might be due to the larger number of sites included in the calculation possibly including data reported with large measurement uncertainties.

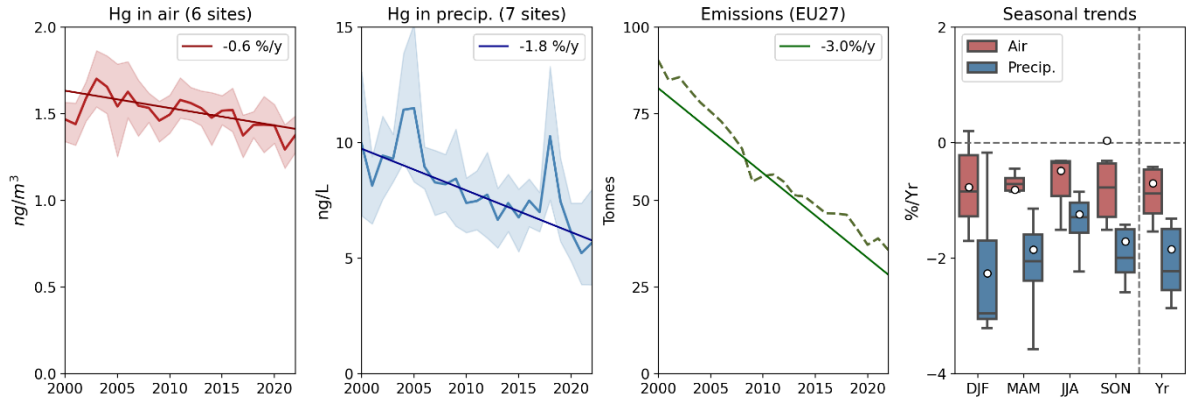


Fig. 2.5. *Trends in mercury from 2000–2022 for EMEP observations in air and precipitation. The solid line in the time series plots indicate the average annual mean concentrations for all the sites and the shaded area the 95% confidence interval. The box plot represents the 50th, 25th, and 75th percentiles and the whiskers lie within the 1.5 inter-quartile ranges for the trends of all the sites, including those with not significant trends. In addition, the mean trends are indicated with white circles.*

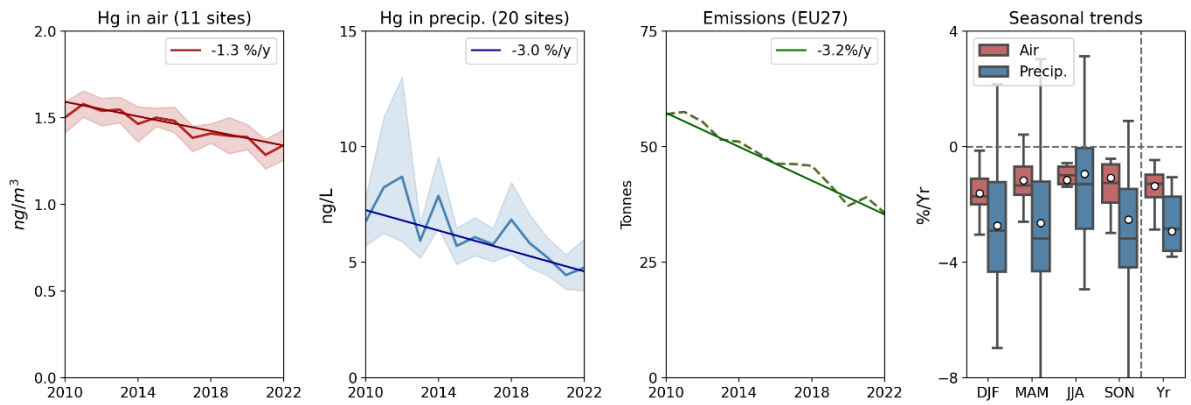


Fig. 2.6. *Trends in mercury from 2010–2022 for EMEP observations in air and precipitation. The solid line in the time series plots indicate the average annual mean concentrations for all the sites and the shaded area the 95% confidence interval. The box plot represents the 50th, 25th, and 75th percentiles and the whiskers lie within the 1.5 inter-quartile ranges for the trends of all the sites, including those with not significant trends. In addition, the mean trends are indicated with white circles.*

European emissions decline at a faster rate than the concentration of Hg in air. The concentration of Hg in air measured at the sites within EMEP is not only influenced by European emissions but is also largely affected by global emissions. There are large uncertainties concerning global Hg emissions, however there are indications that they have been quite stable in recent years. In addition, there are uncertainties in the long-term dynamics of primary anthropogenic and secondary emissions.

Figure 7 and 8 show the times series of Hg in air and precipitation (for the sites included in the trend calculation) between 2000 and 2022, and 2010 and 2022 respectively. The time series show large inter-annual variability, that may to some extent be caused by the measurement uncertainty. All sites with measurements of Hg in air extending back to the early 2000 shows significant decreasing trends of varying magnitude, except the site in Poland showing an increasing trend, though this increasing trend is not significant. Comparing trends between the two time periods, the trends seem to decline at a faster rate since 2010 compared to the complete time period. Though firm conclusions are difficult to draw. Looking at the shorter time series, the relative number of sites with significant trends is less than in the longer times series, which emphasizes the importance of continued long-term monitoring.

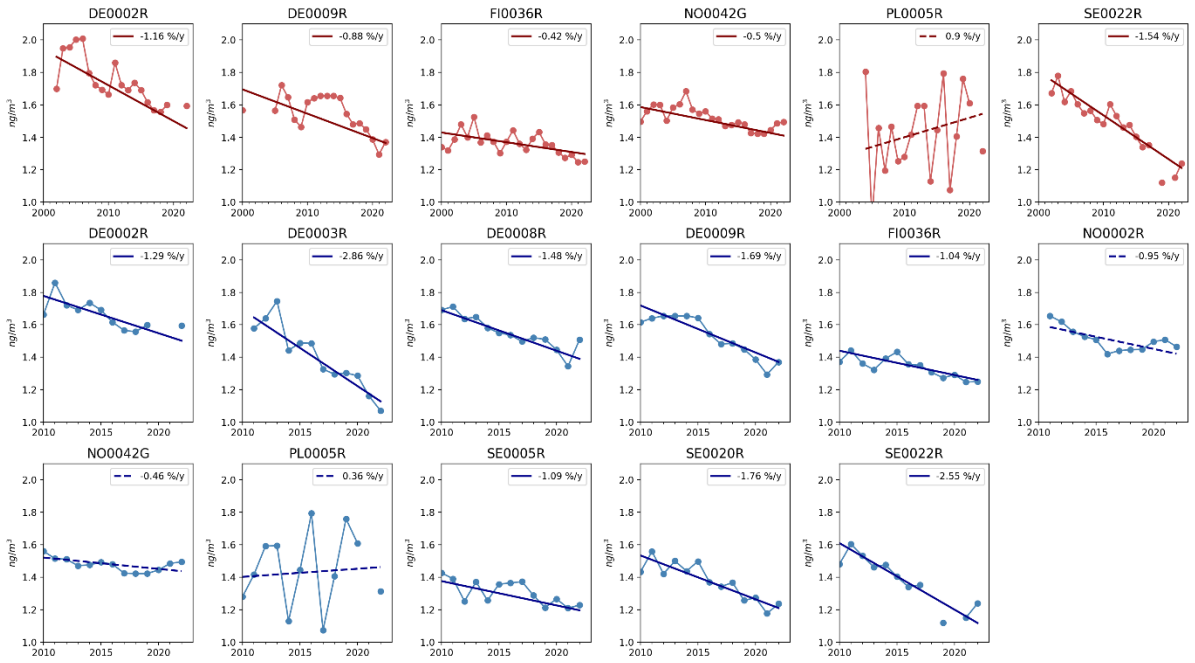


Fig. 2.7. *Time series of Hg concentration in air from 2000–2022 (in red) and 2010-2022 (in blue) for observations within EMEP. The straight line indicates the Sen slope. Solid line indicates a significant trend, whereas a dotted line indicates a not significant trend. Note that the y-axis starts on 1 ng/m³*

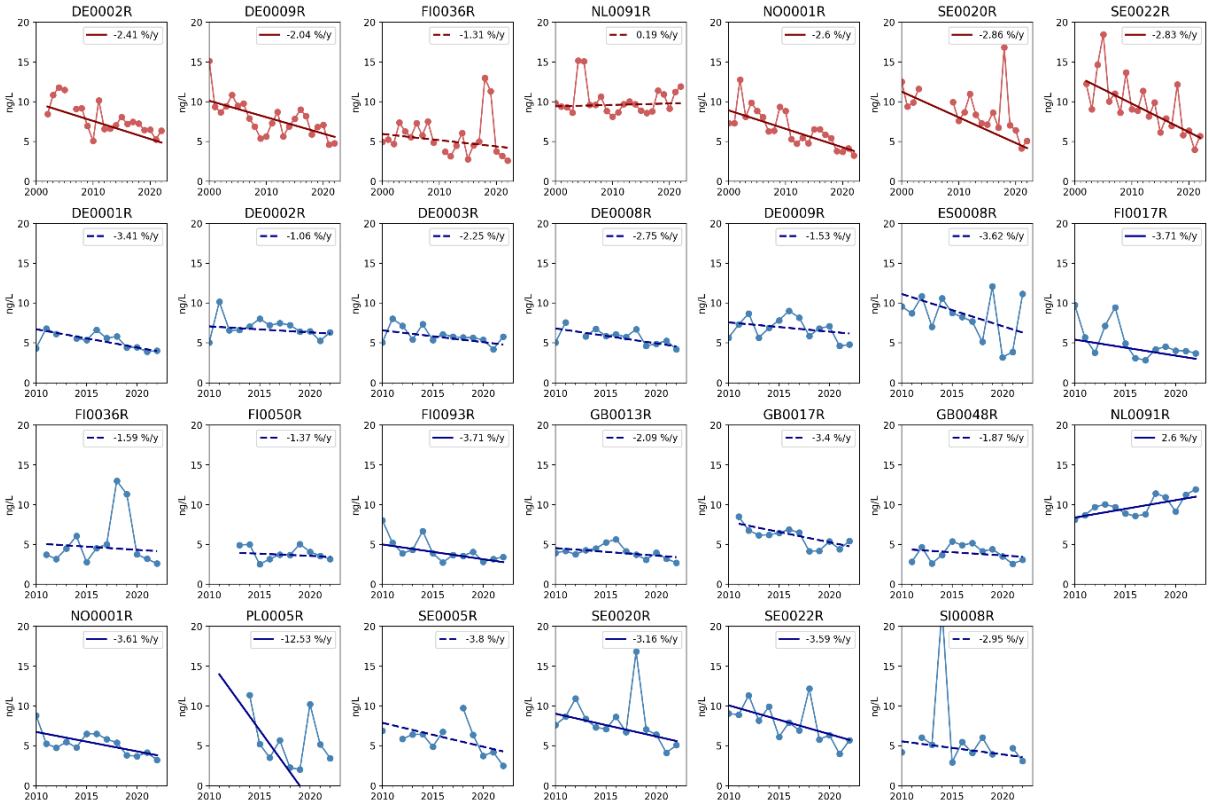


Fig. 2.8.: *Time series of Hg concentration in precipitation from 2000–2022 (in red) and 2010-2022 (in blue) for observations within EMEP. The straight line indicates the Sen slope. Solid line indicates a significant trend, whereas a dotted line indicates a not significant trend.*

Within EMEP, the trends are heterogeneous. All sites show declining trends in Hg in precipitation, except the site in the Netherlands which is increasing at a rate of 0.2 % pr year (2.6% pr year between 2010 and 2022). The declines in Hg in precipitation is attributed to the reduction in anthropogenic emissions, but also changes in meteorological conditions such as increasing precipitation. Hg wet deposition flux depends on the total precipitation amount and the concentration of Hg in that precipitation. Wet deposition is also declining (not shown) but at a slower rate than concentration again indicating that the precipitation depth has increased. It is worth noting that some sites show extreme trends (such as PL0005 -12.5% pr year) that may be caused by noise or gaps in the data series that have a larger impact on the trends for the shorter time spans.

2.4. Monitoring of POPs in air

The spatial coverage of sites monitoring POPs in Europe differs between the different components; The highest coverage is found for the PAHs, e.g. Benzo(a)pyrene is measured at 35 sites from 14 Parties. In comparison, the legacy POPs; PCBs, HCHs and DDTs, are measured at 13 sites from 7 Parties only, while the chemicals of emerging concern (e.g. dechlorane plus and PFOA) are reported at even fewer sites and only from the Nordic countries.

The spatial distribution of concentrations of selected POPs are shown in Figure 9. In general, the concentrations of most POPs decrease from the south/south-east to the north of Europe. For PCB-153, this spatial distribution is explained by a high historical usage in central Europe (Breivik et al., 2002). In contrast to the other POPs, the highest concentrations of HCB were reported in Norway and the Arctic, in addition to Kosetice (CZ0003R). The PAHs were measured at higher concentrations compared to most POPs and will be discussed in more detail below.

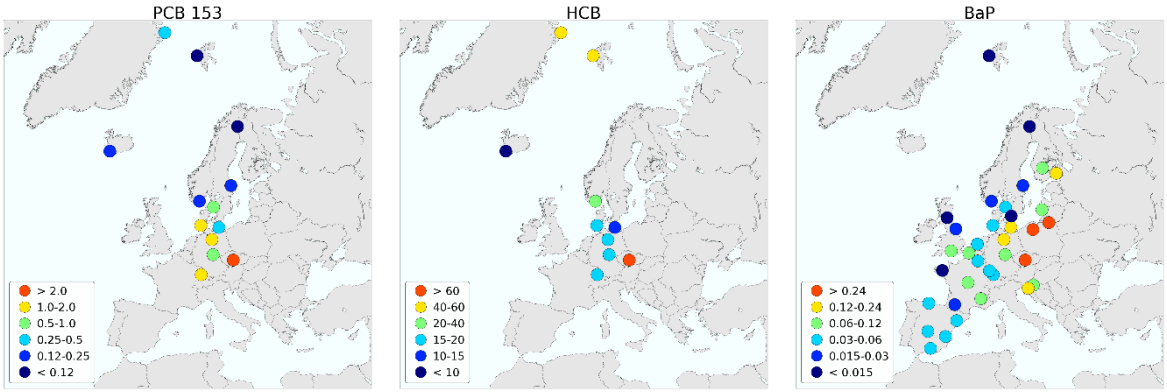


Fig. 2.9. *Annual mean concentrations of HCB, PCB-153 (pg/m³) and benzo[a]pyrene (ng/m³) in air and aerosols at EMEP sites in 2022*

2.5. Seasonal variability of selected PAHs in air during 2022

PAHs are by-products formed during combustion and the air concentrations may be seasonally variable (*Miura et al.*, 2019; Zhang and *Tao*, 2009). In the EMEP monitoring data, the highest concentrations of e.g. Benzo(a)pyrene (B(a)P) are observed in winter (Fig. 2.9) as a result of increased domestic burning of wood and coal.

Unlike most halogenated legacy POPs, several PAHs have a relatively short half-life in air (Brubaker and Hites, 1998). The reaction rate in air is faster during summer because of higher temperatures and concentration of OH-radicals. Hence, some of the seasonal variability observed may also be explained by enhanced atmospheric removal via degradation in summer.

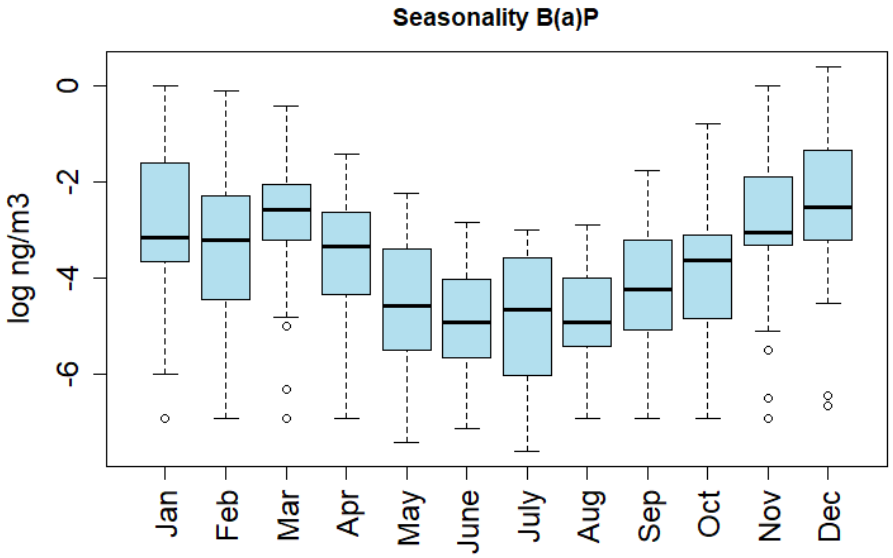


Fig. 2.10. *Box plot of monthly mean concentrations of benzo[a]pyrene (ng/m³) in air and aerosols at EMEP sites in 2022. The boxes represent the range from 25 to 75 percentile with the center line representing the median value. The bars represent the 1 and 99 percentiles.*

The contribution of selected PAHs to the sum of PAHs (Fig. 2.11) are observed to change during the year potentially due to a temperature effect. PAHs contain two fused rings or more, and individual substances within the group of PAHs are highly diverse in terms of physical-chemical properties (Table 2.1). This may cause low-molecular weight PAHs with log KOA less than 9 (e.g. anthracene) to more easily evaporate during summer (i.e. higher presence in the gaseous state), than high-molecular weight PAHs (e.g. benzo(a)pyrene and benzo(ghi)perylene) with a high KOA (>11) as described in more details in the EMEP status report in 2020.

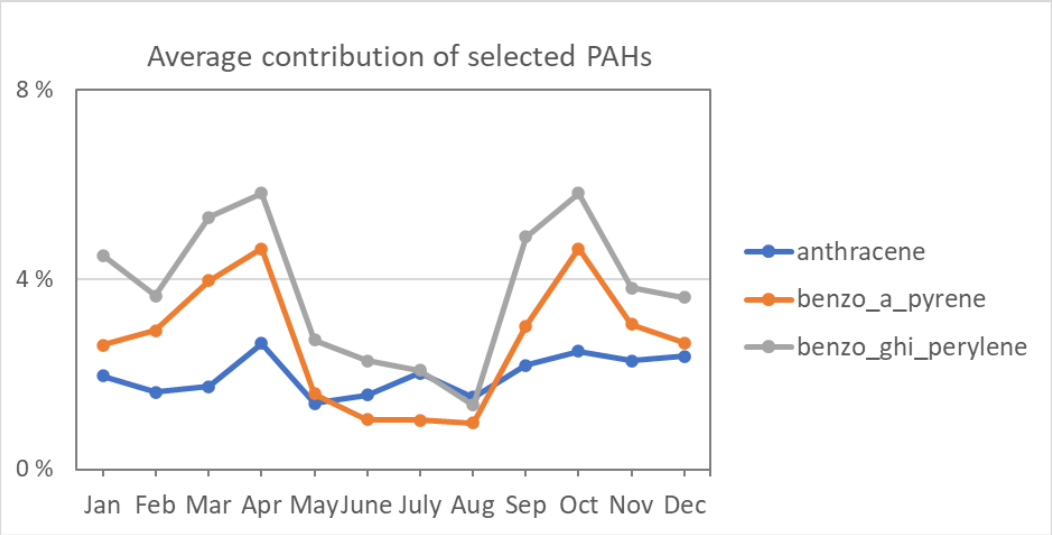


Fig. 2.11. *The monthly abundance of selected PAHs compared to the sum of PAH in air and aerosols at EMEP sites in 2022. The relative contribution of each PAH is the median of the monthly concentration of all the measurements relative to the median of the sum of PAH (ANT, PYR, BaA, FLT, DBahANT, BPE, IPY, BaP, PHE) for all the sites (n=22).*

Table 2.1. *Physical-chemical properties and reaction half-lives in air for selected PAHs, along with the number of sites reporting data for air in 2022.*

Abbreviation	Abbr.	Number of rings	Molecular weight (g/mol)	log K_{OA}[a]	log K_{AW}[a]	$t_{1/2}$ air (hours)[b]	Number of sites (2022)
Naphtalene	NAP	2	128.2	5.19	-1.73	12	5
Anthracene	ANT	3	178.2	7.63	-2.69	1.5	26
Phenanthrene	PHE	3	178.2	7.64	-2.76	11	24
Fluoranthene	FLT	4	202.3	8.81	-3.27	26	25
Pyrene	PYR	4	202.3	8.86	-3.27		25
Benzo[a]anthracene	BaA	4	228.3	10.28	-3.59		40
Chrysene	CHR	4	228.3	10.30	-3.82		28
Benzo[a]Pyrene	BaP	5	252.3	11.48	-4.51		40
Indeno[1,2,3-cd]Pyrene	IPY	6	276.3	12.43	-4.70		39
Benzo[g,h,i]Perylene	BPE	6	276.3	12.55	-4.77		28

a)(Ma et al., 2010), b) (Brubaker and Hites, 1998)

Furthermore, concentrations of PAHs in urban air may be orders of magnitude higher than in remote areas as the Arctic, which has been attributed to a higher influence from primary emissions sources (*Prevedouros* et al. 2004). Hence, PAHs not only show a seasonal variability, but also typically a strong spatial variability. The presence of PAHs in remote areas is mainly due to long-range atmospheric transport. Due to differences in the equilibrium partitioning coefficients between air and water (K_{AW}, Table 2.1), high-molecular weight PAHs are anticipated to be more prone to wet deposition than lighter PAHs. The lighter PAHs (e.g. naphthalene) therefore tend to reach the Arctic more easily (Halvorsen et al., 2023). In summer, the input from long-range atmospheric transport is predicted to be much smaller than in winter, due to higher degradation (Beyer et al., 2003).

2022 was the second-worst wildfire season in the European Union since 2000 and especially Spain was affected (Joint Research Centre, 2023). PAHs are emitted from wildfires and are characterized by high emissions of e.g. acenaphthylene, phenantrene and fluorene (Wentworth et al., 2018). Wildfires may therefore explain the slightly elevated concentrations of benzo(a)pyrene observed in July in Figure 10. It could be interesting to assess possible contribution of wildfires to concentrations of PAHs in air in southern Europe, where wildfires are most likely to happen. However, most sites in e.g. Spain are reporting data with relatively high detection limits and there are therefore too little data to be able to conclude whether wildfires in the area may have influenced the atmospheric concentrations.

2.6. Long-term trend analyses of benzo(a)pyrene in air

PAHs have been monitored for 10 years or more at around twenty EMEP sites. The long-term data series allows for trend analysis using the Digital Filtration (DF) technique that also has been adapted on sites within AMAP (Hung et al., 2016; Yu et al., 2019). The DF technique fits seasonal cycles and inter-annual trends or time series with statistical techniques. An apparent first order half-life, $t_{1/2}$, is calculated by dividing ln2 with the negative value of the linear regression slope of the trend between the natural log of air concentrations, ln C (pg/m^3), and time (year). Long-term time trends for benzo(a)pyrene at selected sites are given in Figure 13.

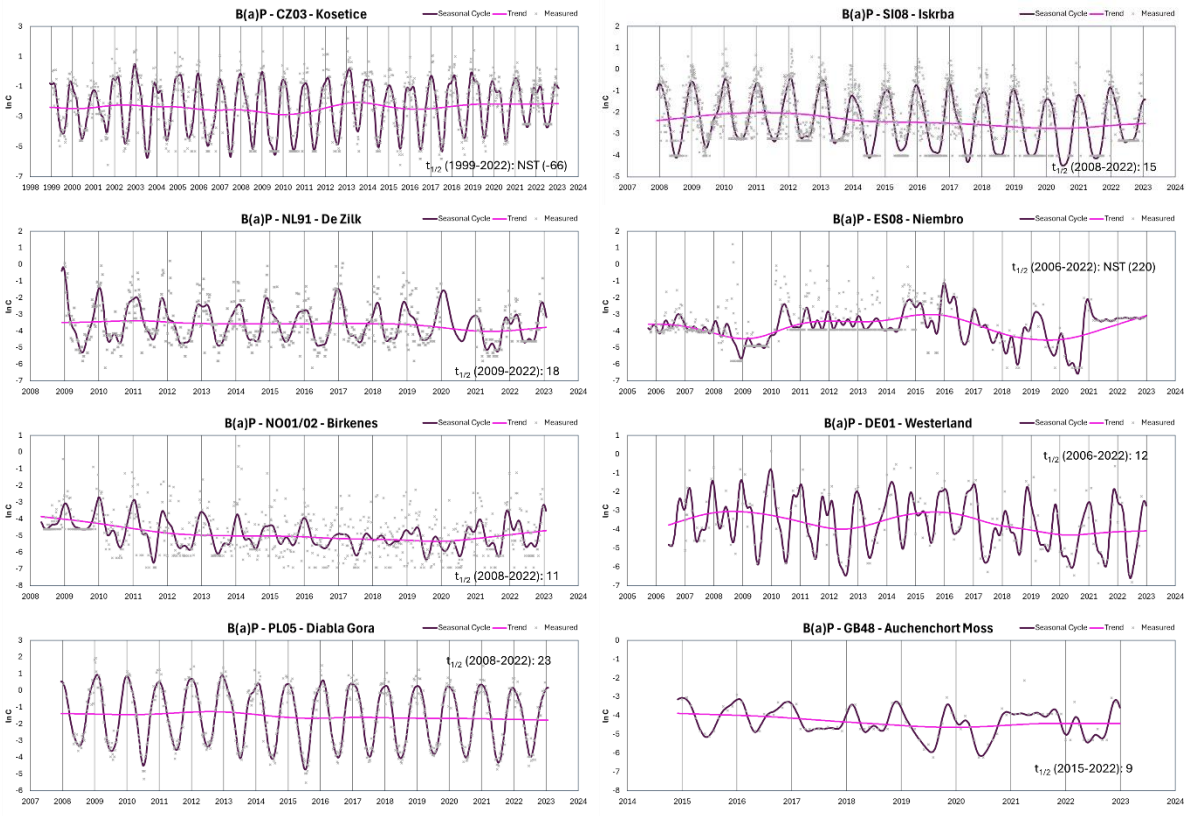


Fig. 2.13. *Temporal-trends of benzo(a)pyrene in air at a selection of EMEP sites. The air concentrations are presented in natural log of concentrations (ln C). NST denotes no significant trend, and the half-lives (t1/2) are in years.*

The obtained half-lives don't give precise information and it should be noted that the compounds do not necessarily decline/increase linearly or consistently in the first order manner throughout the entire monitoring period. However, the relative rates of decline or increase of concentrations can be compared between the sites, e.g. a smaller positive number means that the decrease has been sharper than a larger positive number. In contrast, negative values indicate increasing trends. The absolute values of these half-lives or doubling times should be used with caution. When the r2-value for the trend analysis is too low there is no significant trend (NST) for the time period (Fig. 2.13).

While no significant trend (r^2-value < 1) can be seen for Kosetice and Niembro, no large decrease in concentrations of B(a)P over time ($t_{1/2}$ 9-23 y, Fig. 2.13) is observed for the other EMEP sites, with r^2-values ranging from 0.4 (Westerland) to 0.7 (De Zilk, Diabla Gora). The relatively stable concentrations observed over time is in line with the results within AMAP (Yu et al. 2019) and reflects that emissions sources of PAHs still exist.

2.7. Contaminants of emerging concern (CEC)

The EMEPs monitoring strategy for 2020-2029 recommends monitoring on of polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), hexachlorobenzene (HCB), chlordane, lindane (γ-HCH), α-HCH and DDT/DDE at level 2 sites (UN/ECE, 2019). Beyond the regulated POPs, there are several substances that have public attention due to their potential environmental and human health impacts. These species are often categorised as organic contaminants of emerging concern (CEC) which is recommended for monitoring in the EMEP strategy (level 3). Examples of other POPs than those listed in Level 2 are polybrominated diphenyl ethers (PBDEs), per- and polyfluorinated alkyl substances (PFAS) and short-chain chlorinated paraffins (SCCPs).

New organic chemicals are continuously entering the market, either as substitutes to replace the regulated POPs or to fulfil new demands. These chemicals are often designed to be less persistent, more polar and less hydrophobic than regulated chemicals. Despite that, some may have similar impacts on ecosystems as the legacy POPs while some may fulfil persistence and mobility criteria but do not necessarily bioaccumulate. Monitoring studies of several of the CECs show high concentrations indicating the importance of including CECs in monitoring programmes. The challenges related to sampling and analyses are however an obstacle.

To approach this issue, EMEP arranged a workshop in Nov 2023 to discuss guidelines and strategies for atmospheric monitoring of chemicals of emerging concern (CECs) (Aas et al., 2024b) The workshop focused on various component groups, including per- and polyfluoroalkyl substances (PFAS), flame retardants (FRs), chlorinated paraffins (CPs), siloxanes, and microplastics with plastic additives. The workshop was arranged in close cooperation with the Arctic Monitoring Program (AMAP) and the global monitoring plan (GMP). Some general recommendations from the workshop:

- Harmonization of methods: There is a need for coordinated efforts to align sampling and analytical methods across different regions and monitoring stations. This includes developing standardized protocols for measuring various pollutants, ensuring consistency and comparability of data.
- Expansion of Monitoring Networks: Existing monitoring networks, such as EMEP, should be expanded to include more comprehensive measurements of CECs. This involves leveraging current infrastructure and initiating new campaigns to cover both ionic and neutral forms of pollutants.
- Target Analyte Expansion: Continuously update and broaden the range of target analytes to include emerging pollutants like GenX (HFPO-DA) and other novel compounds. This will help in capturing the full spectrum of contaminants present in the environment.
- Campaigns and Collaborative Efforts: Conduct extensive measurement campaigns and collaborate with international programs (e.g., GAPs and MONET) to enhance data collection efforts. These initiatives should focus on both active and passive sampling techniques to provide a comprehensive overview of pollutant levels.
- New Techniques and Reanalysis: Invest in advanced measurement techniques such as PTR-MS for better detection and quantification of volatile substances. Reanalyzing existing data with these new methods can provide deeper insights into previously collected samples.
- Contamination Prevention and Data Accessibility: Develop and distribute guidelines to prevent contamination during sampling, storage, and analysis, particularly for microplastics. Ensure that collected data is made available in the open-source database EBAS to facilitate broader access and use.
- Centralized Analysis and Standard References: Consider establishing centralized analysis centers to ensure harmonized quantification and reporting of pollutants across different regions. Develop a wider range of environmentally relevant standard reference materials to improve the characterization of pollutants like microplastics.
- Focus on High-Risk Pollutants: Pay special attention to pollutants showing high concentrations in sensitive areas, such as the Arctic. This includes enhancing monitoring programs to include both regulated and emerging substances with significant environmental impact.

3. Status of HM and POP air pollution in 2022

This chapter presents the model assessment results for transboundary pollution from heavy metals and selected POPs in EMEP countries for 2022. It provides detailed information on the spatial distribution of air concentrations and depositions of these pollutants, as well as the contribution of transboundary transport to pollution levels across EMEP countries. Source-receptor matrices characterizing the transboundary pollution in EMEP countries are included in Annex B. Detailed statistics of the model evaluation against measurements is given in Annex C.

3.1. Model setup

The model simulations were conducted using the latest stable open-source version of the GLEMOS model (v2.2.2, https://github.com/glemos-model). Recent updates to the model as well as other modelling tools, and strategic research directions aimed at further development are described in Chapter 4.

Meteorological parameters required for the model simulations were generated using the operational analysis data from the European Centre for Medium Range Weather Forecasts (ECMWF, 2024) pre-processed with the Weather Research and Forecast modelling system (v3.7.1) (WRF, 2024). A community-based global chemistry transport model GEOS-Chem (v14.2) (GEOS-Chem, 2024) was used to generate 3D atmospheric concentrations of chemical reactants and particulate matter, which are required for simulation of Hg and POP chemistry in the atmosphere. Detailed land cover data were incorporated from the Moderate Resolution Imaging Spectroradiometer (MODIS) satellite product - The Terra and Aqua combined MODIS Land Cover Type (MCD12Q1, version 6) (Sulla-Menashe and Friedl, 2023). Data on wind re-suspension of particle-bound heavy metals (Pb and Cd) from soil and seawater has been generated using the dust pre-processor (Gusev et al., 2006; Ilyin et al., 2007).

The most recent gridded Pb, Cd, Hg, B(a)P, B(b)F, B(k)F, and IP emissions data for 2022 for the EMEP domain were prepared by CEIP based on official reporting data 2024 as described in Chapter 1. Additional emissions parameters including vertical distribution and seasonal variation of heavy metal and POP emissions as well as chemical speciation of Hg emissions were produced using approaches previously developed in MSC-E (Ilyin et al., 2018). Additionally, we utilized the global emissions inventory of Hg from the UNEP Global Mercury Assessment 2018 (AMAP/UNEP, 2019; https://www.amap.no/mercury-emissions/datasets) and the global PAHs emissions inventory of the Peking University (Shen et al., 2013; http://inventory.pku.edu.cn/download/download.html) for the global-scale simulations.

The model assessment of heavy metal and POP pollution in the EMEP domain was conducted using a multi-scale nested approach, combining model simulations at both global and regional scales to account for the influence of both regional and global emission sources. Global-scale simulations with a spatial resolution of 1°×1° were performed to provide boundary conditions for the regional domain.

3.2 Lead

Lead (Pb) is a pollutant that is toxic at very low exposure levels and has both acute and chronic effects on human health. It is a multi-organ system toxicant, capable of causing neurological, cardiovascular, renal, gastrointestinal, hematological, and reproductive effects. Lead also bioaccumulates, adversely impacting both terrestrial and aquatic ecosystems. Due to its low vapor pressure, lead compounds in the atmosphere are predominantly present in particulate form, as part of atmospheric aerosols. The transport and deposition properties of lead are determined by these aerosol particles. Since Pb is largely associated with fine particulate matter (PM2.5), it can be transported hundreds to thousands of kilometres from its emission sources.

In 2022, Pb concentrations in surface air across the EMEP countries ranged from 0.3 ng/m³ in Scandinavia and Northern Russia to over 6 ng/m³ in Central Europe and Central Asia (Fig. 3.1a). Average Pb concentrations across most of Europe exceed 1 ng/m³. The highest concentrations, exceeding 10 ng/m³ in certain locations in Central and Western Europe (e.g., Poland, Czechia, the Netherlands, Belgium, Italy, Germany), are associated with significant anthropogenic emissions. Elevated Pb concentrations in Central Asian countries (above 6 ng/m³) are largely due to wind resuspension of the pollutant from bare soils, which also leads to relatively high concentrations in Northern Africa and the Middle East. Geographically, Pb concentrations decrease from south to north and northeast within the region. Seasonally, concentrations are higher during the cold season and in spring, due to increased anthropogenic emissions in winter and wind resuspension from barren and arable lands in spring (Fig. 3.1b). In particular, the peak in mean Pb concentrations across the entire domain and the EMEP countries in March 2022 was due to a well-documented massive Saharan dust intrusion into Europe. (Cuevas-Agulló et al., 2024; Liger et al., 2024; Rodríguez et al., 2024).

Simulated Pb air concentrations align well with measured values, showing a high spatial correlation (0.73) and low relative bias (Fig. 3.1a; Table C1). Over 80% of the 50 measured annual mean concentrations agree with the modelled values within a factor of 2.

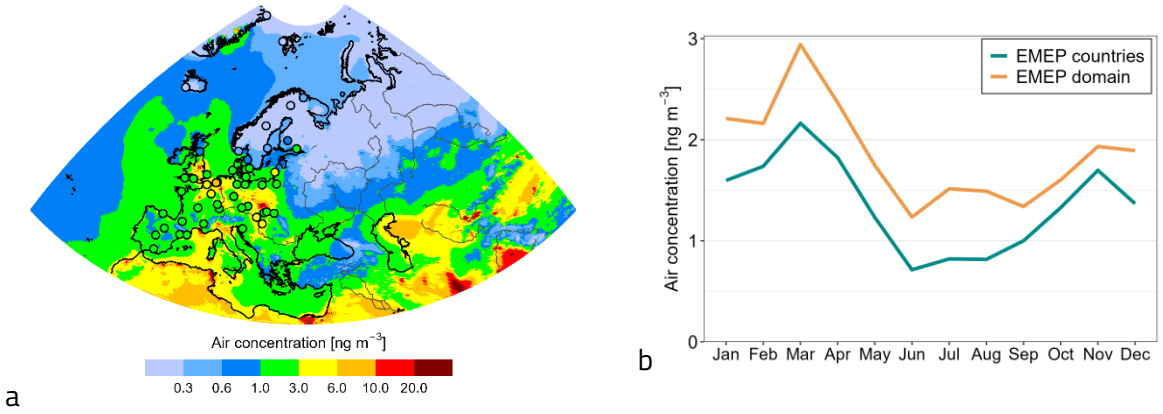


Fig. 3.1. *Annual mean air concentrations of Pb (circles on the map show observed values in the same colour scale) (a) and seasonal variation of mean Pb air concentrations in EMEP countries and EMEP domain (b) in 2022*

Precipitation scavenging, or wet deposition, is a key process responsible for removing pollutants from the atmosphere and depositing them into terrestrial and aquatic ecosystems. The pattern of annual wet deposition of Pb in 2022 partly reflects the spatial distribution of air concentration, with higher levels in Central Europe and Central Asia, as well as the precipitation pattern, with elevated annual precipitation in some regions of Eastern Europe and Central Asia (Blunden et al., 2023). Deposition fluxes mostly varied within the range of 50-500 g km^{-2} y^{-1} (Fig. 3.2a). The highest deposition levels (above 0.8 kg km^{-2} y^{-1}) were observed in some Central (Poland, Czechia, Slovakia) and Southern European (Italy, Montenegro, Bosnia and Herzegovina, Albania) countries, as well as in the mountain regions of Central Asia. The peak wet deposition in both the EMEP countries and the entire domain in 2022 occurred during spring (Fig. 3.2b). This was due to the highest Pb deposition in Southern Europe and Central Asia in March, resulting from dust suspension in African and Central Asian deserts, respectively, followed by elevated deposition in April and May, which was caused by Pb resuspension from arable lands.

Wet deposition measurements of Pb generally confirm the simulated spatial pattern, showing an increasing deposition gradient from Scandinavia to Central Europe (Fig. 3.2a). The modelling results agree with observations within a factor of 2 at nearly half of the measurement sites (Table C1). The relatively low correlation of annual values and a 36% underestimation are due to discrepancies at a few sites reporting extremely high levels of Pb wet deposition.

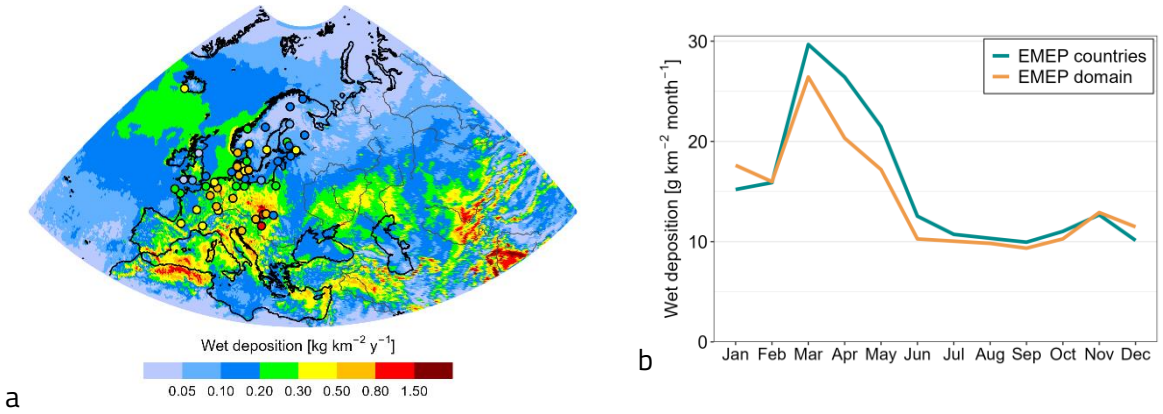


Fig. 3.2. *Annual wet deposition flux of Pb (circles on the map show observed values in the same colour scale) (a) and seasonal variation of mean Pb wet deposition in EMEP countries and EMEP domain (b) in 2022.*

Total atmospheric deposition consists of both wet deposition and direct surface uptake, or dry deposition, of pollutants. The contribution of dry deposition can be significant in forested regions or areas with low precipitation. In 2022, total deposition of Pb in the EMEP countries ranged from 0.1 to 1 kg km^{-2} y^{-1} (Fig. 3.3a). The overall deposition pattern closely follows that of wet deposition, but with notably higher levels in Central Europe (Poland, Czechia, Slovakia), reaching up to 1.5 kg km^{-2} y^{-1} in some areas. The lowest deposition levels (below 0.1 kg km^{-2} y^{-1}) were observed in the northern parts of the domain (Scandinavia, Northern Russia). Seasonal changes in total Pb deposition also reflect the strong impact of dust intrusions from Africa in March, which led to very high deposition levels in Southern Europe, as well as elevated deposition from dust suspension in Central Asia (Fig. 3.3b).

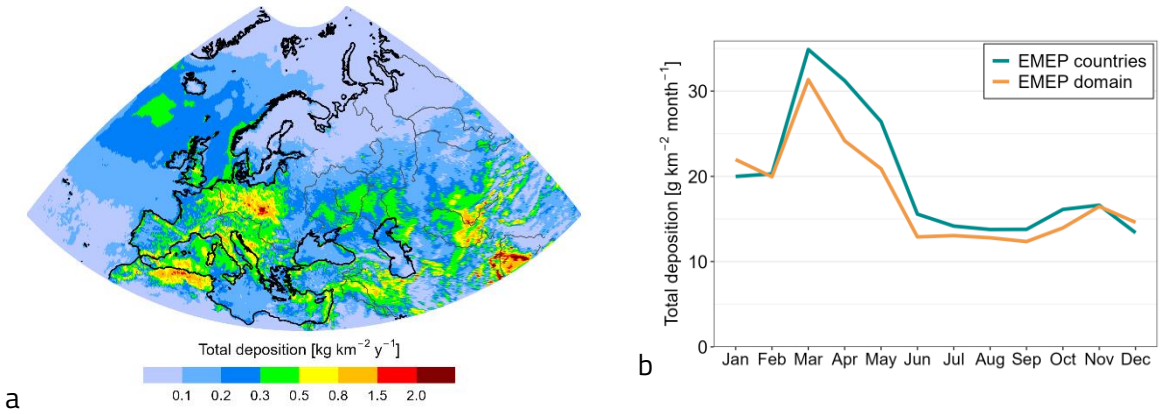


Fig. 3.3. *Annual deposition flux of Pb (a) and seasonal variation of mean Pb deposition in EMEP countries and EMEP domain (b) in 2022*

The relative contributions of different types of pollution sources vary across countries (Fig. 3.4). By distinguishing between primary anthropogenic sources within EMEP countries, secondary sources within the countries' territories, and all other (non-EMEP) sources, the spatial variation in pollution can be better understood. The highest levels of Pb deposition from primary EMEP sources are found

in Central (Poland, Czechia, Slovakia, Germany, Belgium) and Southern (Bosnia and Herzegovina, Serbia, Slovenia, Italy) European countries. Southern European and Central Asian countries also experience notable contributions from non-EMEP sources, particularly from Northern Africa and the Middle East, respectively. The largest relative contributions from secondary sources are observed in Central Asian and Caucasus countries.

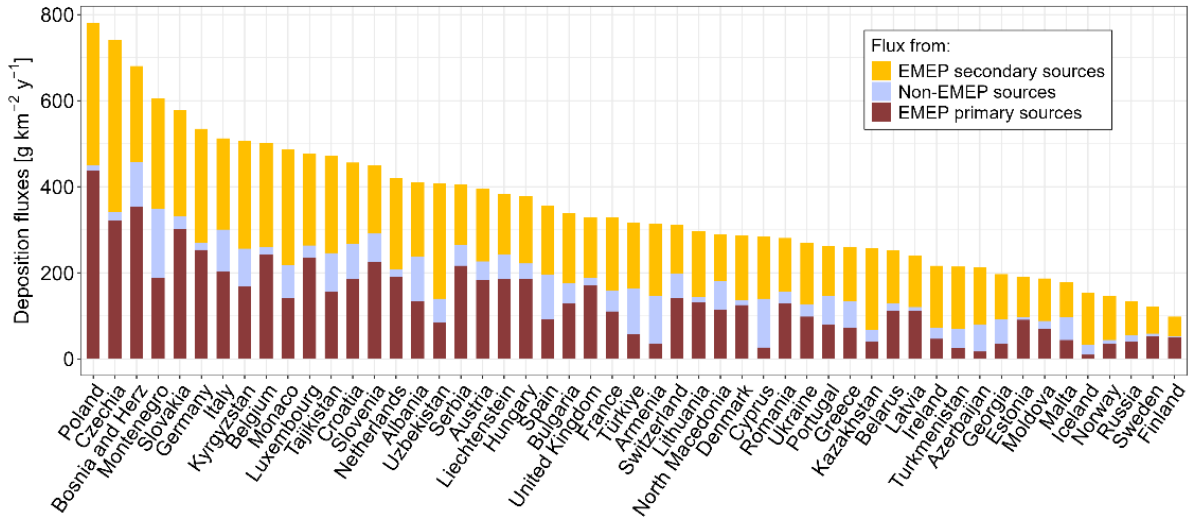


Fig. 3.4. *Country-average deposition of Pb to EMEP countries from EMEP primary anthropogenic, secondary and non-EMEP emission sources in 2022.*

Deposition from primary anthropogenic sources can be categorized based on contributions from domestic emissions and transboundary transport from other EMEP countries. Among the countries with the highest levels of anthropogenic Pb deposition, the relative contributions of these sources vary (Fig. 3.5a). In larger countries with significant national emissions, such as Poland and Germany, domestic sources account for the majority of deposition (65-75%). In contrast, smaller neighbouring countries like Czechia and Slovakia are more heavily influenced by transboundary transport. Countries naturally isolated by water bodies, such as Italy, the United Kingdom, Spain, and Portugal, also tend to have lower contributions from transboundary transport. Overall, transboundary transport contributes more than 50% of Pb anthropogenic deposition in 39 EMEP countries, while in only 12 countries do domestic sources outweigh transboundary contributions (Fig. 3.5b).

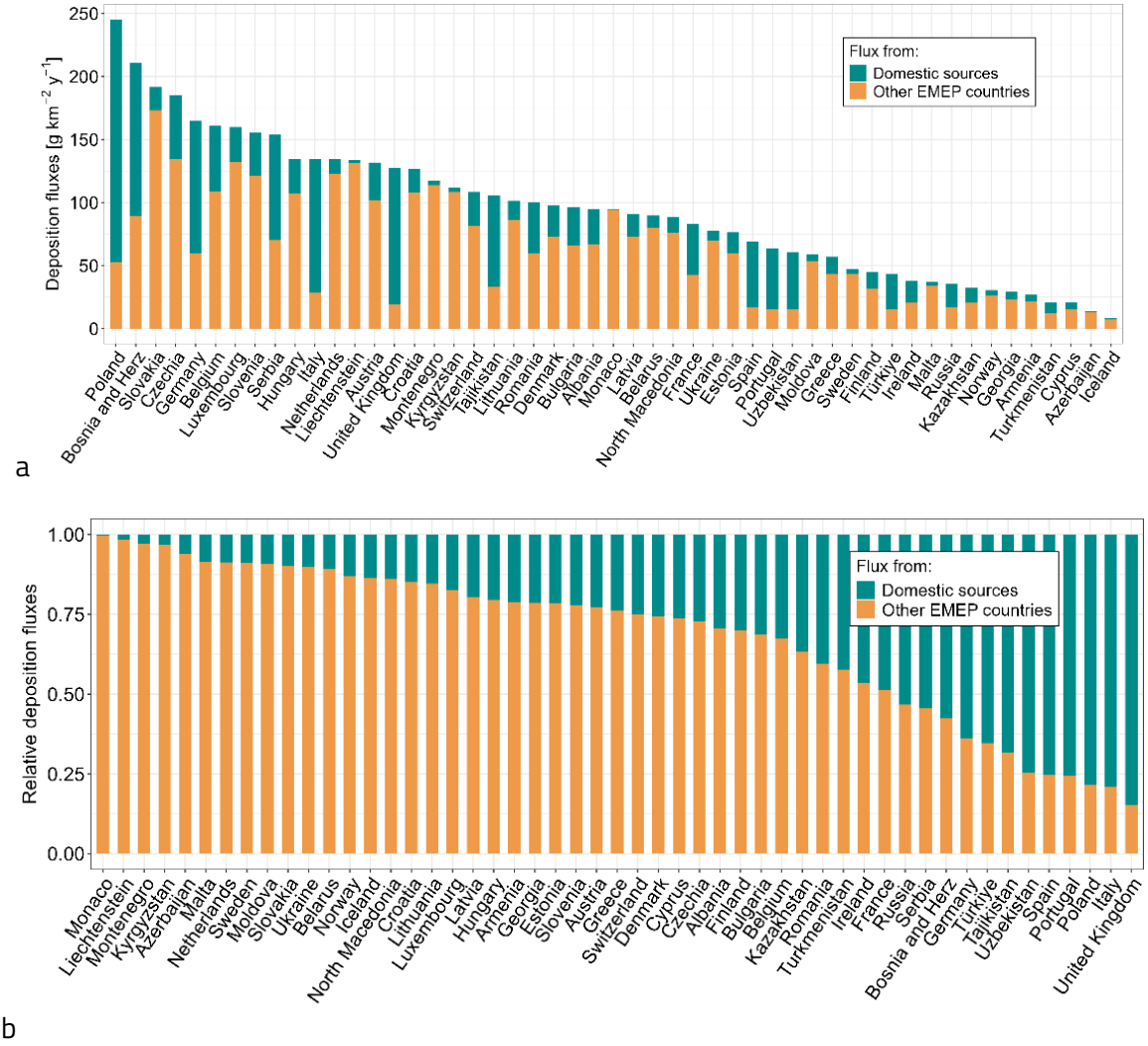


Fig. 3.5. *Country-average Pb anthropogenic deposition to EMEP countries (a) and relative contribution of domestic and foreign sources to Pb anthropogenic deposition in EMEP countries (b) in 2022.*

3.3. Cadmium

Cadmium (Cd) is a non-essential and toxic element that primarily affects the kidneys and skeleton in humans. It is also classified as a carcinogen when inhaled. Key health impacts of Cd exposure include kidney and bone damage, as well as cancer. In the environment, Cd is toxic to plants, animals, and microorganisms. Similar to lead (Pb), cadmium is predominantly found in the atmosphere as part of fine aerosol particles at trace concentrations. Its atmospheric dispersion is influenced by the properties of particulate matter, with a lifetime in the atmosphere ranging from days to weeks, allowing it to travel significant distances from its emission source to its deposition on the surface.

Air concentrations of Cd in 2022 ranged from 0.01 to 0.3 ng/m³ (Fig. 3.6a). The lowest concentration levels were typical in the northern and north-eastern land areas of the domain, due to their

remoteness from major emission sources. Elevated Cd concentrations above 0.1 ng/m³ were observed in Western (Netherlands, Belgium) and Central (Poland, Germany, Czechia) Europe, as well as in the Balkan countries (Serbia, Slovenia, Bosnia and Herzegovina, Croatia). Relatively high concentrations were also assessed in some Central Asian countries (Uzbekistan, Turkmenistan). The seasonal pattern was similar to that of Pb, reflecting both variations in anthropogenic emissions, with a maximum during the cold season, and the effect of Cd resuspension from desert areas in March (Fig. 3.6b).

The model accurately reproduces observed levels of Cd air concentrations, with a high spatial correlation (0.76) and general agreement within a factor of 2 at 77% of the 43 measurement sites (Fig. 3.6a; Table C1). While there is some overestimation, particularly in Central Europe, this is likely due to uncertainties in wind re-suspension of Cd from urban and industrial areas.

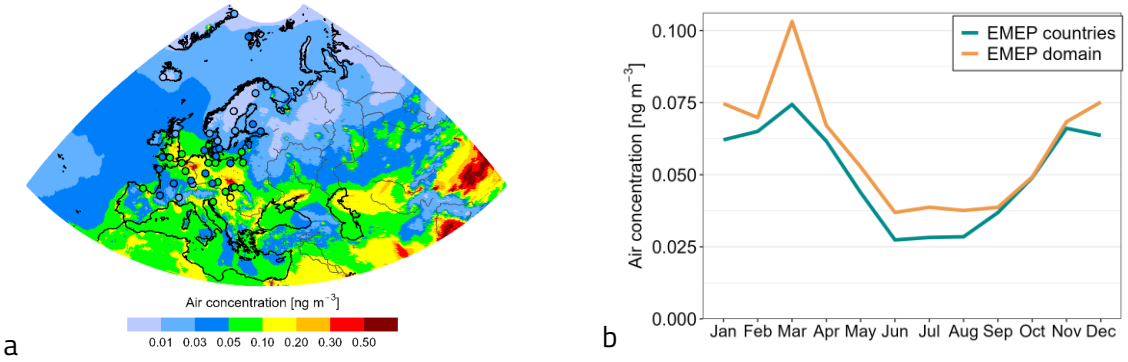


Fig. 3.6. *Annual mean air concentrations of Cd (circles on the map show observed values in the same colour scale) (a) and seasonal variation of mean Cd air concentrations in EMEP countries and EMEP domain (b) in 2022.*

Wet deposition is a significant contributor to Cd pollution in terrestrial and aquatic ecosystems, as well as arable soils. It accounts for 50% to 92% of total Cd deposition in various EMEP countries, depending on the predominant surface type and annual precipitation. In 2022, wet deposition of Cd ranged from 1 g km^{-2} y^{-1} in Scandinavian countries to over 15 g km^{-2} y^{-1} in Central European countries (Poland, Czechia, Slovakia, Germany, Liechtenstein) and the Balkan countries (Montenegro, Bosnia and Herzegovina, Serbia, Albania) (Fig. 3.7a). High Cd wet deposition was also estimated in parts of Eastern Europe and Central Asia due to elevated annual precipitation. Seasonally, wet deposition in the region has pronounced variation with higher levels in spring mostly due to the impact of wind resuspension, and lower levels in late summer (Fig. 3.7b).

Despite a significant underestimation at several measurement sites, leading to an average underprediction of 55%, the model reasonably reproduces the spatial pattern of Cd wet deposition, with a moderate correlation coefficient (0.4) and agreement within a factor of 2 at nearly half of the measurement sites (Fig. 3.7a; Table C1). The underestimation may be due to uncertainties in both

model parameterizations and measurements at certain monitoring sites, which will be further investigated in the future.

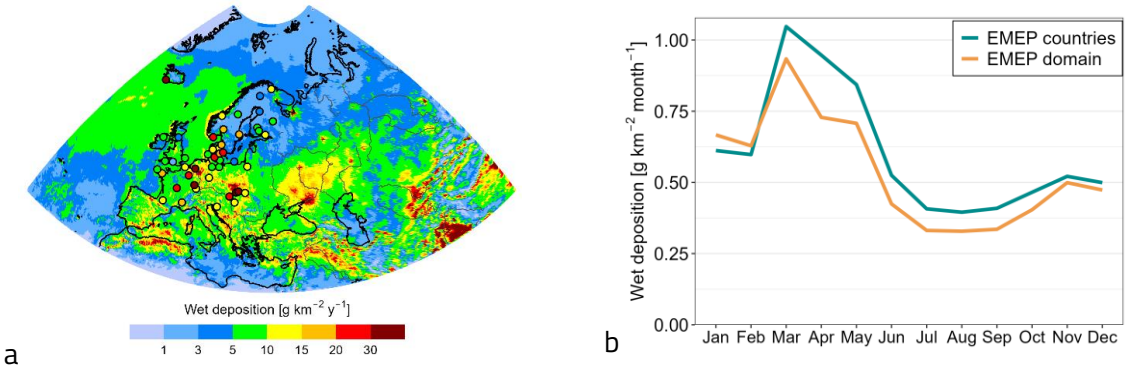


Fig. 3.7. *Annual wet deposition flux of Cd (circles on the map show observed values in the same colour scale) (a) and seasonal variation of mean Cd wet deposition in EMEP countries and EMEP domain (b) in 2022.*

Dry deposition, which contributes to the total atmospheric load, significantly increases deposition fluxes, particularly near emission sources. As a result, the annual Cd deposition pattern shows the highest fluxes in Western and Central Europe (Poland, Czechia, Germany, Slovakia, the Netherlands, Belgium), where they exceed 20 g km^{-2} y^{-1}. Substantial deposition is also observed in areas of Southern and Eastern Europe, and Central Asia. Overall, Cd annual deposition in 2022 ranged from 2 to 70 g km^{-2} y^{-1} (Fig. 3.8a). Similar to Pb, deposition peaked in March due to Cd transport from dust intrusions from Africa, followed by wind resuspension from arable lands in April-May. Elevated deposition in late autumn and winter is also attributed to increased anthropogenic emissions (Fig. 3.8b).

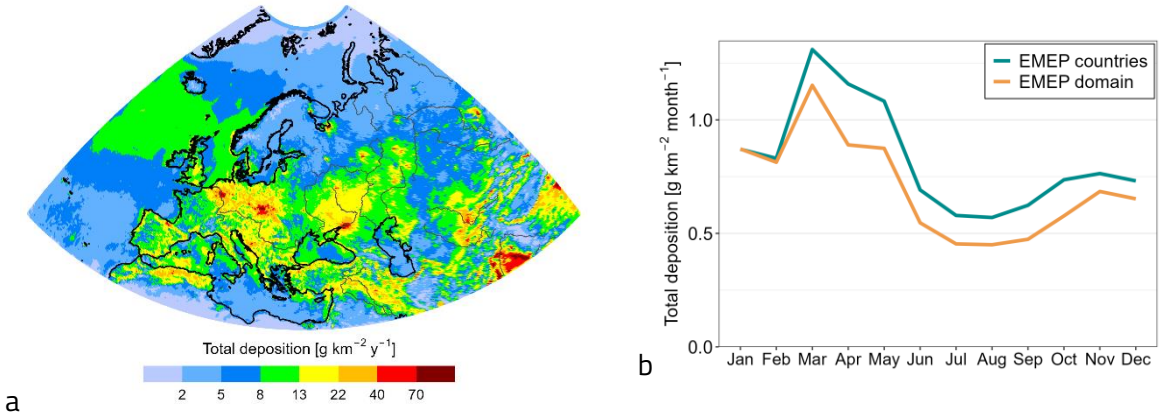


Fig. 3.8. *Annual deposition flux of Cd (a) and seasonal variation of mean Cd deposition in EMEP countries and EMEP domain (b) in 2022*

Cd deposition in EMEP countries originates from emission sources both within and outside the region. The contribution of external non-EMEP sources is particularly significant in countries neighbouring or located near other geographical regions. For example, in some Southern European countries (Spain, Italy, Montenegro, Albania, North Macedonia, Malta), contributions from non-EMEP emissions, primarily from Northern Africa, range from 30% to 40% (Fig. 3.9). Some Central Asian countries (Tajikistan, Kyrgyzstan, Turkmenistan) are also significantly affected by sources in the Middle East and East Asia. These countries are further influenced by secondary emissions from wind resuspension of desert dust in Central Asia. In other countries, the long-term impact of secondary emissions is less pronounced. However, episodic massive dust intrusions from Africa (Cuevas-Agulló et al., 2024; Liger et al., 2024; Rodríguez et al., 2024) can significantly influence Cd deposition in Europe.

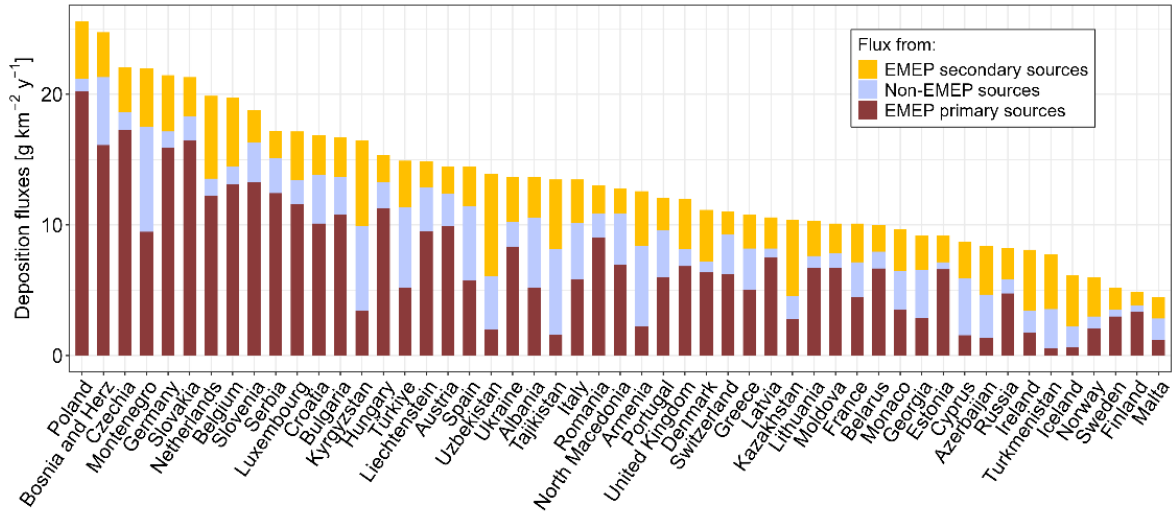


Fig. 3.9. *Country-average deposition of Cd to EMEP countries from EMEP primary anthropogenic, secondary and non-EMEP emission sources in 2022.*

Anthropogenic emissions are dispersed across the region, contributing to Cd deposition in the EMEP countries. The relative contribution of domestic sources to total deposition varies widely, from just a few percent in countries with minor national emissions to as much as 80% in larger countries like Spain, the United Kingdom, and Portugal (Fig. 3.10a). Countries with the highest levels of Cd deposition may be predominantly affected by domestic emissions (e.g., Poland, Bosnia and Herzegovina, Germany) or by transboundary transport from neighbouring countries (e.g., Czechia, Slovakia). However, model estimates indicate that Cd pollution is not solely a national issue in three-quarters (39 out of 51) of the EMEP countries, where transboundary contributions dominate Cd atmospheric deposition (Fig. 3.10b).

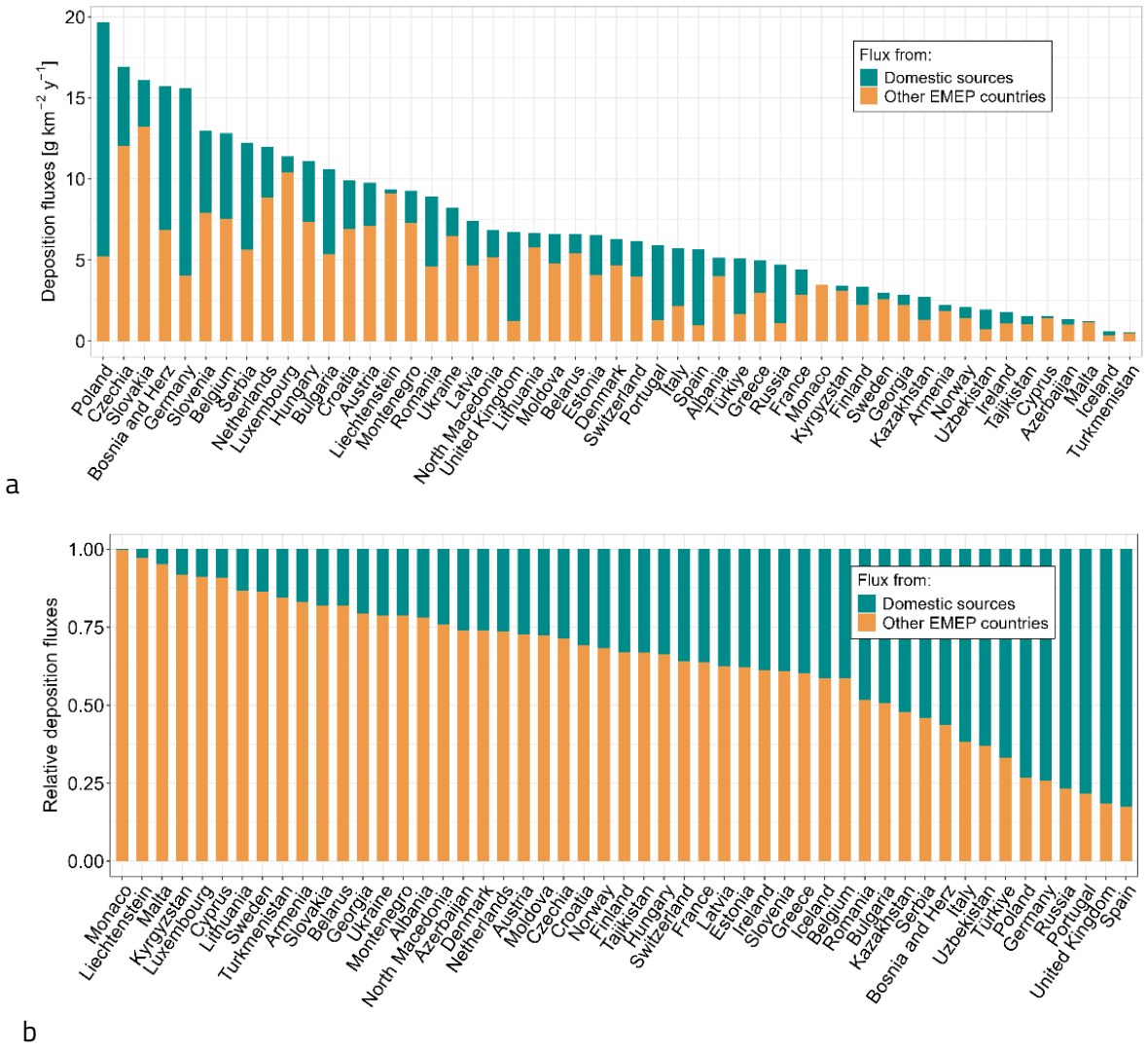


Fig. 3.10. *Country-average Cd anthropogenic deposition to EMEP countries (a) and relative contribution of domestic and foreign sources to Cd anthropogenic deposition in EMEP countries (b) in 2022.*

3.4. Mercury

Mercury (Hg) is toxic in multiple forms, with the greatest concern being organic compounds, particularly methylmercury. This compound can damage the liver, kidneys, and the digestive and respiratory systems. It also causes brain and neurological damage and impairs growth. In animals, mercury has similar effects and is highly toxic to aquatic life. In the atmosphere, mercury is predominantly present in its relatively inert elemental form (Hg^0), which gives it a longer atmospheric lifetime compared to other metals like Pb and Cd. Moreover, Hg^0 can undergo various physicochemical transformations into short-lived oxidized and particulate forms. As a result, the dispersion of atmospheric Hg, its deposition in terrestrial and aquatic environments, and its environmental fate are largely determined by the chemical cycling of Hg compounds.

In 2022, atmospheric Hg^0 concentrations in surface air across the entire EMEP region ranged from 1 to 2 ng m^{-3}, with an average of 1.3 ng m^{-3} (Fig. 3.11a). The variation in atmospheric Hg0 concentrations is relatively small, which can be attributed to its long atmospheric lifetime, resulting in an even distribution of background Hg concentrations. However, regional differences do exist within the EMEP area. Concentrations exceeding 1.6 ng m^{-3} were observed in Poland, Portugal, Spain, Italy, Greece, Albania, Bulgaria, North Macedonia, Croatia, Serbia, Uzbekistan, Kyrgyzstan, Tajikistan, and Turkmenistan. Generally, above-average Hg^0 concentrations are notable near coastal regions of the Mediterranean Sea, and especially over the Black and Caspian seas. Hg0 concentrations below 1.3 ng m^{-3} were recorded in central France as well as in remote regions, such as the Arctic. The seasonality of Hg^0 concentrations is minimal (Fig. 3.11b), with average concentrations ranging from 1.2 to 1.3 ng m^{-3} throughout all months of the year.

Modelling results well agree with Hg^0 concentrations measured at EMEP measurement stations (Fig. 3.11a; Table C1) with unbiased average annual mean levels and discrepancies not exceeding a factor of 2. Relatively low correlation is explained by insignificant spatial variability of Hg^0 within the region.

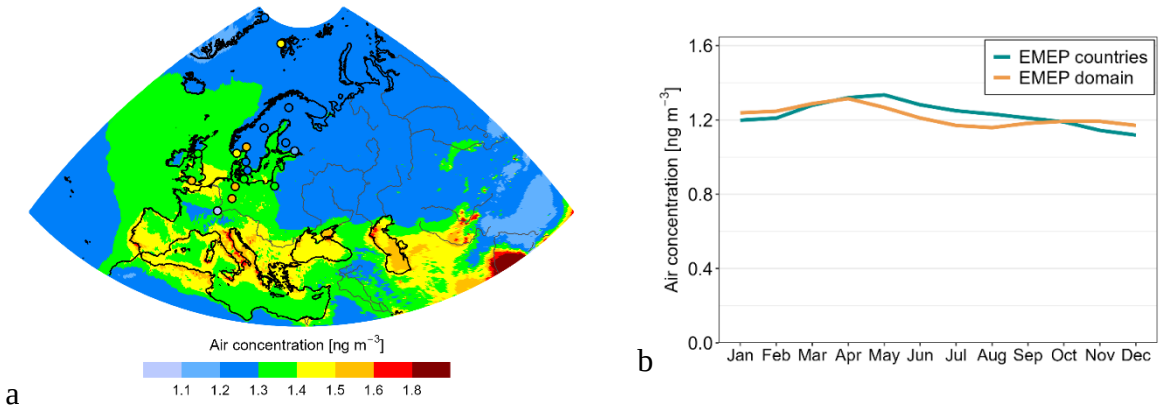


Fig. 3.11. *Annual mean air concentrations of Hg (circles on the map show observed values in the same colour scale) (a) and seasonal variation of mean Hg air concentrations in EMEP countries and EMEP domain (b) in 2022.*

The deposition of Hg is primarily influenced by oxidized Hg forms that are emitted and formed chemically in the atmosphere. Thus, the spatial pattern of Hg deposition is shaped by several factors, including the spatial distribution of emissions, variability in meteorological conditions, and the location of zones with intense atmospheric oxidation. The spatial distribution of Hg wet deposition (Fig. 3.12a) closely mirrors that of total Hg deposition, with the highest wet deposition fluxes observed in Central and Southern Europe, certain Caucasus countries, and Central Asia (see details in the discussion on total Hg deposition). The seasonal variation in Hg wet deposition (Fig. 3.12b) shows that the highest values (above 0.6 g km^{-2} $month^{-1}$) occur during the spring and summer months (March to August), while lower Hg wet deposition is observed during the autumn and winter months (September to February).

Simulated Hg wet deposition slightly overestimates observations (with a bias of 33%) and shows relatively low correlation with measurements due to significant discrepancies at several measurement sites. Nevertheless, more than 60% of observations agree with the modelling results within a factor of 2 (Fig. 3.12a; Table C1). These discrepancies require further analysis and updates to the model parameterizations of Hg atmospheric chemistry and air-surface exchange processes. Ongoing research and developments in this area are discussed in Chapter 4.

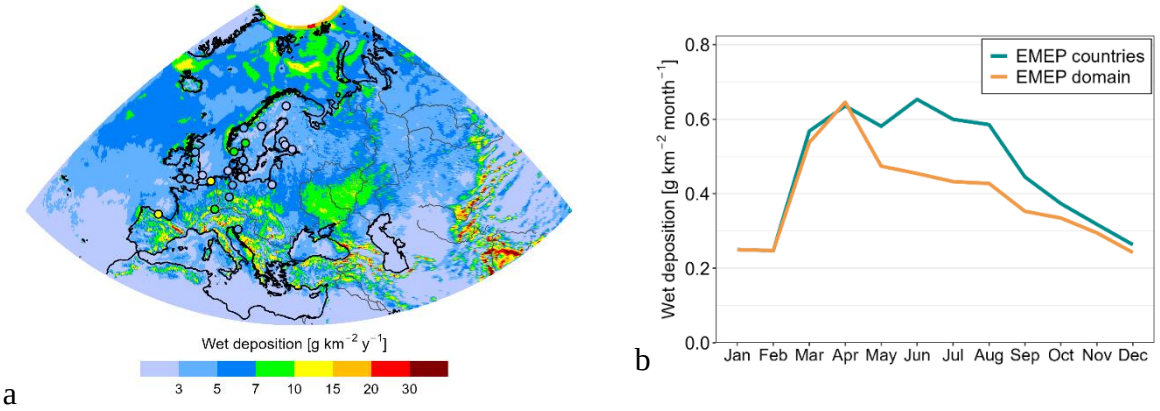


Fig. 3.12. *Annual wet deposition flux of Hg (circles on the map show observed values in the same colour scale) (a) and seasonal variation of mean Hg wet deposition in EMEP countries and EMEP domain (b) in 2022.*

High Hg total deposition levels (exceeding 17 g km^{-2} $year^{-1}$) are observed across Central and Southern Europe, including countries such as Germany, Poland, the Czech Republic, Romania, Italy, Spain, Bosnia and Herzegovina, and Bulgaria (Fig. 3.13a). The most intense deposition fluxes (greater than 25 g km^{-2} $year^{-1}$) are found in parts of the Caucasus and Central Asia, primarily due to significant annual precipitation and enhanced atmospheric oxidation. Elevated Hg total deposition also occurs in the high Arctic, driven by intensive oxidation and deposition of Hg^0 during springtime Atmospheric Mercury Depletion Events (AMDEs). However, it's important to note that a significant portion of the mercury deposited on snow is later re-emitted into the atmosphere. The seasonal variation of Hg total deposition (Fig. 3.13b) shows that the highest values (around 1 g km^{-2} $month^{-1}$) are simulated during the spring and summer months (March to August), with lower deposition estimated for the autumn and winter months (September to February). A pronounced peak in Hg deposition over the EMEP domain is attributed to AMDEs in the Arctic, resulting in similar seasonal patterns for both wet and total Hg deposition.

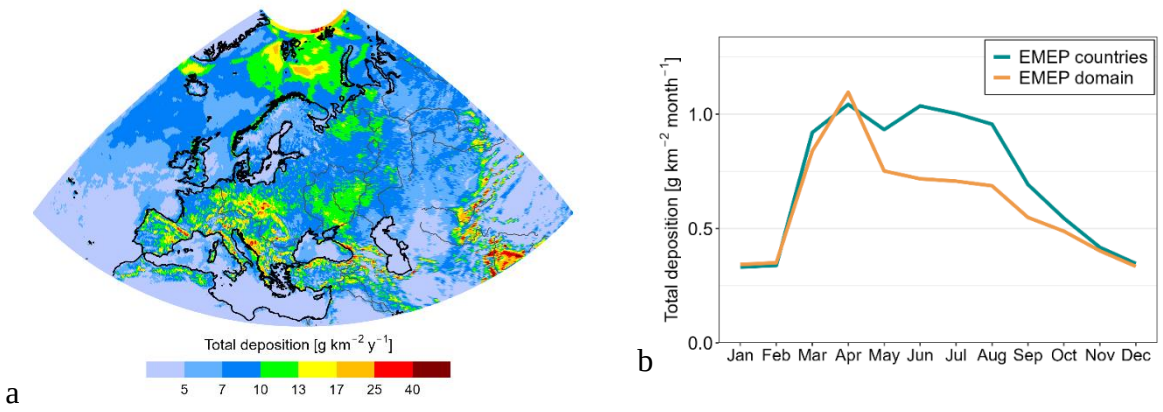


Fig. 3.13. *Annual total deposition flux of Hg (a) and seasonal variation of mean Hg total deposition in EMEP countries and EMEP domain (b) in 2022.*

In 2022, Bosnia and Herzegovina received the highest Hg deposition per km² of its territory (Fig. 3.14). Montenegro and Liechtenstein were the only other recipients with deposition fluxes exceeding 15 g km^{-2} year^{-1}. Generally, global and intercontinental transport (from non-EMEP countries) is the largest contributor to Hg deposition in most EMEP countries, accounting for more than 50% of total deposition in 49 EMEP countries, with the exceptions being Czechia and Poland. Furthermore, in 28 EMEP countries, transboundary transport from non-EMEP sources contributed over 75% of the total deposition flux. The direct impact of regional secondary/natural sources is minimal, contributing less than 3% to the deposition flux in all countries. However, this figure does not account for the portion of Hg secondary emissions that left the EMEP domain and returned via intercontinental transport.

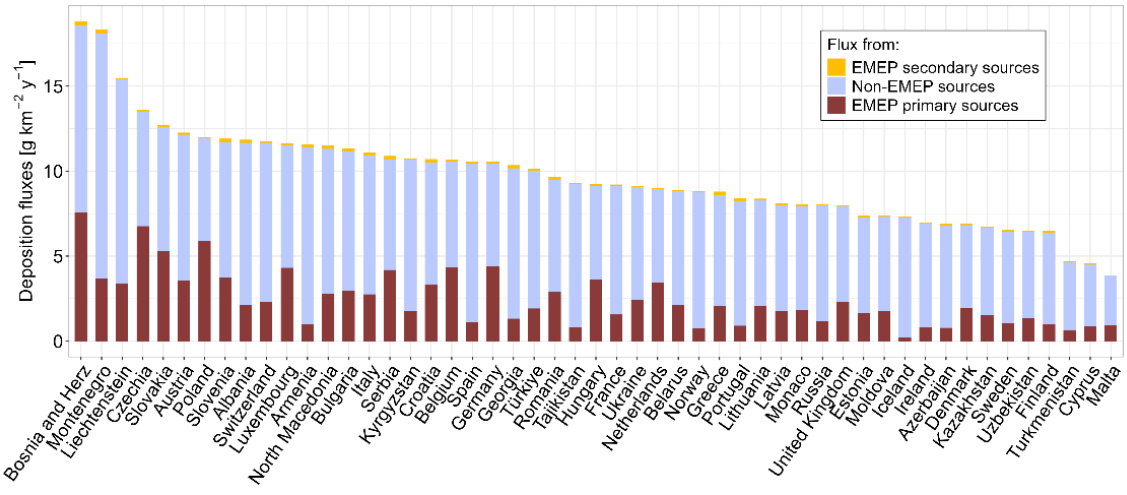


Fig. 3.14. *Country-average deposition of Hg to EMEP countries from anthropogenic, secondary and non-EMEP emission sources in 2022.*

Focusing on Hg deposition from EMEP anthropogenic sources only (Fig. 3.15), transboundary transport dominates Hg total deposition in 40 EMEP countries. In contrast, countries with significant national Hg emissions – such as Bosnia and Herzegovina, Poland, Germany, Italy, the

United Kingdom, Ireland, Türkiye, and Spain – experience higher deposition from domestic sources than from other EMEP countries. Conversely, countries with minimal national emissions (e.g., Liechtenstein, Monaco, Malta, Kyrgyzstan, Cyprus) show a more than 90% relative share of Hg deposition fluxes originating from transboundary transport (Fig. 3.15b).

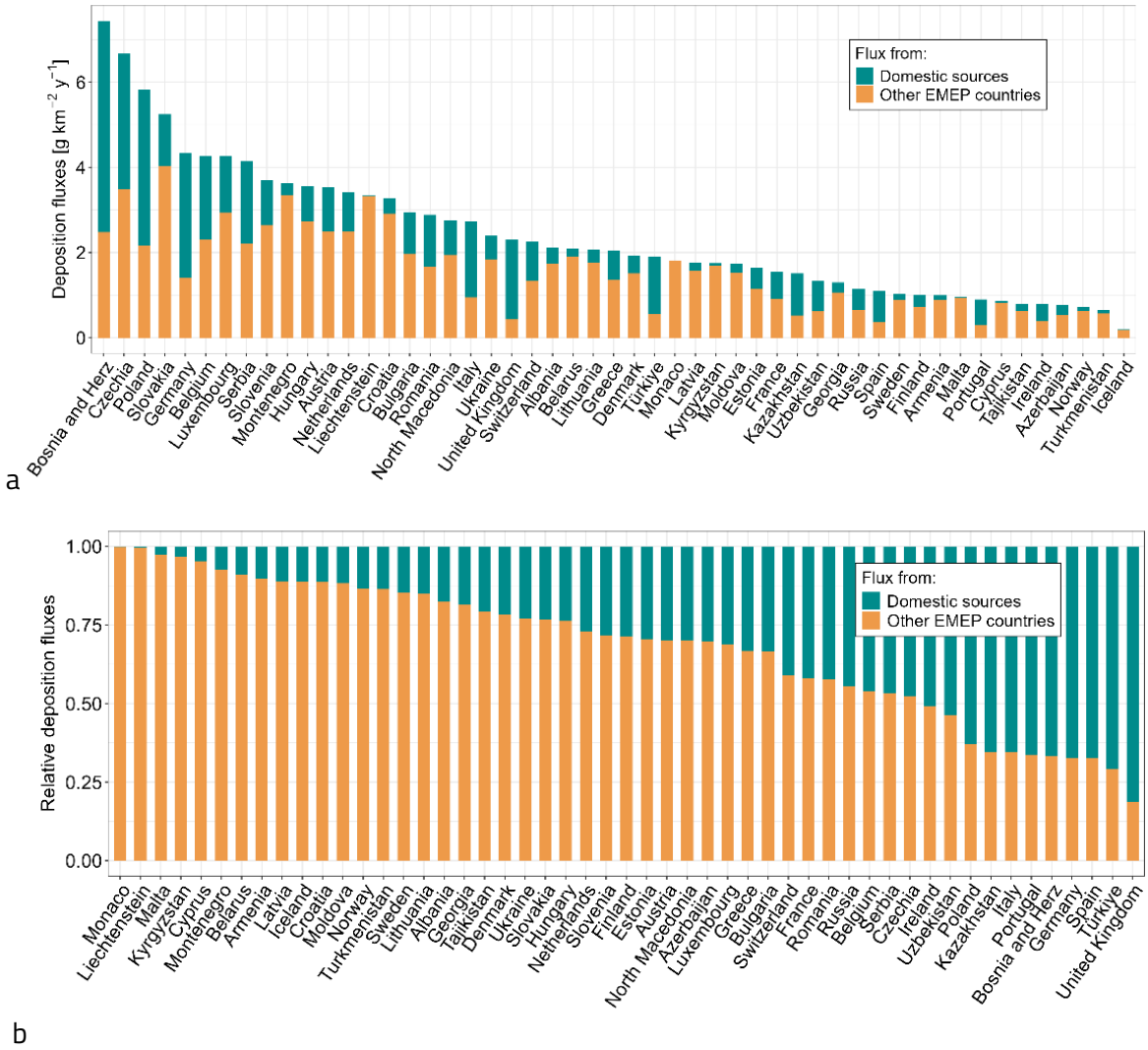


Fig. 3.15. *Country-average Hg anthropogenic deposition to EMEP countries (a) and relative contribution of domestic and foreign sources to Hg anthropogenic deposition in EMEP countries (b) in 2022.*

3.5. Polycyclic Aromatic Hydrocarbons (PAHs)

Polycyclic Aromatic Hydrocarbons (PAHs) are a broad class of pollutants released into the atmosphere during the incomplete combustion of fossil fuels and biomass. Many PAHs pose significant risks to human health, including carcinogenic, mutagenic, and teratogenic effects, as well as liver and kidney toxicity, hematological, pulmonary, and respiratory issues, and neurotoxicity. Additionally, many PAHs are harmful to the environment. Pollution levels of four specific PAHs targeted by the Protocol on POPs – benzo(a)pyrene (B(a)P), benzo(b)fluoranthene (B(b)F),

benzo(k)fluoranthene (B(k)F), and indeno(1,2,3-cd)pyrene (IP) – were assessed by modelling their transboundary transport, atmospheric concentrations, and deposition fluxes. The modelling results were evaluated against observations.

Modelled and observed annual average cumulative air concentrations of four selected PAHs in the surface layer are shown in Fig. 3.16a. The modelled concentrations range from less than 0.01 ng/m^3 to over 5 ng/m^3. The lowest concentrations were modelled in Iceland, with low levels also noted in Spain, Norway, Sweden, Montenegro, and Azerbaijan. Relatively low concentrations, below 1 ng/m^3, were observed in France, Denmark, Estonia, Armenia, Albania, and Finland. Moderate to high concentrations, ranging from 1.5 to 7 ng/m^3, were modelled for most areas in Poland and Czechia, as well as in Serbia, Slovakia, Moldova, northern Italy, southern Germany, and the Dardanelles and Bosphorus straits. High concentrations were also observed in certain areas of Eastern Europe.

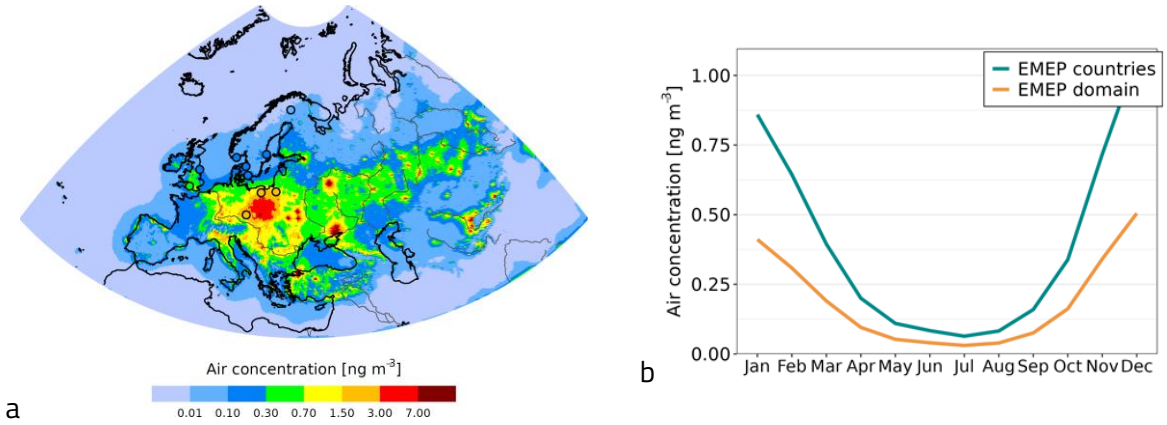


Fig. 3.16. *Annual mean air concentrations the sum of 4 PAHs (circles on the map show observed values in the same colour scale) (a) and seasonal variation of the sum of 4 PAHs air concentrations in EMEP countries and the EMEP domain (b) in 2022.*

The cumulative modelled air concentrations of the sum of four PAHs were compared with observations at 10 sites in the United Kingdom, Norway, Sweden, Finland, Poland, and Czechia. The modelled concentrations show good agreement with measurements, with a high spatial correlation of 0.97 (Fig. 3.16a; Table C1). The mean relative bias across these 10 sites is slightly negative (-10%), indicating that the model slightly underestimates the observed concentrations. Seasonal variations in air concentrations of the four PAHs across the EMEP domain and within EMEP countries are presented in Fig. 3.16b. Winter concentrations are significantly higher than in summer, due to increased emissions from biomass burning during the winter months and more intensive degradation in the summer.

Annual average air concentrations of individual PAHs are presented in Fig. 3.17. The spatial distribution of these concentrations is fairly consistent across the different PAHs, with relatively high levels in Poland, Czechia, and certain areas in Eastern Europe, and lower concentrations in Western and Northern Europe. Notably, the concentration of B(b)F in the EMEP region is higher on average than that of other individual PAHs, a trend confirmed by measurements. B(a)P air concentrations exceed 1 ng/m³ in several regions, including southern Poland, eastern Czechia, and over the Dardanelles and Bosporus straits.

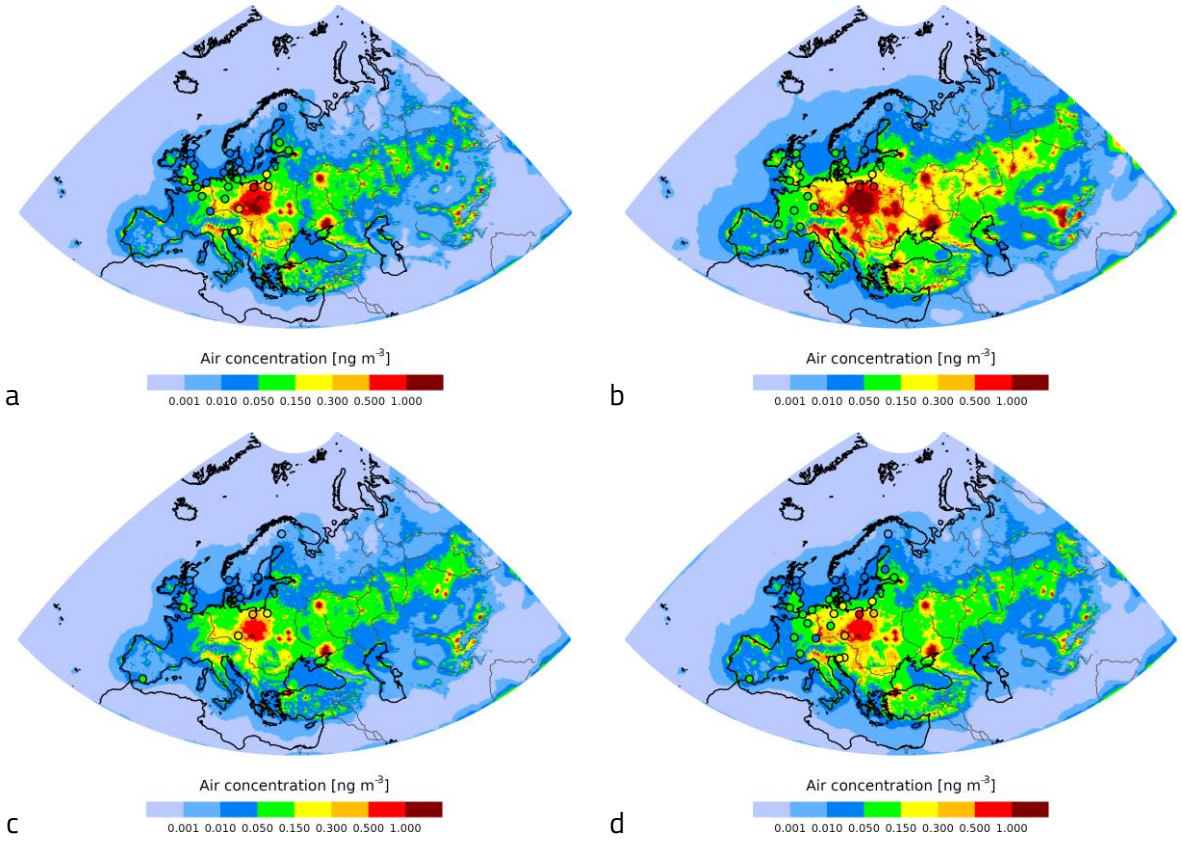


Fig. 3.17. *Annual mean air concentrations of B(a)P (a), B(b)F (b), B(k)F (c), and IP (d) in 2022 (circles on the maps show observed values in the same colour scale).*

The spatial distribution of modelled wet deposition fluxes for the sum of four PAHs in 2022, along with observations, is shown in Fig. 3.18a. Areas with the highest and lowest wet deposition fluxes correspond closely with the distribution of air concentrations. Seasonal variation in wet deposition also mirrors air concentration patterns, with the highest fluxes occurring in winter and the lowest in summer. The highest annual deposition fluxes are observed in the central part of the EMEP region, as well as in certain distant locations, such as the northern coast of Spain and areas in Tajikistan and southern Kazakhstan. The lowest wet deposition in EMEP countries is estimated for the Scandinavian region, northern Russia, and central Spain.

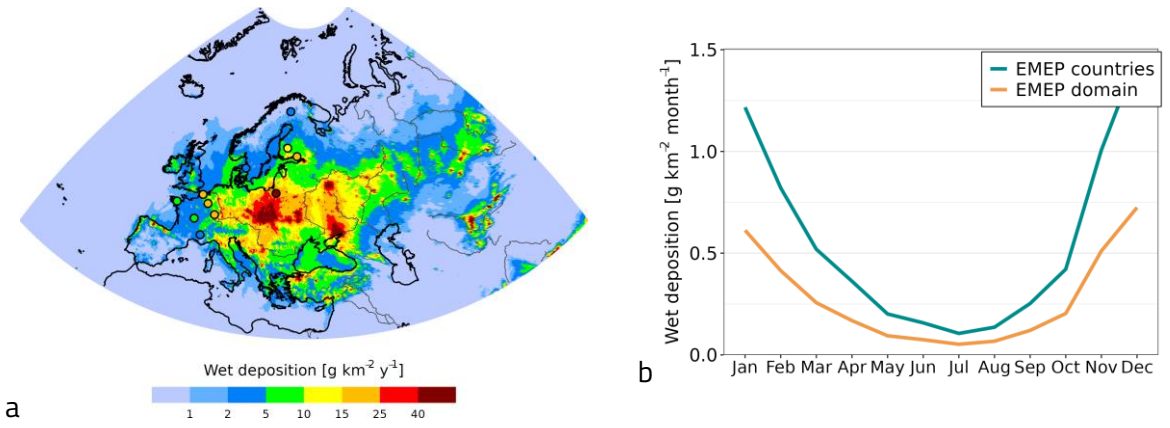


Fig. 3.18 *Annual wet deposition flux of the sum of 4 PAHs (circles on the map show observed values in the same colour scale) (a) and seasonal variation of the sum of 4 PAHs wet deposition in EMEP countries and the EMEP domain (b) in 2022.*

Wet deposition patterns for individual PAHs show similar spatial trends but differ in absolute values (Fig. 3.19). All four PAHs exhibit elevated deposition levels in Central Europe, particularly in Poland and neighbouring countries, as well as in several hot spots in Eastern Europe and Central Asia. Wet deposition gradually decreases from Central Europe toward the north and northeast of the region.

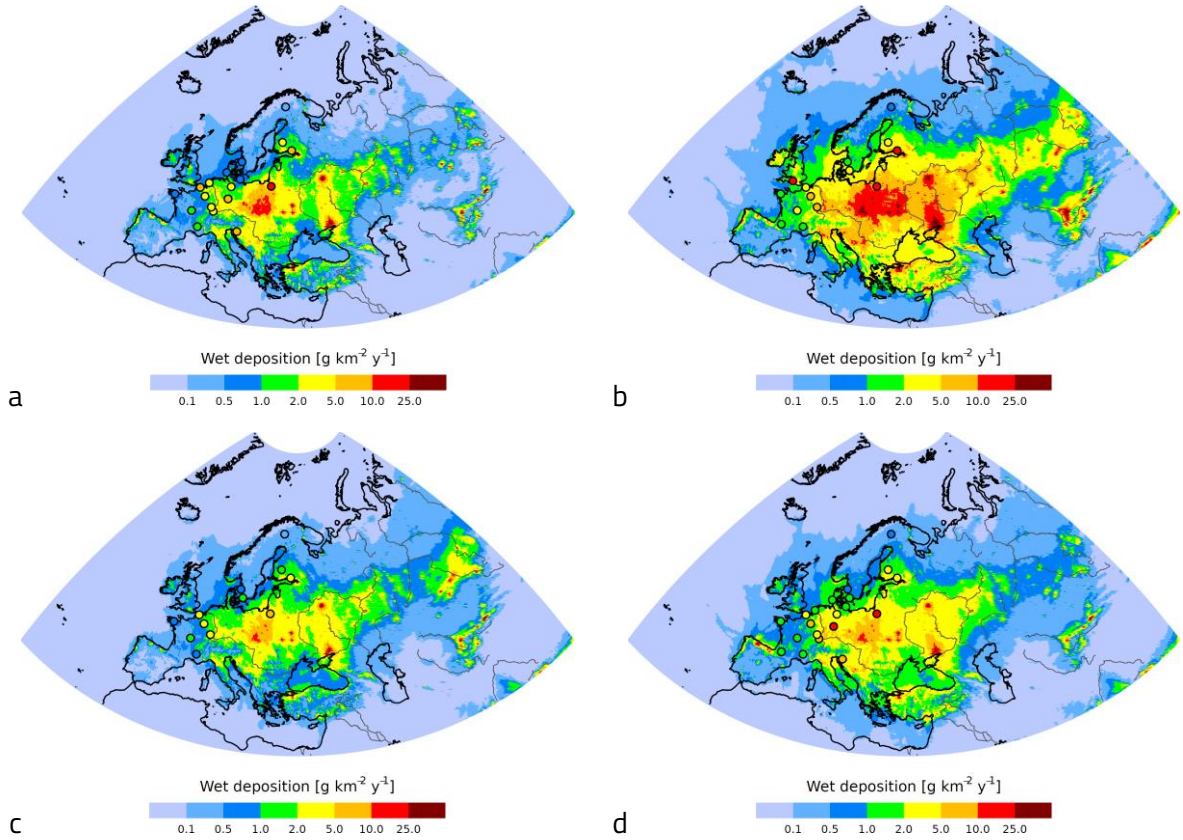


Fig. 3.19. *Annual wet deposition flux of B(a)P (a), B(b)F (b), B(k)F (c), and IP (d) in 2022 (circles on the maps show observed values in the same colour scale).*

Among the PAHs, B(b)F has the highest wet deposition levels, followed by B(a)P, IP, and B(k)F. Observations generally confirm these spatial patterns (Fig. 3.19; Table C1). The model-to-measurement comparison for all four PAHs shows a high spatial correlation, ranging from 0.75 to 0.9. However, the model tends to underestimate observed wet deposition fluxes, with a mean relative bias between -45% and -51%. Despite this, more than half of the simulated annual wet deposition values at the sites agree with observations within a factor of two.

Figure 3.20a shows the spatial distribution of total deposition fluxes for the sum of 4 PAHs in 2022. The highest annual mean deposition is estimated for Central Europe, where air concentrations are also the highest. The greatest deposition fluxes are observed in Poland, northern Czechia and Slovakia, southern Germany, Serbia, and Bosnia and Herzegovina. High deposition is also noted along the Turkish coast near the Dardanelles and Bosporus straits. In contrast, Spain, France, the United Kingdom, Greece, and the Scandinavian countries exhibit relatively low total deposition. The highest deposition fluxes occur in the winter months, driven by elevated emissions from domestic heating, while the lowest are observed in summer due to intensive degradation (Fig. 3.20b). However, there is a noticeable increase in total deposition from April to June, attributed to the high dry deposition of PAHs onto vegetation during the growing season.

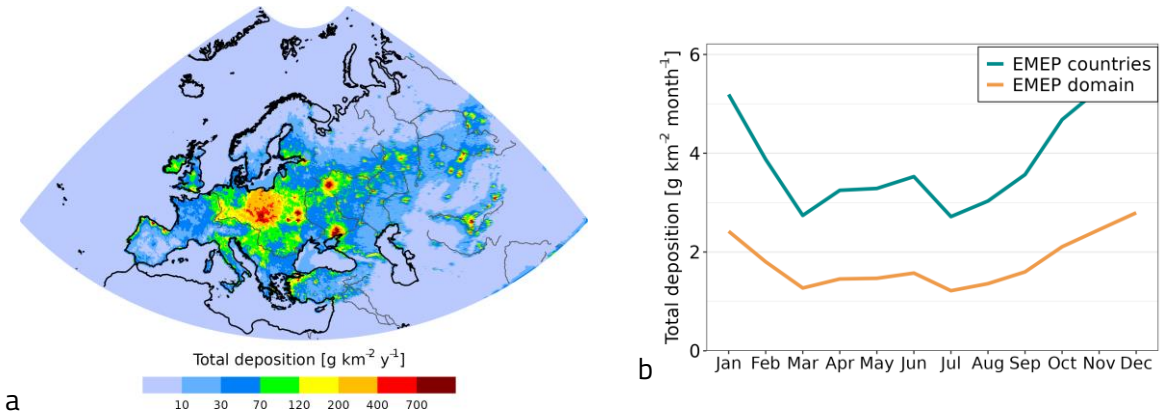


Fig. 3.20. *Annual total deposition flux of the sum of 4 PAHs (a) and seasonal variation of the sum of 4 PAHs total deposition in EMEP countries and the EMEP domain (b) in 2022.*

PAH deposition in the EMEP region reflects contributions from both primary anthropogenic emission sources within EMEP countries and secondary and non-EMEP sources (Fig. 3.21). In most countries, the contributions from non-EMEP and secondary sources are relatively low due to the relatively short atmospheric residence time of PAHs and weak reemission fluxes from surfaces. The combined share of these sources ranges from 10% to 43% of the total deposition in EMEP countries, with the highest shares observed in remote areas and countries near the domain borders, such as Iceland, Portugal, Cyprus, Ireland, Spain, and the United Kingdom.

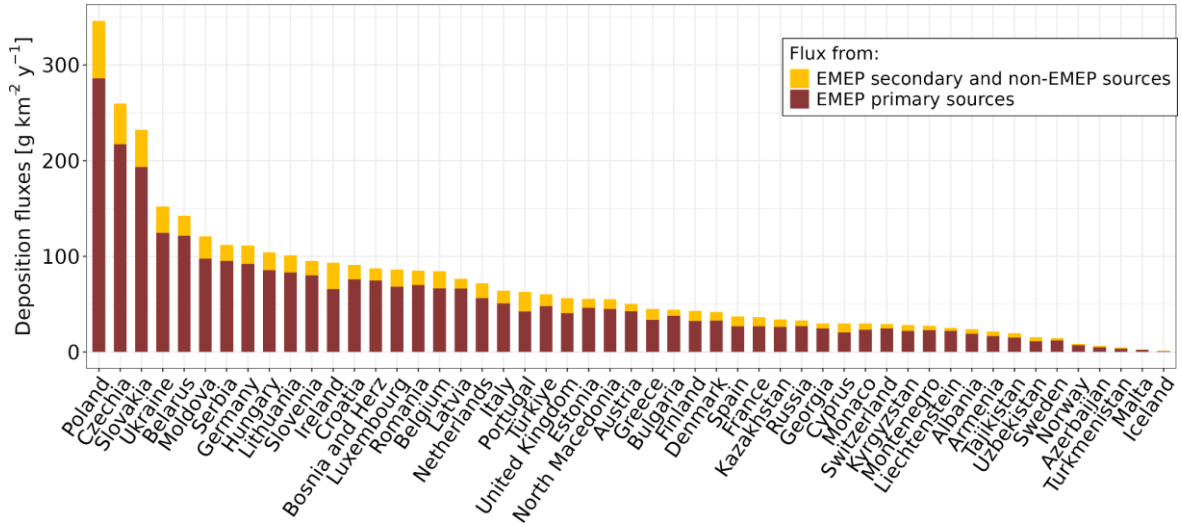


Fig. 3.21. *Country-average deposition of the sum of 4 PAHs to EMEP countries from EMEP primary anthropogenic, secondary and non-EMEP emission sources in 2022.*

The contribution of EMEP primary emissions can be further divided into domestic and foreign sources, highlighting the impact of transboundary pollution. Domestic sources dominate in most countries, exceeding 80% in Italy, Türkiye, Portugal, Ireland, Poland, the United Kingdom, Kazakhstan, and Tajikistan (Fig. 3.22). The highest deposition fluxes from domestic sources are observed in Poland and Czechia, reaching 230 g/km²/year and 140 g/km²/year, respectively. Conversely, transboundary transport plays a dominant role (over 90%) in countries with low anthropogenic emissions, such as Monaco, Liechtenstein, and Albania. Additionally, transboundary transport accounts for more than 50% of total deposition in Austria, Azerbaijan, Belarus, Switzerland, Iceland, Lithuania, Luxembourg, Montenegro, the Netherlands, Slovakia, and Uzbekistan. Given that all selected PAHs are short-lived pollutants, the largest absolute contributions from transboundary transport are found in Central and Eastern European countries, including Czechia, Slovakia, Belarus, Hungary, and Slovenia, which are adjacent to countries with significant anthropogenic emissions. However, it is important to note that domestic sources also contribute significantly in these countries.

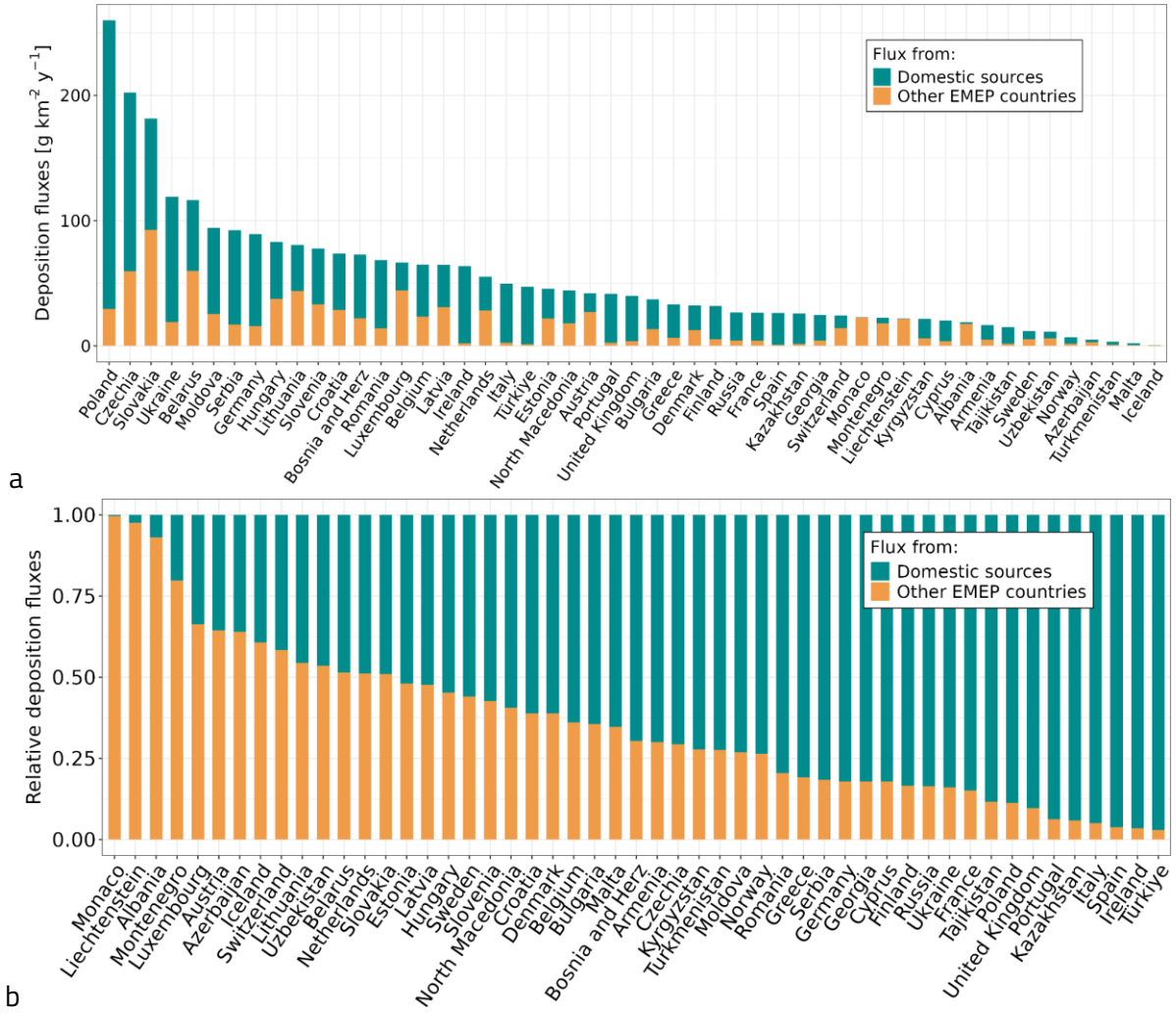


Fig. 3.22 *Country-average anthropogenic deposition of the sum of 4 PAHs to EMEP countries (a) and relative contribution of domestic and foreign sources to the sum of 4 PAHs anthropogenic deposition in EMEP countries (b) in 2022.*

4. Research and developments

In preparation for the operational model assessment of heavy metal and POP pollution, multiple modelling and data processing tools have been installed and set up for simulations. The latest stable open-source version of the GLEMOS model (v2.2.2, https://github.com/glemos-model) was technically updated and adapted for use on supercomputer clusters. All physical and chemical parameterizations of the model were kept unchanged in this year's simulations to ensure consistency with the previous assessment results.

MSC-E has continued and initiated new research activities aimed at improving model parameterizations and evaluating model performance. The ongoing research primarily focuses on updating the model's chemical scheme for Hg by incorporating the latest findings on oxidation and reduction mechanisms from the literature. Additionally, we are refining air-vegetation and air-water exchange processes to improve predictions of pollution in sensitive terrestrial and aquatic ecosystems. A detailed analysis and model evaluation of PAH pollution are being conducted at the country level as part of a newly initiated pilot study for Slovenia and other Balkan countries. Furthermore, a new R-based visualization system has been developed for plotting pollution maps and other graphical products.

4.1. Further development of Hg atmospheric chemistry

Joint research focused on the analysis of Hg atmospheric chemistry and its effect on human exposure levels was conducted in collaboration with researchers from the Institute of Physical Chemistry Blas Cabrera, Spanish National Research Council (Spain), and the Institute of Environment and Ecology, Tsinghua University (China). As part of this research, an experimental version of the GLEMOS model (v2.3) was developed, incorporating a new chemical mechanism for Hg transformations in the atmosphere. This mechanism includes the initial oxidation of Hg^0 by the radicals Br, Cl, and OH, forming unstable Hg^I intermediates, which are further oxidized by these and other reactants (HO_2, O_3, NO_2, HCl, CH_4, CO) to form Hg^{II} or are thermally and photoreduced back to Hg^0 (Fig. 4.1).

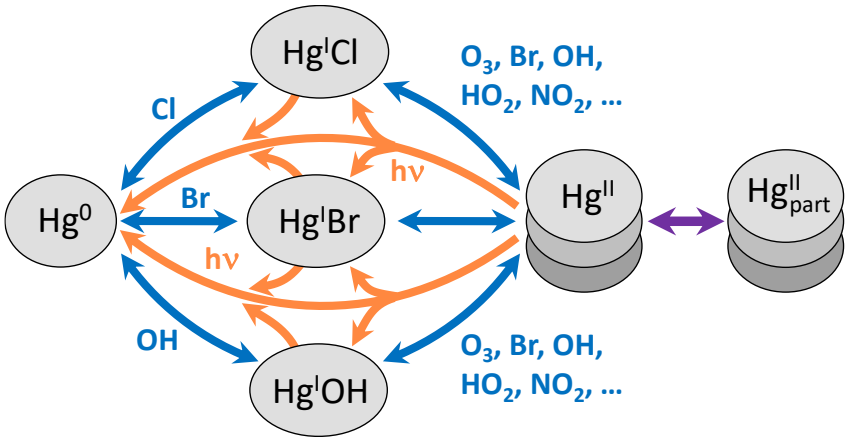


Fig. 4.1. *Scheme Hg chemical transformations in the atmosphere.*

The updated version of the GLEMOS model simulates Hg^0 and nineteen oxidized Hg^I and Hg^{II} species (HgBr, $HgBr_2$, HgBrOH, HgBrCl, HgBrOOH, HgBrONO, HgBrO, HgOH, HgOHOOH, HgOHONO, HgOHO, HgOHOH, HgOHCl, HgCl, $HgCl_2$, HgClO, HgClONO, HgClOOH, and HgO) in both gaseous and particulate forms. Gas-particle partitioning of Hg^I and Hg^{II} was parameterized using an empirically derived thermodynamic equilibrium mechanism for individual oxidized Hg species, following *Amos et al.* (2012), without respeciation in the particulate phase. Additionally, we incorporated aqueous-phase photoreduction in cloud droplets, using the photolysis rate constant of 0.15 h^{-1} measured (Saiz-Lopez et al., 2018). Six-hourly concentration fields of the chemical reactants Br, Cl, OH, HO_2, O_3, NO_2, HCl, CH_4, and CO, which participate in Hg chemistry, were archived from simulations of the CAM-Chem model.

We performed simulations for the period 2007 to 2013 using anthropogenic Hg emissions data from 2010 (AMAP/UN Environment, 2019). Prescribed fluxes of natural and secondary Hg^0 reemissions from soil and seawater were generated based on the Hg concentration in soil, soil temperature, and solar radiation for land emissions, and proportional to the primary production of organic carbon in seawater for ocean emissions (Travnikov et al., 2017). Additionally, prompt reemission of Hg from snow was included using an empirical parameterization based on observational data (Sprovieri et al., 2005; Kirk et al., 2006; Johnson et al., 2008). The first six years of the period were used for model spin-up to achieve steady-state Hg concentrations in the troposphere.

The simulation results for the atmospheric transport and deposition of Hg were evaluated against observations. The dataset used for measurements was derived from the compilation of observations for 2013, as detailed in (Travnikov et al., 2017). This dataset included data from the Global Mercury Observation System (GMOS), the European Monitoring and Evaluation Programme (EMEP) regional network for Europe, the Mercury Deposition Network of the National Atmospheric Deposition Program (NADP/MDN), the Atmospheric Mercury Network (AMNet), and the Canadian

National Atmospheric Chemistry Database (NAtChem) for North America. The evaluation primarily relied on comparing observed and simulated Hg^0 concentrations and Hg wet deposition, as these are considered the most reliable available Hg observations.

The model effectively reproduces the average measured Hg^0 concentrations (1.69 ng m^{-3} modelled vs. 1.63 ng m^{-3} observed), with a high spatial correlation coefficient of ~0.88 and a normalized root mean square error (NRMSE) of ~23% (Fig. 4.2a). The mean simulated wet deposition (9.59 µg m^{-2} y^{-1}) aligned well with the observed average across all 134 available measurement sites (9.64 µg m^{-2} y^{-1}), showing a spatial correlation of 0.52 and an NRMSE of about 50% (Fig. 4.2b).

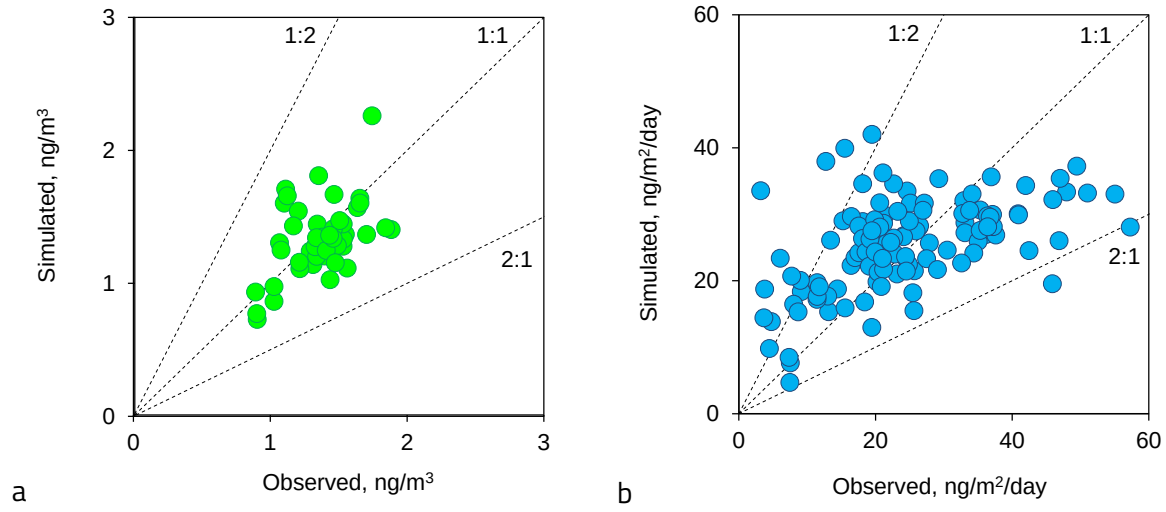


Fig. 4.2. *Evaluation of model simulations of Hg0 air concentration (a) and Hg wet deposition (b) against observations*

Oxidized $Hg^{I,II}$ are key fractions of Hg responsible for deposition to aquatic and terrestrial ecosystems. A more detailed representation and simulation of individual $Hg^{I,II}$ species allow for a better understanding of their formation and cycling in the atmosphere. Model simulations show that the dominant $Hg^{I,II}$ species in the troposphere are gaseous $HgCl_2$ (47%), gaseous HgBrOH (9%), and total particulate Hg (43%). This $Hg^{I,II}$ partitioning is similar to previous estimates by Shah et al. (2021), despite slightly different assumptions about $Hg^{I,II}$ gas-particle interactions used in the model formulations. At the surface level, the composition of $Hg^{I,II}$ species differs, with a smaller share of $HgCl_2$ and a larger contribution of HgBrOH, particularly in high-latitude regions (Fig. 4.3).

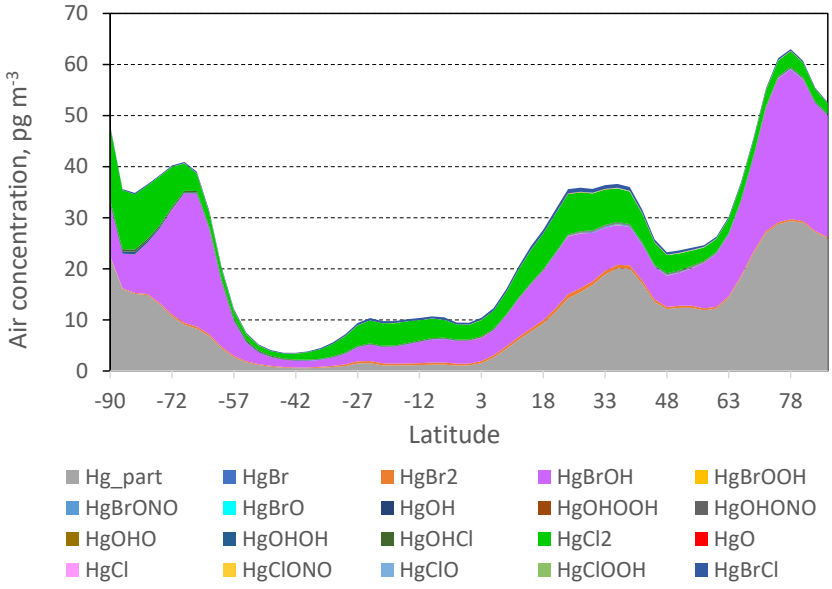


Fig. 4.3. *Simulated zonal average distribution of HgI,II species in the surface air*

Evaluating simulated $Hg^{I,II}$ is challenging due to the well-recognized high uncertainties and the issue of biased low values in most of the currently available $Hg^{I,II}$ measurement databases (Gustin et al., 2013; 2021; Marusczak et al., 2017; Dunham-Cheatham et al., 2023). To address these limitations, an empirically derived posterior correction approach was developed and applied for the model evaluation and analysis, as discussed in Section 4.2.

The experimental version of the GLEMOS model, incorporating an updated chemical mechanism, was used to quantify the impact of anthropogenic emissions of short-lived halogens (chlorine-, bromine-, and iodine-containing species with lifetimes below six months) on the Hg chemical cycle in the atmosphere and human exposure to Hg contamination. The results of this study were published in a journal paper *(Fu et al.*, 2024).

4.2. Evaluation and analysis of simulated reactive Hg

Historical observations of reactive Hg (gaseous and particulate $Hg^{I,II}$) in the air have predominantly relied on KCl-coated denuder technology, which has been reported to inaccurately quantify gaseous oxidized Hg (GOM), resulting in biased low values (e.g., Marusczak et al., 2017; Gustin et al., 2013, 2021; Dunham-Cheatham et al., 2023). These underestimated values of reactive Hg limit the usefulness of significant long-term speciated Hg measurement datasets for evaluating chemical transport models that simulate Hg. The lack of reliable observations of reactive Hg can lead to biased model estimates, which are then used for policy decisions. To potentially make these extensive reactive Hg datasets more valuable, MSC-E has developed an empirical posterior correction approach that links the degree of reactive Hg underestimation to ancillary data, such as air pollutant concentrations and meteorological parameters.

Data for establishing an empirical relationship between reactive Hg underestimation and meteorological or air pollutant data was sourced from the literature (Gustin et al., 2013; Huang and Gustin, 2015; Lyman et al., 2010; McClure et al., 2014). Using this information, we applied a multiple linear regression (MLR) model to link reactive Hg underestimation to the two most critical parameters identified: ozone concentration and specific humidity:

$$F_u = 1.510 + 0.018 \cdot [O_3] + 0.096 \cdot SH$$

Where F_u is the reactive Hg underestimation factor, $[O_3]$ is the ozone concentration in ppb, and SH is the specific humidity in g kg^{-1}.

Additionally, meteorological and air pollutant data were used for each reactive Hg measurement dataset to calculate site-specific underestimation factors. This data was sourced from the National Oceanic and Atmospheric Administration (NOAA) and the Government of Canada for humidity and temperature, and from the US Environmental Protection Agency (US EPA), the Government of Canada, the EBAS database, and the TOAR-II database for ozone (O_3). Using the developed approach, a global dataset of GOM measurement from national and international monitoring networks from (Travnikov et al., 2013) was corrected, as shown in Fig. 4.4. The correction factor varied from 2.1 to 3.3, depending on the site location and ambient conditions.

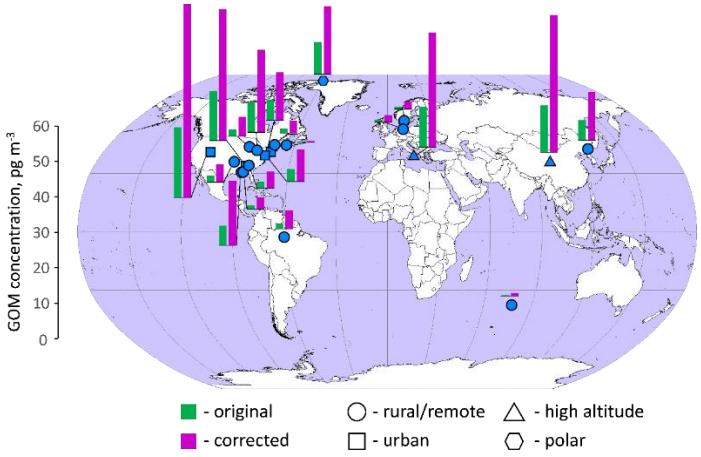


Fig. 4.4 *Original (green) and corrected (violet) GOM measurements in 2013, adapted from Travnikov et al. (2017). The correction was performed using the empirical multiple linear regression approach.*

The corrected measurement data was used to evaluate global-scale simulations with the experimental version of GLEMOS, as discussed in Section 4.1. Simulated reactive Hg concentrations were compared with the 2013 observational dataset, which combined corrected GOM and uncorrected particulate Hg (Fig. 4.5a). The evaluation revealed a significant positive bias (53%) in the modelling results (Fig. 4.5b), despite unbiased traditional model evaluations against Hg^0 and wet deposition measurements (Section 4.1). This discrepancy may stem from several factors, including uncertainties in the speciation of anthropogenic emissions in available inventories, missing reactive Hg redox mechanisms in near-ground air, and uncertainties in reactive Hg dry deposition. In all

cases, currently available model estimates of Hg deposition to ecosystems can be significantly biased high or low depending on prevailing factors.

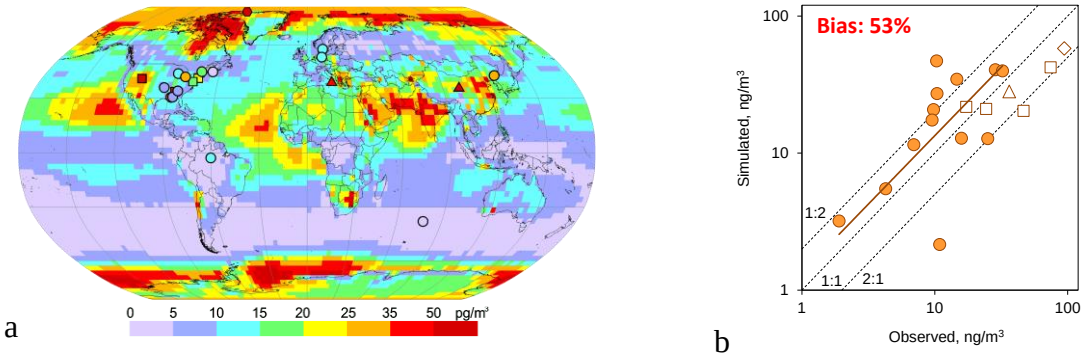


Fig. 4.5. *Global distribution of reactive Hg simulated for 2013 (a) and evaluation of the modelling results against observations (b). The statistics are calculated only for rural and remote sites.*

To explore potential reasons for the model's overestimation of reactive Hg and their impact on the estimated global mercury deposition patterns, several sensitivity simulations were conducted (Table 4.1). These simulations aimed to reduce the biased high model estimates of reactive Hg by adjusting Hg emissions speciation, dry deposition velocity, and photoreduction rates within the model. The results of the sensitivity simulations were then compared with the base case.

Table 4.1. *Description of sensitivity simulations.*

Scenario	Description
Base case	Standard model formulation
Emissions speciation	Share of reactive Hg emissions decreased to 10% of total emissions
Dry deposition	Dry deposition velocity of GOM increased by a factor of 2
Photochemistry	Photoreduction rates of reactive Hg increased by a factor of 2

The results of the sensitivity simulations are presented in Fig. 4.6 as differences between the base case and each sensitivity run. All these simulations help reduce discrepancies between the simulated and observed reactive Hg without significantly affecting the model's performance in simulating other parameters, such as Hg^0 air concentration and Hg wet deposition. The *'Emissions speciation'* sensitivity run suggests that the current models may overestimate Hg deposition near major emission regions while underestimating it over the ocean and in remote areas (Fig. 4.6a). The *'Dry deposition'* scenario indicates that uncertainties in GOM dry deposition velocity may lead to overestimation of Hg deposition in areas with high precipitation and underestimation in arid regions (Fig. 4.6b). Finally, the *'Photochemistry'* scenario shows that underestimating the photoreduction of reactive Hg could result in biased high Hg deposition over the oceans in the Northern Hemisphere and underestimation over continental areas in the Southern Hemisphere (Fig. 4.6c).

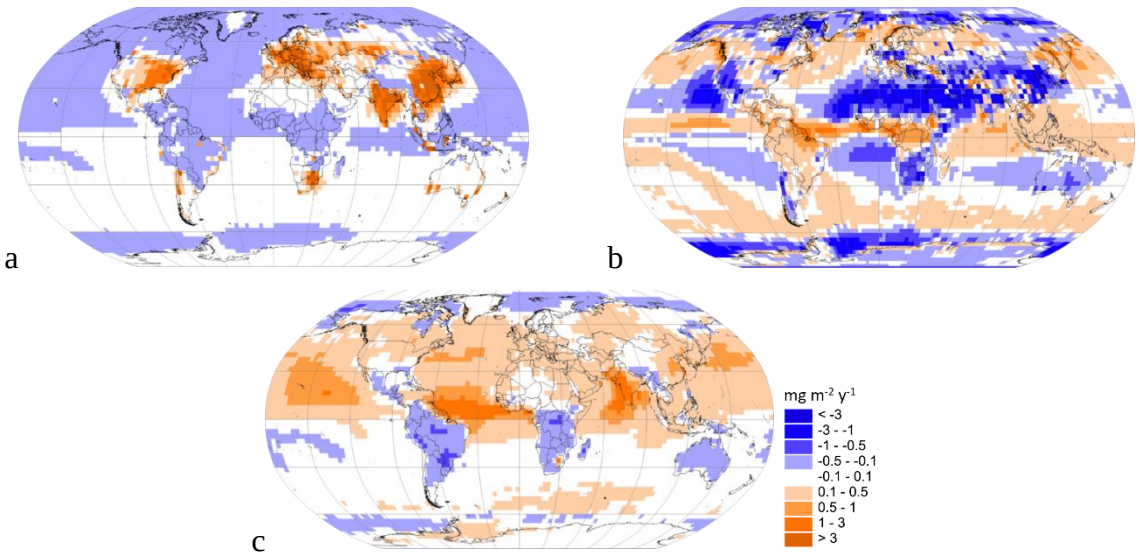


Fig. 4.6. *Sensitivity simulation results, showing possible bias in Hg deposition simulations due to uncertainties of: (a) emissions speciation; (b) dry deposition of reactive Hg and (c) photoreduction of reactive Hg.*

Thus, the sensitivity simulations aimed at reducing the modelled bias revealed possible inaccuracies in the modelling results due to uncertainties in various processes:

- Underestimated transport of Hg from industrial to remote regions;
- Incorrect balance between Hg dry and wet deposition;
- Insufficient transport of Hg from the Northern to the Southern Hemisphere.

Further analysis and refinement of these processes will enhance model performance and reduce uncertainties in the simulations. The results of this study were presented at the recent International Conference on Mercury as a Global Pollutant (ICMGP 2024), held in July 2024 in Cape Town, South Africa.

4.4. Evaluation of Hg deposition to vegetation

Understanding atmospheric elemental mercury Hg^0 deposition fluxes is crucial for comprehending global Hg cycling and assessing associated ecological risks. Among the terrestrial compartments, forest ecosystems play an important role in this global cycling. In this context, foliar atmospheric Hg uptake and Hg deposition onto leaf surfaces represent significant deposition pathways to vegetated areas. However, the global magnitude of this flux remains highly uncertain, with estimates ranging from 1000 to 4000 Mg per year (Jiskra, 2018; Zhou et al., 2021; Zhou and Obrist, 2021).

Model estimates of Hg^0 deposition fluxes are primarily derived empirically and have been recently evaluated using observational datasets of Hg measurements in vegetation samples. Specifically, these estimates have been refined using observations from litterfall, throughfall, and flux tower measurements. Additionally, Hg^0 deposition fluxes calculated using the offline version of a global 3-D chemical transport model have been compared with forest foliar Hg uptake fluxes derived from a

bottom-up model for European forests (Wohlgemuth et al., 2023). This approach utilizes foliar Hg concentrations from the UNECE International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests) and the Austrian Bio-Indicator Grid to calculate foliar Hg uptake fluxes for individual tree species at different locations (Wohlgemuth et al., 2020).

Despite the existence of harmonized protocols developed by the ICP Forests (Seidling et al., 2017), variations in foliar Hg concentrations can arise due to diverse sampling, sample preparation, and analytical methods. Reported Hg concentrations from a wide range of studies are also associated with uncertainties due to the variety of methodological approaches adopted for determining Hg concentrations in foliage samples. This variability is not accounted for when observational Hg datasets from different studies are used to evaluate and refine model estimates. Consequently, the evaluation of model estimates of Hg^0 deposition fluxes may inherit these uncertainties, affecting the accuracy of the modelling outputs. Therefore, it is imperative to estimate how uncertainties related to methodological approaches translate into model Hg^0 deposition estimates, with potential implications for our understanding of Hg cycling and associated ecological risks.

Figure 4.7 outlines the bottom-up approach used in this work. The foliar Hg concentration from the datasets is adjusted for uncertainty by multiplying each value by a specified factor, resulting in three distinct sets of data: upper bound values, average values, and lower bound values. The foliar Hg concentration of each foliage sample is then multiplied by the respective leaf mass per area to yield foliar Hg content normalized to leaf area. Foliar Hg uptake rates for each tree species are derived from the change in foliar Hg content normalized to leaf area over time, using a linear regression fit. Subsequently, foliar Hg uptake fluxes per ground surface area are calculated by multiplying the foliar Hg uptake rates by species-specific leaf area indices (LAI), using the formula: $uptake_{ground\ area} = uptake_{leaf\ area} \times LAI$.

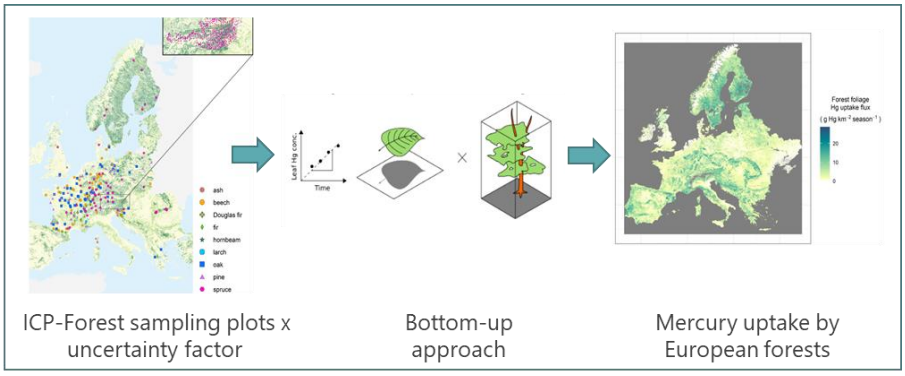


Fig. 4.7. *Bottom-up quantification method for estimating foliar Hg uptake fluxes in European forests (Wohlgemuth et al., 2020).*

To assess the foliar uptake flux over the growing season, the average daily uptake flux is multiplied by the total number of days in the growing season. The estimated fluxes were used to evaluate Hg^0

deposition to forests simulated with GLEMOS (Fig. 4.8). The model performance in estimating Hg^0 deposition fluxes varies across different sites. While the model accurately reproduces deposition fluxes in Northern Scandinavia, it generally underestimates the bottom-up estimates in Central Europe. Additionally, the model does not differentiate Hg^0 deposition across different tree species, resulting in reasonable agreement with measurement-based estimates for pines but underestimating deposition to spruces, oaks, and beeches. Future improvements will focus on updating the model parameterizations for Hg^0 dry deposition and conducting more detailed evaluations, potentially in collaboration with ICP-Forests.

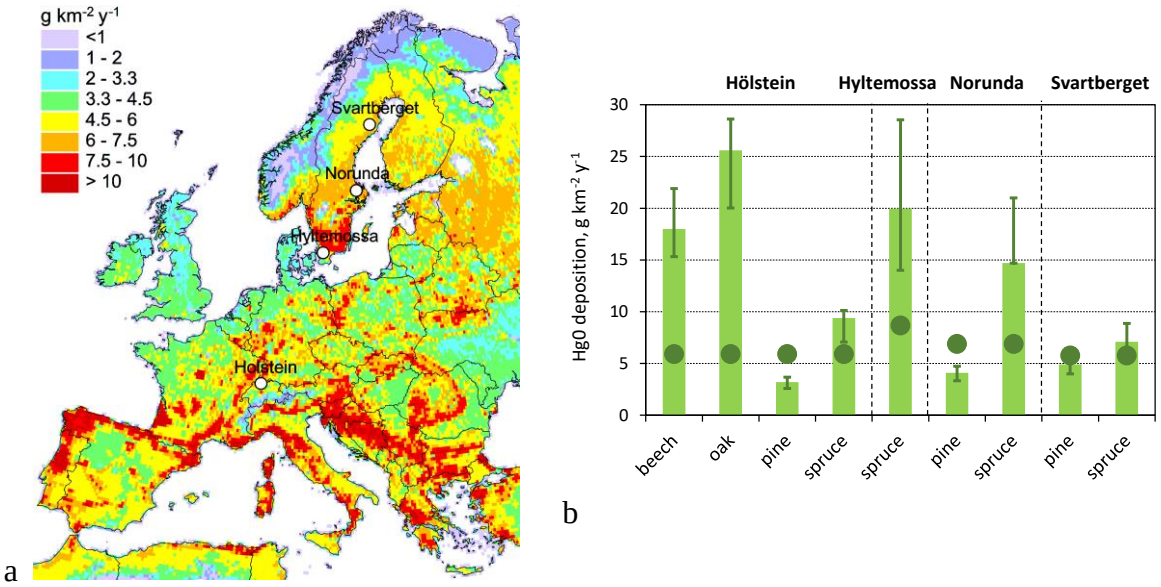


Fig. 4.8. *Simulated Hg0 deposition to European forests in 2022 (a) and comparison of simulated Hg0 fluxes (circles) against bottom-up foliar Hg uptake etimates (bars).*

4.5. A country-scale study of PAH pollution in the Balkan countries

The country-scale pilot studies are a long-term research and assessment initiative that MSC-E has successfully conducted in cooperation with the Task Force on Measurements and Modelling (TFMM) for over 12 years. During this period, 10 European countries – Czechia, Croatia, the Netherlands, Belarus, Spain, France, the UK, Poland, Germany, and Norway – have participated in these studies (Fig. 4.9a). The pilot studies focus on a detailed assessment of heavy metal and POP pollution in individual countries, including fine-resolution modelling, evaluation and refinement of national emission inventories, and enhancement of modelling tools. Recently, MSC-E initiated a new study to investigate polycyclic aromatic hydrocarbon (PAH) pollution in the Balkan region. The first phase of this study will concentrate on country-scale pollution in Slovenia and explore the possibility of extending the research to other Balkan countries (Fig. 4.9b).

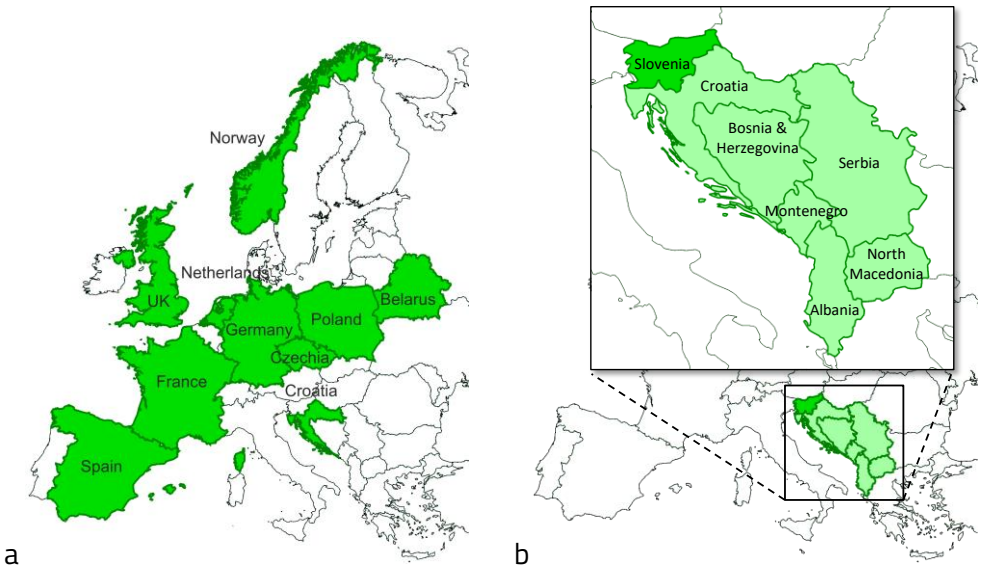


Fig. 4.9. *Countries included in the country-scale pilot studies on heavy metal and POP pollution during the period 2010-2022 (a) and the Balkan countries targeted in the new study (b).*

According to current MSC-E simulations, Slovenia is among the top ten EMEP countries with the highest B(a)P deposition (Fig. 4.10a), receiving on average more than 30 g km^{-2} y^{-1}. Annual mean B(a)P air concentrations can exceed 0.6 ng m^{-3} in some densely populated areas (Fig. 4.12a). This concentration is significantly higher during the cold season and can exceed 1 ng m^{-3} over large areas, which is the target value for B(a)P air concentration set by the European Union (European Directive 2004/107/EC).

Approximately half (52%) of B(a)P deposition in the country and up to 68% of the annual B(a)P concentration in surface air originates from national emission sources (Fig. 4.10b). Other significant contributors are neighbouring countries – Croatia, Austria, and Italy. However, these estimates contain significant uncertainties, as they are based on relatively rough regional model assessments and need detailed evaluation against observations. Therefore, the issue of B(a)P pollution and human exposure in the country, from both national emission sources and transboundary transport, requires further investigation and refinement on a national scale.

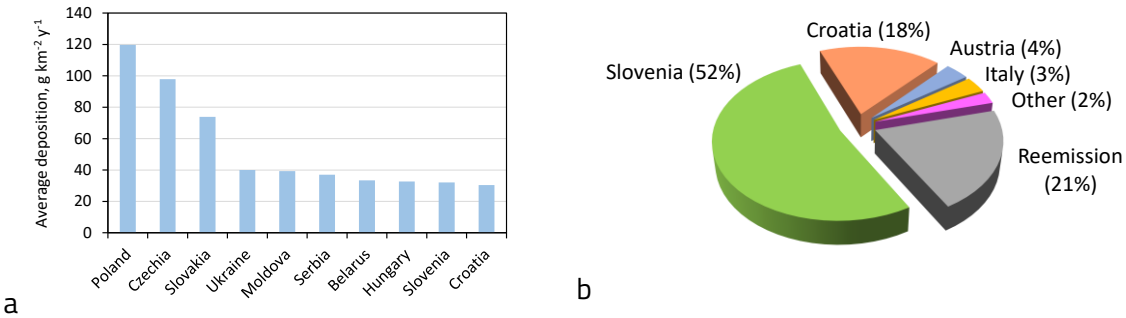


Fig. 4.10. *Top ten countries with the highest B(a)P deposition (a) and source attribution of B(a)P deposition in Slovenia (b) in 2022 (based on MSC-E simulations).*

According to the national emissions data submitted to EMEP, B(a)P anthropogenic emissions are highly inhomogeneously distributed across the country (Fig. 4.11a). The majority of emissions are concentrated around cities, where a significant portion of the country's population resides. The predominant sector contributing to B(a)P emissions in the country is residential combustion, accounting for more than 90% of total B(a)P emissions (Fig. 4.11b). Two other sectors contributing a minor share of total emissions are industry and road transport.

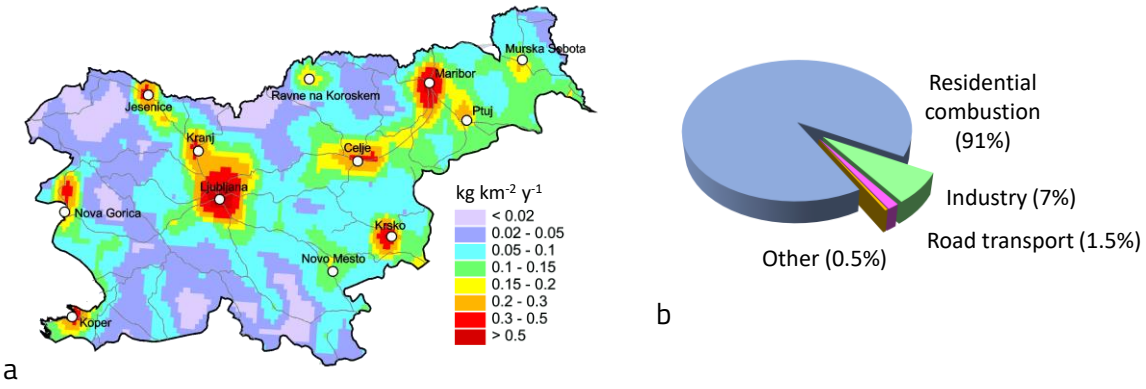


Fig. 4.11. *Spatial distribution (a) and sectoral composition of B(a)P emissions in Slovenia in 2022 according to the EMEP data.*

One of the key aspects of pollution assessment is the availability of observational data, which can be used for direct analysis of pollution levels, sources, and trends, as well as for evaluating model estimates. Various types of measurement data will be involved in the study. These include regular measurements of PAH air concentrations from the EMEP monitoring network (EBAS, 2024) and the European Environment Agency's Air Quality e-Reporting (AQ e-Reporting, 2024). In addition, detailed measurement data of PAH levels, including their isotope composition, will be drawn from intensive measurement campaigns (Fig. 4.12a and 4.12b). Finally, an extensive dataset of PAH measurements in natural archives – such as mosses and lichens – will be used in the study.,

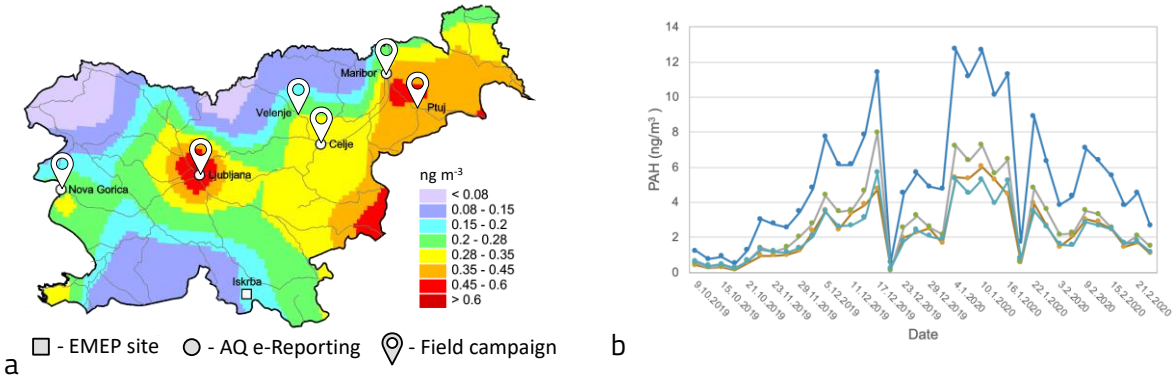


Fig. 4.12 *Available PAH measurements in Slovenia of air concentration (a) and measurements of various PAHs during the measurement campaign in Nova Gorica (b).*

Program of the study includes the following steps:

- Collection of national emissions and monitoring data;
- Fine-resolution simulations of PAH levels in the country;
- Evaluation of modelling results vs. variety of observations;
- Analysis of spatial patterns of PAH pollution using simulations and lichen/moss archives;
- Source attribution of PAH levels using source-receptor modelling and stable isotopes analysis;
- Evaluation and refinement of the national PAH emissions inventory.

The progress and results of the study will be reported to the Task Force on Measurements and Modelling (TFMM) and at the Joint Sessions of EMEP Steering Body and Working Group on Effects.

5. Cooperation

MSC-East resumes and continues scientific collaboration with various international and national bodies, aiming to enhance research and assessment approaches applied by the Centre and to disseminate the scientific knowledge gained within the Convention. These bodies include EMEP Task Forces, International Cooperative Programmes of the Working Group on Effects (WGE), and other international conventions and programmes such as the Minamata and Stockholm Conventions, HELCOM, OSPAR, and AMAP.

5.1. Task Force on Measurements and Modelling

MSC-E contributed to the work of the Task Force on Measurements and Modelling (TFMM) by participating in the Task Force's twenty-fifth meeting (Warsaw, 6-7 May 2024). The Centre presented its ongoing research and development activities, results of the preliminary simulations conducted for 2022, as well as updates of the GLEMOS model, including further development of the chemical scheme for Hg, air-surface exchange fluxes, and POP multi-media processes. MSC-East confirmed its plans to continue country-scale studies of heavy metal and POP pollution and announced a new pilot study for Slovenia and other Balkan countries. Future activities of the Centre will also include contributions to the cooperative EMEP activities on contaminants of emerging concern (item 1.1.1.28) and participation in the analysis of B(a)P health-related effects (item 1.1.1.8).

5.2. Task Force on Hemispheric Transport of Air Pollution

MSC-East continues its long-term collaboration with the Task Force on Hemispheric Transport of Air Pollution (TF HTAP). Currently, the Centre participates in the multi-model research initiative, the Multi-Compartment Mercury Modelling and Analysis Project (MCHgMAP), launched within TF HTAP in cooperation with the Minamata Convention for assessing the effectiveness of current and future mitigation policies (item 1.1.4.3). The project assessment consists of a series of model experiments using off-line coupled atmospheric, ocean, and multi-media mass balance models (Table 5.1) to account for changes in primary anthropogenic and secondary Hg sources as well as environmental conditions in the Hg cycling between land, ocean, and atmosphere.

The atmospheric component of the study employs four global chemical transport models – GEM-MACH-Hg, GEOS-Chem, GLEMOS, and WACCM – to simulate atmospheric transport and air-surface exchange of Hg from 2010 to 2020. Enhanced consistency between the models is achieved by utilizing unified primary and secondary emissions datasets.

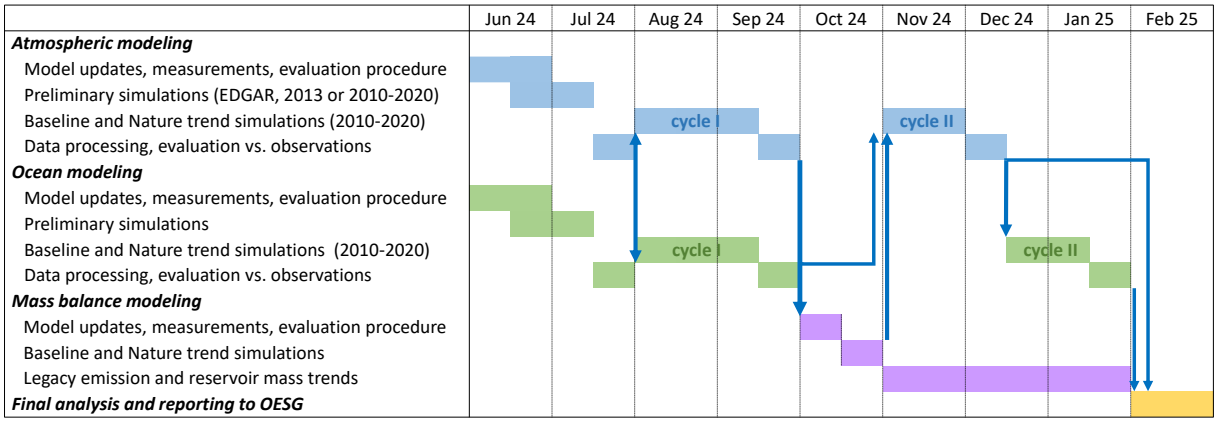
8 The 2024–2025 workplan for the implementation of the Convention (ECE/EB.AIR/154/Add.1).

Table 5.1. *Models participating in the project*

Model	Institution
Atmospheric models	
GEM-MACH-Hg	Environment and Climate Change Canada (Canada)
GEOS-Chem	Massachusetts Institute of Technology (USA)
GLEMOS	Meteorological Synthesizing Centre - East (Slovenia)
WACCM	Institute of Physical Chemistry Blas Cabrera (Spain)
Ocean models	
MERCY	HEREON (Germany)
MITgcm	Nanjing University (China)
Multi-media mass balance models	
Global Biogeochemical Box Model (GBBM)	Harvard University (USA), University Grenoble Alpes, CNRS (France)
WorM^3	Indian Institute of Technology Hyderabad (India)
Terrestrial model	
2D air-land Hg exchange model	Lamar University (USA), Institute of Geochemistry, CAS (China)

The first phase of MCHgMAP multi-model simulations is currently in progress and is expected to be completed by the spring of 2025 (Table 5.2). It focuses on assessing the spatial patterns and temporal trends of Hg levels in remote and affected regions according to the baseline scenario, and evaluating simulated trends against a compilation of long-term measurements. Additionally, a perturbation scenario aims to isolate the effect of temporal changes in anthropogenic emissions on Hg levels from the influence of changing environmental factors. Multiple trend analysis methods are applied to both observed and modelled Hg concentrations and deposition to maximize the information obtained from observed and modelled time series.

Table 5.2. *Timeline of the first phase of MCHgMAP multi-model simulations*



MSC-E participated in the development of the assessment program and coordinated the atmospheric modelling group activities throughout all stages of the project. Specifically, it contributed to the design of the overall model simulation and analysis program, the formulation of multi-model experiments, and the specification of output results. MSC-E also developed a harmonized approach to estimating Hg exchange between the atmosphere and the ocean for consistent application within the project. A detailed description of the project's formulation and program was published in a position paper (Dastoor et al., 2024). The paper provides comprehensive information on the setup and coordination of the assessment, including a review, scientific rationale, and recommendations for improving and utilizing anthropogenic and geogenic emissions inventories, observational data on Hg levels in air and seawater, air-surface exchange fluxes, characteristics of available chemical transport models for Hg, and the detailed program for model simulations and analysis of the assessment results.

The Centre will also contribute to another modelling initiative recently launched under TF HTAP to study multi-pollutant effects of wildfires and biomass burning (item 1.1.4.4). The contributions and plans of MSC-E were highlighted at the recent virtual Task Force meeting held on April 22-25, 2024.

5.3. Other International Bodies

In addition, MSC-E prioritises its cooperation with other international bodies. As part of the MCHgMAP project, the Centre actively contributes to the work of the Open-ended Scientific Group for the effectiveness evaluation of the Minamata Convention on Mercury (item 1.3.4). Cooperation with the Marine Conventions (HELCOM and OSPAR) on the assessment of heavy metal and POP pollution in the Baltic Sea and Northern Atlantic waters is currently being renewed as part of multilateral or bilateral contracts. The Centre also considers opportunities for cooperation and data exchange with the Stockholm Convention on Persistent Organic Pollutants (item 1.3.3) and the Arctic Monitoring and Assessment Programme (AMAP).

6. Future directions

Future research and development work at MSC-E, in accordance with the revised mandate (ECE/EB.AIR/144/Add.1) and the 2024-2025 workplan for implementing the Convention (ECE/EB.AIR/154/Add.1), will include:

- Consecutive updates to the GLEMOS model, focusing on key physical and chemical processes governing the dispersion of heavy metals and POPs in the atmosphere and other media, with particular emphasis on the multi-media aspects of POP modelling.
- Distribution of an updated GLEMOS code, making it available to the wider scientific community and experts from the Parties through an open-source repository (https://github.com/).
- Conducting a country-scale assessment and analysis of PAH pollution as part of a pilot study for Slovenia and other Balkan countries, in cooperation with TFMM.
- Participation in TFMM cooperative activities, with efforts focused on contaminants of emerging concern and the analysis of B(a)P health-related effects.
- Collaborating with TF HTAP on the assessment and attribution of Hg pollution trends as part of the MCHgMAP project, along with contributing to the multi-pollutant, multi-effects study of wildfires.
- Renewing collaboration with ICP Vegetation for a joint analysis of temporal trends and changes in spatial patterns of heavy metal and POP deposition, utilizing both model simulations and moss measurements.
- Cooperating with the Marine Conventions (HELCOM and OSPAR) to assess heavy metal and POP pollution in the Baltic Sea and Northern Atlantic waters through multilateral or bilateral contracts.

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Annex A.1. Reporting of priority heavy metals and POPs in EMEP East region

Table A1. *Reporting of main heavy metals (Pb, Cd, Hg) in EMEP-East region since 2015.*

Reporting of main heavy metals (Pb, Cd, Hg)										
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Armenia	2008 - 2013 (only Pb, only a few sectors)	2014		2016	2017		2019	2020	2021	2022
Azerbaijan	1990 - 2013 (only Hg, only a few sectors)	1990-2014 (Pb, Cd: 1995-2014)	1990 - 2015 (Pb, Cd: 1995-2015)	1990 - 2016 (Pb, Cd: 1995-2016)	1995-2017 (Hg1990-2017)					1990-2022
Belarus	2013			2014-2016	2017	2018	2019	2020	2020, 2021	2022
Georgia	2007 - 2013 (no Hg)	2007-2014 (Cd, Hg: 2013-2014)	2007 - 2015	2007-2016	2007-2017		1990-2019	1990-2020	1990-2021	1990-2022
Kazakhstan		2013-2014	1990, 2000, 2005, 2010 - 2015	1990 - 2016		1990 - 2018	1990-2019	1990-2020	1990-2021	1990-2022
Kyrgyzstan		2014 (only Hg)	2015 (only Hg)		2017	2018				1990-2022
Republic of Moldova	2013	1990-2014 (no emissions calculated for the waste sector)	1990 - 2015			1990 - 2017	1990-2019			
Russian Federation										
Ukraine	2013	2014	2015	2016		2016, 2017, 2018	2019	2020	1990-2021	1990-2022
Turkey					1990 - 2017 *(just for very few IPPU categories)*	1990 - 2018 *(just for very few*	1990-2019	1990-2020	1990-2021	1990-2022

Table A2. *Reporting of POPs (PCDD/Fs, PAHs, HCB, PCBs) in EMEP East region since 2015.*

Reporting of POPs (PCDD/Fs, PAHs, HCB, PCBs)										
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Armenia		2014		2016 (only PCDD/Fs)	2017 (No HCB, no PCBs)		2019	2020	2021	2022
Azerbaijan	1995-2013	1995-2014 (no HCB, no PCBs)	1995-2015	1995-2016	1995 -2017 (HCB, PCBS no data for 2000)					1990-2022
Belarus	2013			2014-2016	2017	2018	2019	2020	2020, 2021	2022
Georgia	2007-2013 (no HCB)	2007-2014 (PCDD/Fs) 2013-2014 (PAHs, HCB, PCBs)	2007-2015	2007-2016 (HCB only 2013-2016)	2007-2017		1990-2019	1990-2020	1990-2021	1990-2022
Kazakhstan		2013-2014	1990, 2000, 2005, 2010-2015	1990-2016		1990 -2018	1990-2019	1990-2020	1990-2021	1990-2022
Kyrgyzstan					2017	2018				1990-2022
Republic of Moldova	2013	1990-2014 (no emissions calculated for the waste sector)	1990-2015			1990-2017	1990-2019			
Russian Federation										
Ukraine	2013 (no PCDD/Fs)				2017	2017, 2018	2019	2020	1990-2021	1990-2022
Turkey										

Annex A.2. Significant changes (over ±15 %) between national totals used in models in year 2024 and national totals used in models in 2023

Data values represent the 'total national totals'. The column 'data sources' in the table below indicates the following four cases:

- "reported": both 2021 and 2022 data are reported by country.
- "gapfilled": both 2021 and 2022 data are gap-filled by expert estimates
- "new gapfilled": 2021 data was reported by country and 2022 data had to be gap-filled by expert estimates (because it was not reported by country)
- "new reported": 2021 data was gap-filled, 2022 data is as reported by country

The indicator "new" in column "% change" indicates that the value has been either reported or gap-filled for the first time.

Component	CC	Data sources	Unit	2021 value	2020 value	% change	Value change
B(a)P	AL	New reported	t	0.021	0.680	-97%	-0.660
B(a)P	AZ	New reported	t	0.474	0.396	20%	0.078
B(a)P	ES	gapfilled	t	13.032	10.215	28%	2.818
B(a)P	KG	New reported	t	6.560	4.112	60%	2.448
B(a)P	LU	gapfilled	t	0.152	0.124	23%	0.029
B(a)P	PL	gapfilled	t	74.455	89.124	-16%	-14.669
B(a)P	PT	gapfilled	t	3.750	5.831	-36%	-2.081
B(b)F	AL	New reported	t	0.033	0.678	-95%	-0.645
B(b)F	AZ	New reported	t	0.493	0.420	17%	0.072
B(b)F	KG	New reported	t	8.724	5.860	49%	2.865
B(b)F	LU	gapfilled	t	0.317	0.220	44%	0.097
B(b)F	PL	gapfilled	t	77.808	91.707	-15%	-13.898
B(b)F	PT	gapfilled	t	3.810	4.950	-23%	-1.140
B(b)F	SI	gapfilled	t	1.667	1.099	52%	0.569
B(k)F	AL	New reported	t	0.000	0.313	-100%	-0.313
B(k)F	AZ	New reported	t	0.427	0.353	21%	0.073
B(k)F	ES	gapfilled	t	5.666	4.754	19%	0.912
B(k)F	GE	gapfilled	t	1.148	0.907	27%	0.241
B(k)F	KG	New reported	t	3.392	2.310	47%	1.082
B(k)F	LU	gapfilled	t	0.147	0.111	32%	0.036
B(k)F	PT	gapfilled	t	1.585	2.636	-40%	-1.051
B(k)F	SI	gapfilled	t	0.681	1.062	-36%	-0.381
Cd	AZ	New reported	t	0.183	0.104	77%	0.080
Cd	KG	New reported	t	0.250	0.501	-50%	-0.251
Cd	TR	gapfilled	t	7.262	3.968	83%	3.293
PCDD/F	AL	New reported	g I-TEQ	0.002	9.183	-100%	-9.181
PCDD/F	AZ	New reported	g I-TEQ	3.406	5.176	-34%	-1.770
PCDD/F	KG	New reported	g I-TEQ	28.678	14.595	96%	14.082
HCB	AL	New reported	kg	0.016	0.132	-88%	-0.116
HCB	AZ	New reported	kg	0.160	0.043	272%	0.117

Component	CC	Data sources	Unit	2021 value	2020 value	% change	Value change
HCB	HR	New reported	kg	0.321	0.505	-36%	-0.184
HCB	KG	New reported	kg	0.185	0.665	-72%	-0.481
Hg	AZ	New reported	t	0.197	0.275	-28%	-0.078
Hg	KG	New reported	t	0.291	0.849	-66%	-0.559
Hg	KZT	New reported	t	13.363	24.554	-46%	-11.191
Hg	TR	gapfilled	t	6.129	10.731	-43%	-4.603
IcP	AL	New reported	t	0.197	0.574	-66%	-0.377
IcP	AZ	New reported	t	0.106	0.080	32%	0.025
IcP	DE	gapfilled	t	20.267	17.437	16%	2.830
IcP	ES	gapfilled	t	17.169	5.362	220%	11.806
IcP	KG	New reported	t	3.203	1.944	65%	1.258
IcP	LU	gapfilled	t	0.090	0.077	17%	0.013
IcP	PT	gapfilled	t	2.226	3.289	-32%	-1.063
IcP	SI	gapfilled	t	1.023	0.425	141%	0.598
PAH	AL	New reported	t	0.261	2.245	-88%	-1.984
PAH	AM	gapfilled	t	2.095	1.207	74%	0.888
PAH	AT	gapfilled	t	5.680	7.197	-21%	-1.517
PAH	AZ	gapfilled	t	1.499	1.250	20%	0.249
PAH	CZ	gapfilled	t	46.360	29.995	55%	16.365
PAH	EE	gapfilled	t	3.748	2.956	27%	0.791
PAH	ES	gapfilled	t	47.207	30.920	53%	16.286
PAH	IS	gapfilled	t	0.084	0.065	29%	0.019
PAH	KG	New reported	t	21.879	14.226	54%	7.653
PAH	KZT	gapfilled	t	247.095	198.516	24%	48.580
PAH	LU	gapfilled	t	0.706	0.532	33%	0.174
PAH	MT	New reported	t	0.139	0.062	124%	0.077
PAH	PL	gapfilled	t	220.618	260.503	-15%	-39.885
PAH	PT	gapfilled	t	11.371	16.706	-32%	-5.334
Pb	AZ	New reported	t	0.589	2.104	-72%	-1.515
Pb	HR	New reported	t	8.360	6.305	33%	2.055
Pb	KG	New reported	t	5.072	12.216	-58%	-7.145
Pb	KZT	New reported	t	105.036	696.025	-85%	-590.989
PCB	AZ	New reported	kg	0.032	0.968	-97%	-0.937
PCB	HR	New reported	kg	3.236	409.536	-99%	-406.300
PCB	KG	New reported	kg	6.082	3.912	55%	2.169
PCB	LT	New reported	kg	0.694	1.246	-44%	-0.552
PCB	LU	gapfilled	kg	1.210	2.578	-53%	-1.368

Annex A.3. Overview of heavy metals and POPs gap-filling in 2024

Table A3. *Gap filling of heavy metals (Cd Hg, Pb)*

	Cd	Hg	Pb
Albania	exp.	exp.	exp.
Armenia	R	R	R
Aral Lake	-	-	-
Asian Areas	exp.	exp.	exp.
Austria	R	R	R
Atlantic Ocean	-	-	-
Azerbaijan	R	R	R
Bosnia and Herzegovina	exp.	exp.	exp.
Baltic Sea	-	-	-
Belgium	R	R	R
Bulgaria	R	R	R
Black Sea	-	-	-
Belarus	R	R	R
Caspian Sea	-	-	-
Switzerland	R	R	R
Cyprus	R	R	R
Czechia	R	R	R
Germany	R	R	R
Denmark	R	R	R
Estonia	R	R	R
Spain	R	R	R
Finland	R	R	R
France	R	R	R
United Kingdom	R	R	R
Georgia	R	R	R
Greece	R	R	R
Croatia	R	R	R
Hungary	R	R	R
Ireland	R	R	R
Iceland	R	R	R
Italy	R	R	R
Kyrgyzstan	R	R	R
Kazakhstan	R	R	R

	Cd	Hg	Pb
Liechtenstein	exp.	exp.	exp.
Lithuania	R	R	R
Luxembourg	R	R	R
Latvia	R	R	R
Monaco	R	R	R
Republic of Moldova	exp.	exp.	exp.
Montenegro	R	R	R
Mediterranean Sea	-	-	-
North Macedonia	R	R	R
Malta	R	R	R
Netherlands	R	R	R
Norway	R	R	R
North Africa	exp.	exp.	exp.
North Sea	-	-	-
Poland	R	R	R
Portugal	R	R	R
Romania	R	R	R
Serbia	R	R	R
Russian Federation	exp.	exp.	exp.
Russian Federation in the extended EMEP domain	exp.	exp.	exp.
Sweden	R	R	R
Slovenia	R	R	R
Slovakia	R	R	R
Tajikistan	exp.	exp.	exp.
Turkmenistan	exp.	exp.	exp.
Türkiye	R+exp.	R+exp.	R+exp.
Ukraine	R	R	R
Uzbekistan	exp.	exp.	exp.

Table A4. *Gap filling of persistent organic pollutants (POPs) for the year 2022*

	B(a)P	B(b)F	B(k)F	PCDD/F	HCB	IP	PAH	PCB
Albania	R	R	R	R	R	R	R	R
Armenia	R	R	R	R	R	R	sum	R
Aral Lake	-	-	-	-	-	-	-	-
Asian Areas	-	-	-	-	-	-	-	-
Austria	R	R	R	R	R	R	sum	R
Atlantic Ocean	-	-	-	-	-	-	-	-
Azerbaijan	R	R	R	R	R	R	sum	R
Bosnia and Herzegovina	exp.	exp.	exp.	exp.	exp.	exp.	exp.	-
Baltic Sea	-	-	-	-	-	-	-	-
Belgium	R	R	R	R	R	R	sum	R
Bulgaria	R+exp.	R+exp.	R+exp.	R	R	R+exp.	R+exp.	R
Black Sea	-	-	-	-	-	-	-	-
Belarus	R	R	R	R	R	R	sum	R
Caspian Sea	-	-	-	-	-	-	-	-
Switzerland	R	R	R	R	R	R	R	R
Cyprus	R	R	R	R	R	R	R	R
Czechia	R	R	R	R	R	R	sum	R
Germany	R+exp.	R+exp.	R+exp.	R	R	R+exp.	R+exp.	R
Denmark	R	R	R	R	R	R	R	R
Estonia	R	R	R	R	R	R	sum	R
Spain	R+exp.	R+exp.	R+exp.	R	R	R+exp.	R+exp.	R
Finland	R	R	R	R	R	R	R	R
France	R	R	R	R	R	R	R	R
United Kingdom	R	R	R	R	R	R	R	R
Georgia	R+exp.	R+exp.	R+exp.	R	R	R+exp.	sum	R
Greece	R	R	R	R	R	R	sum	R
Croatia	R	R	R	R	R	R	sum	R
Hungary	R	R	R	R	R	R	sum	R
Ireland	R	R	R	R	R	R	R	R
Iceland	R	R	R	R	R	R	sum	R
Italy	R+exp.	R+exp.	R+exp.	R	R	R+exp.	sum	R
Kyrgyzstan	R	R	R	R	R	R	R	R
Kazakhstan	R	R	R	R	R	R	sum	R
Liechtenstein	exp.	exp.	exp.	exp.	exp.	exp.	exp.	-
Lithuania	R	R	R	R	R	R	sum	R
Luxembourg	sum	sum	sum	R	R	sum	sum	sum
Latvia	R	R	R	R	R	R	sum	R
Monaco	R	R	R	R	R	R	R	R
Republic of Moldova	exp.	exp.	exp.	exp.	exp.	exp.	exp.	exp.
Montenegro	R	R	R	R	R	R	R	R
Mediterranean Sea	-	-	-	-	-	-	-	-

	B(a)P	B(b)F	B(k)F	PCDD/F	HCB	IP	PAH	PCB
North Macedonia	R	R	R	R	R	R	sum	R
Malta	R	R	R	R	R	R	R	R
Netherlands	R	R	R	R	R	R	sum	R
Norway	R	R	R	R	R	R	sum	R
North Africa	-	-	-	-	-	-	-	-
North Sea	-	-	-	-	-	-	-	-
Poland	R+exp.	R+exp.	R+exp.	R	R	R+exp.	sum	R
Portugal	R+exp.	R+exp.	R+exp.	R	R	R+exp.	sum	R
Romania	R+exp.	R+exp.	R+exp.	R	R	R+exp.	sum	R
Serbia	R+exp.	R+exp.	R+exp.	R	R	R+exp.	sum	R
Russian Federation	exp.	exp.	exp.	exp.	exp.	exp.	exp.	-
Russian Federation in the extended EMEP domain	exp.	exp.	exp.	exp.	exp.	exp.	exp.	-
Sweden	R+exp.	R+exp.	R+exp.	R	R+exp.	R+exp.	sum	R
Slovenia	R+exp.	R+exp.	R+exp.	R	R	R+exp.	sum	R
Slovakia	R+exp.	R+exp.	R+exp.	R	R	R+exp.	sum	R
Tajikistan	exp.	exp.	exp.	exp.	exp.	exp.	exp.	-
Turkmenistan	exp.	exp.	exp.	exp.	exp.	exp.	exp.	-
Türkiye	exp.	exp.	exp.	exp.	exp.	exp.	exp.	-
Ukraine	exp.	exp.	exp.	exp.	exp.	exp.	exp.	R
Uzbekistan	exp.	exp.	exp.	exp.	exp.	exp.	exp.	-

R	*Reported/new reported*
sum	*Sum of sectors/components*
R+exp.	*Reported data plus expert estimates (e.g. PAH split)*
exp.	*Expert estimates*

Annex B. Source-receptor matrices of heavy metal and PAHs transboundary transport in 2022

Table B1. *List of country codes used in the tables for source-receptor matrices.*

Code	Country	Code	Country	Code	Country
AL	Albania	GB	United Kingdom	MK	North Macedonia
AM	Armenia	GE	Georgia	MT	Malta
AT	Austria	GR	Greece	NL	Netherlands
AZ	Azerbaijan	HR	Croatia	NO	Norway
BA	Bosnia and Herzegovina	HU	Hungary	PL	Poland
BE	Belgium	IE	Ireland	PT	Portugal
BG	Bulgaria	IS	Iceland	RO	Romania
BY	Belarus	IT	Italy	RS	Serbia
CH	Switzerland	KY	Kyrgyzstan	RU	Russia
CY	Cyprus	KZ	Kazakhstan	SE	Sweden
CZ	Czech Republic	LI	Liechtenstein	SI	Slovenia
DE	Germany	LT	Lithuania	SK	Slovakia
DK	Denmark	LU	Luxembourg	TJ	Tajikistan
EE	Estonia	LV	Latvia	TM	Turkmenistan
ES	Spain	MC	Monaco	TR	Türkiye
FI	Finland	MD	Moldova	UA	Ukraine
FR	France	ME	Montenegro	UZ	Uzbekistan

Table B2. *Source-receptor matrix of Pb deposition to EMEP countries in 2022. Columns and rows are sources and receptors, receptively.*

Code	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KY
AL	1.13E+03	1.73E-02	1.19E+01	6.39E-03	1.28E+02	1.73E+00	6.98E+01	8.77E-01	5.98E+00	2.40E-02	1.34E+01	2.95E+01	7.37E-01	1.56E-01	1.03E+02	4.13E-01	7.38E+01	1.20E+01	6.24E-02	1.87E+02	2.25E+01	2.69E+01	3.20E-01	6.83E-03	1.15E+03	1.86E-03
AM	1.05E+00	2.25E+02	1.14E+00	1.56E+01	4.54E+00	2.37E-01	5.48E+00	6.36E-01	6.65E-01	2.81E+00	1.06E+00	3.61E+00	2.32E-01	1.22E-01	5.66E+00	2.59E-01	3.27E+00	2.01E+00	2.66E+02	4.21E+00	8.73E-01	1.24E+00	4.05E-02	2.27E-03	2.37E+01	6.92E-02
AT	6.69E+00	1.93E-02	3.50E+03	7.14E-03	2.52E+02	1.16E+02	1.35E+01	2.51E+00	4.68E+02	1.23E-02	6.42E+02	3.09E+03	1.49E+01	2.65E+00	2.72E+02	4.52E+00	6.31E+02	3.22E+02	5.69E-02	2.68E+00	2.65E+02	3.23E+02	7.00E+00	1.41E-01	2.80E+03	1.81E-03
AZ	1.53E+00	7.01E+01	2.17E+00	8.97E+01	7.18E+00	5.66E-01	7.80E+00	2.29E+00	1.35E+00	2.62E+00	2.39E+00	9.15E+00	6.79E-01	5.85E-01	8.54E+00	1.24E+00	5.82E+00	4.62E+00	1.76E+02	4.94E+00	1.43E+00	2.21E+00	9.09E-02	6.76E-03	3.55E+01	3.42E-01
BA	8.34E+01	2.93E-02	1.57E+02	1.06E-02	1.05E+04	1.39E+01	7.55E+01	6.03E+00	2.89E+01	1.96E-02	1.59E+02	2.56E+02	5.24E+00	1.19E+00	2.33E+02	2.60E+00	2.09E+02	5.94E+01	9.33E-02	2.51E+01	5.37E+02	3.54E+02	1.75E+00	3.46E-02	2.84E+03	5.69E-03
BE	2.33E-01	9.23E-03	9.42E+00	2.62E-03	4.21E+00	2.41E+03	4.91E-01	6.06E-01	2.41E+01	1.67E-03	1.87E+01	1.11E+03	1.16E+01	7.99E-01	1.66E+02	2.18E+00	1.91E+03	1.25E+03	2.67E-02	1.43E-01	1.48E+00	4.16E+00	2.20E+01	2.93E-01	6.18E+01	1.33E-03
BG	9.42E+01	6.94E-01	9.02E+01	2.24E-01	3.85E+02	1.05E+01	4.51E+03	2.52E+01	2.11E+01	1.12E+00	1.18E+02	2.24E+02	7.99E+00	2.44E+00	1.71E+02	5.01E+00	1.16E+02	6.05E+01	2.47E+00	2.17E+02	6.89E+01	2.47E+02	1.57E+00	4.39E-02	9.53E+02	7.37E-02
BY	1.18E+01	1.23E+00	2.01E+02	8.56E-01	2.15E+02	1.05E+02	9.05E+01	2.50E+03	7.15E+01	8.34E-01	4.69E+02	1.76E+03	2.27E+02	7.19E+01	1.62E+02	1.12E+02	3.55E+02	7.41E+02	3.95E+00	1.95E+01	6.66E+01	2.52E+02	1.84E+01	4.60E-01	5.24E+02	1.15E-01
CH	1.11E+00	2.93E-03	5.64E+01	1.09E-03	1.64E+01	5.06E+01	9.48E-01	2.38E-01	1.47E+03	1.33E-03	1.92E+01	8.35E+02	2.89E+00	1.93E-01	2.54E+02	4.67E-01	8.94E+02	1.25E+02	8.58E-03	6.16E-01	1.35E+01	4.61E+00	3.56E+00	5.96E-02	2.00E+03	3.05E-04
CY	1.01E+00	2.55E-02	1.09E+00	5.77E-03	3.71E+00	7.34E-02	3.69E+00	1.78E-01	4.76E-01	6.44E+01	9.87E-01	2.17E+00	1.04E-01	2.72E-02	2.61E+00	5.54E-02	2.76E+00	5.37E-01	5.09E-02	8.16E+00	8.09E-01	1.03E+00	1.93E-02	1.04E-03	2.98E+01	7.03E-04
CZ	4.15E+00	3.60E-02	8.20E+02	1.10E-02	2.39E+02	1.27E+02	1.57E+01	1.02E+01	1.96E+02	9.53E-03	6.91E+03	4.74E+03	4.83E+01	5.70E+00	1.77E+02	8.79E+00	5.64E+02	4.39E+02	1.12E-01	2.28E+00	1.24E+02	4.13E+02	1.03E+01	2.38E-01	6.46E+02	4.24E-03
DE	4.04E+00	1.42E-01	8.82E+02	4.30E-02	8.36E+01	2.51E+03	1.38E+01	2.66E+01	1.44E+03	2.73E-02	2.09E+03	5.77E+04	4.17E+02	1.52E+01	1.05E+03	3.47E+01	6.56E+03	5.89E+03	4.35E-01	3.57E+00	5.07E+01	1.42E+02	1.22E+02	2.03E+00	1.63E+03	1.98E-02
DK	6.59E-02	1.39E-02	1.83E+01	4.50E-03	3.16E+00	1.73E+02	3.31E-01	4.85E+00	1.58E+01	1.27E-03	6.02E+01	1.31E+03	1.42E+03	2.15E+00	8.03E+01	5.79E+00	3.59E+02	1.26E+03	3.86E-02	6.67E-02	2.07E+00	9.28E+00	3.06E+01	5.11E-01	3.72E+01	3.09E-03
EE	7.60E-01	1.66E-01	1.82E+01	8.86E-02	1.42E+01	3.34E+01	3.40E+00	4.47E+01	9.03E+00	2.70E-02	6.12E+01	4.27E+02	1.07E+02	8.97E+02	3.03E+01	2.94E+02	7.98E+01	2.90E+02	3.89E-01	6.77E-01	4.33E+00	1.46E+01	7.40E+00	2.05E-01	3.31E+01	1.20E-02
ES	2.23E+01	1.61E-01	3.00E+01	4.10E-02	1.13E+02	1.67E+02	2.80E+01	2.18E+00	5.70E+01	2.56E-02	4.06E+01	6.06E+02	1.01E+01	8.12E-01	3.50E+04	2.46E+00	2.60E+03	1.13E+03	4.11E-01	2.35E+01	3.08E+01	1.54E+01	5.48E+01	4.22E-01	2.55E+03	5.17E-03
FI	2.72E+00	5.36E-01	6.96E+01	2.90E-01	4.89E+01	1.62E+02	1.15E+01	8.70E+01	3.53E+01	6.26E-02	2.43E+02	1.68E+03	2.86E+02	5.47E+02	1.38E+02	4.98E+03	3.62E+02	1.14E+03	1.32E+00	2.06E+00	1.58E+01	5.82E+01	2.56E+01	1.34E+00	1.41E+02	4.47E-01
FR	1.57E+01	9.59E-02	1.85E+02	3.63E-02	2.42E+02	1.53E+03	1.45E+01	6.08E+00	8.34E+02	3.18E-02	2.62E+02	5.62E+03	8.67E+01	5.85E+00	8.32E+03	1.51E+01	2.95E+04	4.91E+03	2.80E-01	1.00E+01	9.69E+01	6.00E+01	1.36E+02	1.37E+00	5.99E+03	7.04E-03
GB	6.09E-01	7.31E-02	2.08E+01	2.18E-02	8.00E+00	4.30E+02	1.02E+00	5.41E+00	3.87E+01	8.50E-03	4.67E+01	1.29E+03	7.57E+01	3.85E+00	8.35E+02	1.09E+01	1.93E+03	3.52E+04	1.94E-01	4.58E-01	3.13E+00	5.60E+00	8.43E+02	4.72E+00	1.23E+02	1.31E-02
GE	2.97E+00	6.32E+01	8.21E+00	9.12E+00	2.21E+01	1.39E+00	3.69E+01	6.67E+00	4.10E+00	4.06E+00	8.69E+00	2.65E+01	2.11E+00	9.21E-01	1.92E+01	1.72E+00	1.43E+01	1.11E+01	5.21E+02	1.16E+01	5.03E+00	1.05E+01	2.72E-01	1.20E-02	8.76E+01	1.21E-01
GR	2.81E+02	2.84E-01	4.25E+01	9.38E-02	2.64E+02	6.15E+00	6.56E+02	8.75E+00	2.06E+01	1.63E+00	4.56E+01	1.03E+02	3.55E+00	1.21E+00	2.39E+02	2.27E+00	1.88E+02	3.61E+01	1.13E+00	2.26E+03	5.01E+01	8.67E+01	9.73E-01	2.84E-02	2.40E+03	2.42E-02
HR	4.52E+01	2.42E-02	2.71E+02	7.81E-03	1.86E+03	1.31E+01	3.56E+01	3.75E+00	2.96E+01	1.18E-02	1.60E+02	2.58E+02	4.52E+00	9.71E-01	2.26E+02	2.12E+00	2.11E+02	5.32E+01	8.07E-02	1.26E+01	1.53E+03	3.88E+02	1.42E+00	3.45E-02	3.06E+03	2.00E-03
HU	4.02E+01	3.74E-02	6.51E+02	1.18E-02	1.20E+03	2.38E+01	9.22E+01	1.26E+01	5.14E+01	1.57E-02	5.12E+02	5.91E+02	1.32E+01	3.57E+00	1.51E+02	8.20E+00	1.72E+02	9.76E+01	1.22E-01	2.39E+01	3.97E+02	3.52E+03	2.25E+00	8.50E-02	1.43E+03	3.12E-03
IE	1.75E-01	1.36E-02	1.04E+00	3.98E-03	1.53E+00	2.74E+01	2.59E-01	6.20E-01	1.94E+00	1.67E-03	2.83E+00	7.18E+01	6.97E+00	6.48E-01	1.71E+02	2.16E+00	1.73E+02	1.17E+03	3.58E-02	1.23E-01	3.36E-01	4.37E-01	1.50E+03	1.16E+00	1.77E+01	1.75E-03
IS	2.78E-01	1.21E-02	6.01E+00	4.34E-03	2.51E+00	1.87E+01	5.26E-01	5.65E-01	5.32E+00	1.71E-03	1.21E+01	1.32E+02	1.67E+01	6.52E-01	5.24E+01	2.86E+00	7.97E+01	3.13E+02	3.01E-02	2.47E-01	8.85E-01	2.05E+00	1.79E+01	1.33E+02	2.48E+01	1.61E-02
IT	1.95E+02	9.51E-02	4.37E+02	3.17E-02	1.67E+03	1.00E+02	8.46E+01	6.57E+00	4.71E+02	6.92E-02	1.94E+02	1.20E+03	1.21E+01	1.35E+00	1.65E+03	3.63E+00	2.58E+03	3.14E+02	2.55E-01	9.93E+01	6.49E+02	2.16E+02	8.56E+00	1.54E-01	4.82E+04	9.85E-03
KY	3.00E+00	7.58E+00	2.53E+00	3.70E+00	8.35E+00	7.81E-01	7.01E+00	1.05E+00	2.19E+00	1.46E+00	2.41E+00	1.10E+01	5.86E-01	2.70E-01	1.50E+01	7.52E-01	8.80E+00	3.88E+00	1.38E+01	5.73E+00	1.79E+00	2.29E+00	1.04E-01	5.36E-03	5.62E+01	1.08E+03
KZ	3.36E+01	1.08E+02	8.05E+01	6.19E+01	1.76E+02	4.62E+01	2.02E+02	8.57E+01	4.98E+01	1.15E+01	1.33E+02	6.01E+02	4.19E+01	2.50E+01	3.30E+02	6.42E+01	2.72E+02	2.82E+02	2.37E+02	7.63E+01	4.09E+01	9.30E+01	7.84E+00	3.32E-01	9.33E+02	9.30E+02
LI	4.19E-03	1.38E-05	8.48E-01	5.15E-06	6.42E-02	3.47E-01	4.59E-03	1.35E-03	9.93E+00	5.90E-06	1.39E-01	6.44E+00	1.19E-02	1.15E-03	1.29E+00	2.22E-03	3.58E+00	9.52E-01	3.98E-05	2.82E-03	6.09E-02	2.43E-02	2.29E-02	3.33E-04	7.43E+00	2.08E-06
LT	1.54E+00	1.27E-01	5.62E+01	6.32E-02	3.30E+01	5.73E+01	9.89E+00	3.20E+02	2.14E+01	3.92E-02	1.72E+02	8.58E+02	2.45E+02	3.28E+01	5.96E+01	6.03E+01	1.50E+02	4.80E+02	4.01E-01	1.42E+00	1.15E+01	4.45E+01	1.16E+01	2.85E-01	8.38E+01	1.38E-02
LU	3.34E-02	5.40E-04	1.67E+00	1.83E-04	6.51E-01	5.02E+01	4.61E-02	6.50E-02	5.41E+00	1.64E-04	2.99E+00	1.71E+02	6.82E-01	7.36E-02	1.68E+01	2.17E-01	1.69E+02	4.53E+01	1.55E-03	2.09E-02	3.03E-01	4.55E-01	1.09E+00	1.46E-02	1.35E+01	7.76E-05
LV	1.48E+00	1.96E-01	4.03E+01	1.08E-01	2.87E+01	5.49E+01	7.59E+00	1.24E+02	1.76E+01	4.59E-02	1.30E+02	7.73E+02	2.14E+02	1.27E+02	5.87E+01	1.22E+02	1.38E+02	4.66E+02	4.81E-01	1.40E+00	9.85E+00	3.36E+01	1.14E+01	2.94E-01	6.71E+01	1.42E-02
MC	8.94E-04	1.73E-06	6.99E-03	6.08E-07	1.38E-02	5.47E-03	5.70E-04	1.46E-04	1.56E-02	5.19E-07	4.15E-03	3.20E-02	3.21E-04	3.43E-05	7.24E-02	9.19E-05	6.94E-01	1.01E-02	4.62E-06	4.31E-04	8.30E-03	2.97E-03	2.95E-04	7.35E-06	8.34E-01	1.85E-07
MD	6.02E+00	1.12E-01	1.71E+01	5.36E-02	4.38E+01	2.64E+00	8.10E+01	1.77E+01	4.73E+00	2.26E-01	2.70E+01	6.33E+01	5.34E+00	1.76E+00	2.04E+01	2.91E+00	1.97E+01	2.57E+01	3.61E-01	1.10E+01	1.11E+01	4.62E+01	4.50E-01	2.29E-02	1.21E+02	6.81E-02
ME	1.24E+02	1.08E-02	1.58E+01	3.34E-03	4.62E+02	1.81E+00	3.50E+01	9.79E-01	5.25E+00	1.16E-02	1.83E+01	3.36E+01	7.28E-01	1.94E-01	6.74E+01	5.36E-01	4.91E+01	9.78E+00	3.65E-02	2.56E+01	4.03E+01	4.34E+01	2.92E-01	6.67E-03	9.00E+02	1.45E-03
MK	2.57E+02	2.89E-02	1.41E+01	1.06E-02	1.12E+02	1.71E+00	1.79E+02	1.36E+00	4.85E+00	7.65E-02	1.62E+01	3.20E+01	7.54E-01	1.83E-01	5.36E+01	4.53E-01	3.84E+01	8.07E+00	9.29E-02	2.75E+02	1.78E+01	3.77E+01	2.45E-01	5.98E-03	4.25E+02	2.98E-03
MT	2.15E-01	4.33E-05	6.28E-02	6.99E-06	5.28E-01	5.51E-03	1.02E-01	3.14E-03	3.09E-02	1.98E-04	4.22E-02	8.10E-02	2.75E-03	4.81E-04	5.12E-01	9.18E-04	3.50E-01	5.14E-02	1.65E-04	1.21E-01	9.28E-02	5.96E-02	1.56E-03	3.76E-05	1.16E+01	2.48E-06
NL	1.15E-01	8.67E-03	6.51E+00	2.42E-03	1.82E+00	1.18E+03	2.89E-01	6.46E-01	2.17E+01	9.50E-04	1.78E+01	1.85E+03	2.31E+01	6.29E-01	1.36E+02	1.76E+00	1.05E+03	1.67E+03	2.44E-02	8.88E-02	8.94E-01	2.83E+00	2.62E+01	3.77E-01	3.59E+01	2.09E-03
NO	1.26E+00	1.79E-01	5.54E+01	8.39E-02	3.25E+01	3.27E+02	3.18E+00	2.26E+01	3.89E+01	2.61E-02	1.63E+02	1.96E+03	6.51E+02	1.91E+01	2.47E+02	9.36E+01	7.65E+02	3.90E+03	4.23E-01	1.19E+00	1.29E+01	4.25E+01	1.07E+02	7.07E+00	1.59E+02	3.00E-01
PL	1.44E+01	3.01E-01	7.57E+02	1.33E-01	5.48E+02	4.30E+02	5.83E+01	3.42E+02	2.62E+02	7.99E-02	4.05E+03	1.24E+04	7.43E+02	4.14E+01	4.27E+02	8.47E+01	1.29E+03	2.24E+03	9.64E-01	8.37E+00	2.06E+02	7.70E+02	5.52E+01	1.03E+00	1.16E+03	3.51E-02
PT	1.33E+00	1.08E-02	1.08E+00	2.80E-03	5.38E+00	1.07E+01	1.66E+00	1.22E-01	2.23E+00	2.31E-03	1.84E+00	3.74E+01	9.02E-01	8.18E-02	1.43E+03	2.37E-01	9.68E+01	8.78E+01	2.83E-02	1.44E+00	1.16E+00	6.51E-01	5.64E+00	7.29E-02	7.32E+01	2.82E-04
RO	9.42E+01	5.48E-01	3.40E+02	2.09E-01	1.09E+03	3.20E+01	9.31E+02	5.61E+01	7.10E+01	5.72E-01	3.70E+02	7.54E+02	3.24E+01	6.90E+00	2.82E+02	1.34E+01	2.65E+02	1.72E+02	1.81E+00	1.14E+02	2.19E+02	1.19E+03	4.21E+00	1.39E-01	1.81E+03	1.47E-01
RS	1.86E+02	7.92E-02	1.59E+02	2.61E-02	1.77E+03	1.25E+01	4.56E+02	1.11E+01	2.61E+01	1.95E-01	1.74E+02	2.85E+02	7.70E+00	1.91E+00	1.49E+02	4.12E+00	1.43E+02	5.63E+01	2.59E-01	1.20E+02	2.08E+02	6.37E+02	1.59E+00	5.20E-02	1.43E+03	1.48E-02
RU	2.08E+02	2.30E+02	8.24E+02	1.31E+02	1.55E+03	5.09E+02	1.61E+03	1.93E+03	3.92E+02	3.43E+01	1.54E+03	7.04E+03	1.07E+03	1.37E+03	1.57E+03	3.03E+03	2.06E+03	3.73E+03	6.12E+02	5.13E+02	3.66E+02	9.65E+02	9.63E+01	6.07E+00	5.26E+03	2.68E+02
SE	1.38E+00	2.60E-01	8.22E+01	1.25E-01	4.93E+01	5.16E+02	5.11E+00	1.08E+02	5.96E+01	4.40E-02	3.46E+02	5.02E+03	2.23E+03	1.35E+02	2.91E+02	7.43E+02	1.05E+03	3.85E+03	6.34E-01	1.11E+00	1.78E+01	6.06E+01	8.98E+01	2.66E+00	2.22E+02	1.79E-01
SI	5.83E+00	6.53E-03	3.36E+02	2.21E-03	1.47E+02	1.04E+01	7.35E+00	6.83E-01	2.06E+01	3.87E-03	6.60E+01	2.33E+02	1.85E+00	2.84E-01	9.15E+01	6.33E-01	1.07E+02	3.71E+01	2.13E-02	1.84E+00	4.41E+02	9.86E+01	8.09E-01	1.56E-02	1.55E+03	4.41E-04
SK	1.28E+01	2.71E-02	3.94E+02	9.66E-03	4.47E+02	2.23E+01	2.96E+01	1.20E+01	5.46E+01	1.13E-02	9.49E+02	7.41E+02	2.37E+01	2.65E+00	1.04E+02	5.96E+00	1.57E+02	1.02E+02	7.89E-02	5.09E+00	1.39E+02	8.94E+02	2.66E+00	8.35E-02	6.90E+02	2.25E-03
TJ	1.06E+00	3.95E+00	1.11E+00	2.05E+00	3.76E+00	2.46E-01	3.05E+00	4.51E-01	9.35E-01	7.58E-01	9.47E-01	3.84E+00	2.03E-01	9.35E-02	6.27E+00	2.45E-01	3.41E+00	1.40E+00	6.60E+00	2.21E+00	8.18E-01	1.05E+00	3.84E-02	1.89E-03	2.45E+01	2.34E+01
TM	1.66E+00	1.47E+01	3.57E+00	1.14E+01	1.01E+01	7.96E-01	9.71E+00	2.05E+00	2.24E+00	1.75E+00	3.49E+00	1.27E+01	7.66E-01	4.90E-01	1.22E+01	1.13E+00	8.30E+00	4.77E+00	3.23E+01	4.47E+00	2.16E+00	3.43E+00	1.38E-01	9.29E-03	5.12E+01	7.98E+00
TR	8.30E+01	1.63E+02	9.95E+01	1.24E+01	3.46E+02	1.55E+01	1.10E+03	6.20E+01	4.58E+01	1.46E+02	1.10E+02	3.00E+02	2.50E+01	7.07E+00	4.30E+02	1.39E+01	2.59E+02	1.15E+02	1.25E+02	5.97E+02	7.04E+01	1.47E+02	2.70E+00	1.39E-01	2.30E+03	4.44E-01
UA	1.02E+02	1.19E+01	5.12E+02	7.62E+00	1.23E+03	1.19E+02	1.07E+03	6.63E+02	1.61E+02	7.28E+00	9.14E+02	2.49E+03	1.87E+02	4.94E+01	4.95E+02	8.52E+01	6.78E+02	7.81E+02	4.34E+01	2.26E+02	2.85E+02	9.87E+02	1.69E+01	5.47E-01	2.84E+03	2.14E+00
UZ	2.65E+00	1.59E+01	5.73E+00	8.60E+00	1.53E+01	1.62E+00	1.43E+01	3.88E+00	3.80E+00	1.67E+00	6.34E+00	2.49E+01	1.58E+00	9.92E-01	2.10E+01	2.31E+00	1.44E+01	9.39E+00	3.29E+01	5.71E+00	3.33E+00	5.41E+00	2.64E-01	1.41E-02	7.98E+01	8.98E+01

Table B2. *(continued)*

Code	KZ	LI	LT	LU	LV	MC	MD	ME	MK	MT	NL	NO	PL	PT	RO	RS	RU	SE	SI	SK	TJ	TM	TR	UA	UZ
AL	3.40E-01	2.80E-02	5.16E-01	2.52E-01	3.19E-01	1.54E-02	9.35E-01	9.31E+00	8.24E+01	3.53E+00	4.06E-01	1.65E-01	9.04E+01	8.22E+00	5.34E+01	5.59E+02	1.77E+01	2.85E-01	6.18E+00	8.10E+00	3.89E-02	2.79E-01	1.95E+01	5.17E+00	3.38E-01
AM	1.48E+01	3.33E-03	1.90E-01	2.70E-02	2.24E-01	9.14E-04	5.83E-01	6.34E-02	5.29E-01	5.25E-02	5.41E-02	6.76E-02	1.73E+01	8.39E-01	1.25E+01	5.95E+00	5.50E+01	1.36E-01	6.31E-01	5.68E-01	1.22E+00	4.25E+01	3.03E+02	8.40E+00	2.49E+01
AT	6.07E-01	4.97E+00	4.96E+00	1.99E+01	4.73E+00	8.30E-02	7.47E-01	1.39E+00	2.06E+00	8.61E-01	2.68E+01	1.72E+00	1.30E+03	3.00E+01	7.68E+01	3.50E+02	1.28E+01	4.41E+00	7.07E+02	8.42E+01	3.05E-02	3.35E-01	5.70E+00	3.89E+00	2.59E-01
AZ	9.59E+01	6.92E-03	7.15E-01	6.24E-02	8.40E-01	1.42E-03	1.20E+00	1.09E-01	8.29E-01	6.79E-02	1.40E-01	2.48E-01	4.23E+01	1.11E+00	1.88E+01	9.93E+00	2.10E+02	5.85E-01	1.11E+00	1.05E+00	5.57E+00	2.34E+02	2.42E+02	2.14E+01	1.33E+02
BA	8.66E-01	1.50E-01	4.47E+00	1.89E+00	2.43E+00	7.16E-02	2.81E+00	3.06E+01	1.11E+01	4.07E+00	3.68E+00	9.48E-01	9.19E+02	2.58E+01	2.01E+02	1.26E+03	2.57E+01	2.19E+00	6.14E+01	7.36E+01	1.00E-01	5.48E-01	1.20E+01	1.17E+01	7.41E-01
BE	3.12E-01	7.11E-02	9.94E-01	7.95E+01	9.24E-01	7.52E-03	8.83E-02	5.83E-02	1.38E-01	1.81E-02	1.19E+02	1.18E+00	1.47E+02	1.53E+01	2.94E+00	5.73E+00	4.70E+00	1.98E+00	1.53E+00	2.13E+00	1.32E-02	6.79E-02	5.53E-01	1.15E+00	8.26E-02
BG	1.97E+01	1.09E-01	9.20E+00	1.40E+00	5.44E+00	2.76E-02	4.32E+01	6.91E+00	7.89E+01	2.29E+00	2.80E+00	1.76E+00	1.10E+03	1.86E+01	2.82E+03	1.77E+03	3.91E+02	3.51E+00	3.15E+01	8.20E+01	1.08E+00	8.21E+00	4.65E+02	1.49E+02	9.66E+00
BY	2.42E+01	4.33E-01	5.47E+02	1.03E+01	2.56E+02	2.43E-02	3.88E+01	2.13E+00	7.02E+00	3.66E-01	3.26E+01	2.36E+01	1.18E+04	1.79E+01	4.09E+02	3.60E+02	8.67E+02	6.93E+01	5.62E+01	1.87E+02	1.29E+00	1.35E+01	1.45E+02	3.61E+02	9.27E+00
CH	4.62E-02	9.04E+00	4.17E-01	1.16E+01	4.15E-01	9.19E-02	4.47E-02	1.20E-01	2.61E-01	4.18E-01	8.62E+00	2.94E-01	4.82E+01	2.64E+01	2.45E+00	8.67E+00	1.32E+00	5.02E-01	1.23E+01	1.26E+00	5.00E-03	2.59E-02	4.82E-01	2.38E-01	3.15E-02
CY	1.49E-01	2.84E-03	8.09E-02	1.11E-02	5.65E-02	6.05E-04	1.75E-01	7.20E-02	4.11E-01	1.12E-01	2.02E-02	2.42E-02	9.39E+00	1.50E-01	5.05E+00	4.11E+00	5.68E+00	4.82E-02	5.60E-01	4.18E-01	1.16E-02	9.02E-02	9.38E+01	1.43E+00	1.10E-01
CZ	1.56E+00	1.29E+00	1.27E+01	2.47E+01	1.07E+01	2.53E-02	8.61E-01	1.44E+00	2.41E+00	2.17E-01	3.96E+01	4.76E+00	8.87E+03	1.84E+01	8.31E+01	3.78E+02	2.45E+01	8.70E+00	1.05E+02	1.87E+02	5.05E-02	4.43E-01	4.88E+00	8.47E+00	4.31E-01
DE	4.93E+00	8.89E+00	3.67E+01	4.57E+02	2.85E+01	9.99E-02	2.04E+00	8.93E-01	3.35E+00	4.13E-01	7.82E+02	3.06E+01	7.68E+03	1.06E+02	6.55E+01	1.32E+02	7.76E+01	3.58E+01	6.12E+01	6.81E+01	1.98E-01	1.28E+00	1.06E+01	2.12E+01	1.34E+00
DK	6.11E-01	7.68E-02	1.05E+01	7.47E+00	4.41E+00	3.90E-03	1.34E-01	1.36E-02	4.16E-02	8.20E-03	6.61E+01	2.05E+01	6.08E+02	7.21E+00	2.68E+00	4.59E+00	9.95E+00	2.02E+01	2.07E+00	5.16E+00	2.53E-02	1.35E-01	5.01E-01	1.83E+00	2.05E-01
EE	5.20E+00	5.56E-02	1.12E+02	2.08E+00	2.88E+02	1.64E-03	1.13E+00	1.64E-01	4.50E-01	1.45E-02	1.18E+01	1.88E+01	1.07E+03	2.92E+00	1.92E+01	2.24E+01	1.33E+02	7.68E+01	3.47E+00	1.10E+01	8.96E-02	2.23E+00	5.76E+00	1.07E+01	1.46E+00
ES	1.42E+00	1.99E-01	9.41E-01	1.44E+01	9.67E-01	1.20E-01	1.90E+00	1.55E+00	6.54E+00	4.11E+00	3.28E+01	2.81E+00	1.51E+02	3.55E+03	5.69E+01	7.71E+01	2.51E+01	2.72E+00	1.90E+01	4.54E+00	2.99E-02	2.52E-01	1.35E+01	6.66E+00	2.48E-01
FI	3.27E+01	2.08E-01	1.60E+02	9.25E+00	2.26E+02	8.45E-03	2.78E+00	5.34E-01	1.46E+00	6.61E-02	5.36E+01	1.26E+02	3.28E+03	1.84E+01	5.61E+01	8.12E+01	1.59E+03	7.36E+02	1.29E+01	3.61E+01	2.78E+00	9.89E+00	1.49E+01	2.86E+01	1.59E+01
FR	1.40E+00	1.66E+00	9.98E+00	2.42E+02	8.66E+00	1.35E+00	1.11E+00	2.09E+00	4.19E+00	3.67E+00	2.19E+02	1.18E+01	1.18E+03	5.99E+02	5.02E+01	1.29E+02	3.92E+01	1.68E+01	7.49E+01	2.32E+01	8.63E-02	6.89E-01	8.78E+00	7.32E+00	6.17E-01
GB	2.50E+00	1.58E-01	8.26E+00	1.90E+01	6.08E+00	1.32E-02	1.89E-01	8.31E-02	2.14E-01	5.16E-02	1.16E+02	1.59E+01	3.42E+02	8.94E+01	4.66E+00	7.77E+00	2.31E+01	1.29E+01	2.94E+00	2.86E+00	1.34E-01	6.37E-01	2.34E+00	3.59E+00	9.36E-01
GE	1.95E+01	2.22E-02	2.54E+00	1.59E-01	2.11E+00	3.47E-03	6.42E+00	3.03E-01	2.23E+00	1.53E-01	3.83E-01	5.09E-01	1.81E+02	2.32E+00	9.80E+01	3.86E+01	3.25E+02	1.08E+00	4.17E+00	5.54E+00	1.12E+00	5.72E+01	7.13E+02	5.92E+01	3.42E+01
GR	7.09E+00	9.94E-02	3.10E+00	8.78E-01	2.17E+00	4.26E-02	1.23E+01	5.65E+00	1.64E+02	8.66E+00	1.29E+00	7.83E-01	3.85E+02	1.88E+01	4.43E+02	7.51E+02	1.72E+02	1.57E+00	2.07E+01	2.96E+01	3.88E-01	2.93E+00	6.63E+02	5.88E+01	3.38E+00
HR	7.55E-01	1.67E-01	3.05E+00	1.85E+00	1.96E+00	7.44E-02	1.35E+00	6.45E+00	6.91E+00	3.02E+00	3.28E+00	8.15E-01	7.55E+02	2.17E+01	1.31E+02	8.79E+02	1.51E+01	2.04E+00	2.92E+02	5.16E+01	3.81E-02	3.72E-01	8.10E+00	6.46E+00	3.00E-01
HU	1.49E+00	3.04E-01	1.08E+01	3.57E+00	6.36E+00	4.07E-02	3.16E+00	9.28E+00	1.95E+01	1.27E+00	7.04E+00	1.97E+00	3.57E+03	1.65E+01	6.35E+02	2.73E+03	4.82E+01	4.48E+00	1.91E+02	9.27E+02	4.24E-02	4.64E-01	7.51E+00	2.66E+01	4.28E-01
IE	4.07E-01	6.46E-03	9.11E-01	1.48E+00	7.50E-01	1.61E-03	3.72E-02	1.87E-02	6.13E-02	7.02E-03	5.85E+00	1.66E+00	2.25E+01	2.79E+01	9.04E-01	1.19E+00	4.35E+00	1.99E+00	2.12E-01	2.38E-01	1.71E-02	1.05E-01	4.41E-01	5.35E-01	1.27E-01
IS	6.99E-01	2.90E-02	9.47E-01	1.27E+00	7.97E-01	2.17E-03	5.49E-02	2.62E-02	1.09E-01	1.42E-02	5.00E+00	1.19E+01	9.30E+01	8.94E+00	1.58E+00	2.90E+00	1.02E+01	4.76E+00	8.23E-01	9.05E-01	1.15E-01	2.10E-01	6.48E-01	5.30E-01	5.80E-01
IT	1.35E+00	2.62E+00	5.60E+00	1.55E+01	3.14E+00	1.30E+00	2.69E+00	1.71E+01	3.42E+01	2.12E+01	2.05E+01	2.01E+00	1.16E+03	1.43E+02	1.69E+02	6.92E+02	3.19E+01	3.99E+00	4.82E+02	5.23E+01	1.50E-01	8.79E-01	4.14E+01	1.13E+01	1.18E+00
KY	1.95E+03	1.01E-02	4.10E-01	1.02E-01	3.82E-01	2.47E-03	5.18E-01	1.67E-01	1.40E+00	7.41E-02	1.82E-01	2.25E-01	3.06E+01	1.84E+00	1.22E+01	1.06E+01	1.06E+02	3.90E-01	1.49E+00	1.13E+00	5.75E+03	5.58E+02	1.13E+02	8.07E+00	2.38E+04
KZ	4.07E+04	2.48E-01	3.29E+01	5.06E+00	2.94E+01	4.58E-02	3.16E+01	3.08E+00	1.83E+01	1.34E+00	1.22E+01	1.46E+01	1.97E+03	3.84E+01	6.02E+02	2.79E+02	1.37E+04	3.14E+01	3.38E+01	5.50E+01	6.38E+03	5.51E+03	1.66E+03	7.42E+02	3.39E+04
LI	2.48E-04	5.00E-01	2.34E-03	6.88E-02	2.67E-03	3.12E-04	2.18E-04	4.47E-04	1.07E-03	1.35E-03	5.78E-02	1.19E-03	2.80E-01	1.49E-01	1.20E-02	4.22E-02	5.81E-03	2.17E-03	5.69E-02	7.04E-03	3.51E-05	1.32E-04	2.23E-03	1.13E-03	2.14E-04
LT	5.05E+00	1.34E-01	1.31E+03	4.46E+00	2.24E+02	3.78E-03	3.59E+00	3.56E-01	9.41E-01	4.49E-02	2.01E+01	1.73E+01	3.82E+03	6.95E+00	5.32E+01	5.92E+01	1.34E+02	5.69E+01	1.01E+01	3.66E+01	1.13E-01	1.12E+00	9.67E+00	3.31E+01	1.06E+00
LU	1.40E-02	1.44E-02	1.15E-01	1.07E+02	1.13E-01	1.43E-03	8.18E-03	5.94E-03	1.11E-02	3.67E-03	4.12E+00	7.58E-02	1.43E+01	1.49E+00	2.83E-01	6.13E-01	3.24E-01	1.64E-01	3.25E-01	2.03E-01	7.86E-04	4.65E-03	4.99E-02	7.74E-02	5.00E-03
LV	6.61E+00	1.09E-01	4.91E+02	3.79E+00	1.42E+03	2.76E-03	2.20E+00	3.03E-01	8.24E-01	3.63E-02	1.92E+01	2.21E+01	2.45E+03	5.80E+00	3.89E+01	4.79E+01	1.53E+02	8.27E+01	8.19E+00	2.47E+01	1.18E-01	2.57E+00	9.38E+00	2.29E+01	1.81E+00
MC	1.94E-05	5.78E-05	9.03E-05	9.12E-04	7.35E-05	5.34E-03	3.72E-05	1.20E-04	2.15E-04	2.91E-04	9.08E-04	5.57E-05	2.12E-02	6.48E-03	2.24E-03	8.77E-03	5.66E-04	1.13E-04	6.89E-03	8.36E-04	3.02E-06	1.95E-05	3.12E-04	1.75E-04	2.53E-05
MD	6.94E+00	2.61E-02	6.36E+00	3.89E-01	4.57E+00	3.95E-03	2.14E+02	6.12E-01	3.80E+00	1.95E-01	8.44E-01	9.88E-01	5.46E+02	2.51E+00	5.26E+02	8.58E+01	1.95E+02	2.00E+00	8.25E+00	2.80E+01	8.30E-01	2.62E+00	4.77E+01	1.26E+02	5.47E+00
ME	3.06E-01	2.65E-02	7.34E-01	2.59E-01	3.98E-01	1.34E-02	6.42E-01	7.35E+01	1.15E+01	2.71E+00	4.65E-01	1.65E-01	1.22E+02	6.72E+00	4.31E+01	4.56E+02	9.00E+00	3.71E-01	7.09E+00	1.24E+01	2.63E-02	1.46E-01	7.29E+00	2.80E+00	2.12E-01
MK	5.98E-01	2.36E-02	6.01E-01	2.47E-01	3.60E-01	1.03E-02	1.66E+00	3.27E+00	4.02E+02	1.06E+00	3.90E-01	1.62E-01	1.20E+02	5.73E+00	8.19E+01	7.35E+02	1.74E+01	3.17E-01	5.94E+00	1.15E+01	6.00E-02	4.30E-01	3.39E+01	6.65E+00	5.48E-01
MT	5.00E-04	1.51E-04	1.43E-03	9.29E-04	9.22E-04	6.22E-05	1.87E-03	1.38E-02	4.32E-02	1.40E+00	9.63E-04	5.49E-04	3.05E-01	3.09E-02	1.17E-01	3.59E-01	1.34E-02	1.01E-03	4.08E-02	2.14E-02	1.88E-05	1.13E-04	6.66E-02	7.53E-03	1.57E-04
NL	3.18E-01	7.28E-02	1.19E+00	1.75E+01	7.76E-01	4.66E-03	1.03E-01	2.36E-02	7.29E-02	1.39E-02	5.92E+02	2.01E+00	1.27E+02	1.54E+01	2.08E+00	3.01E+00	4.53E+00	2.30E+00	9.82E-01	1.64E+00	1.81E-02	6.43E-02	3.35E-01	9.84E-01	1.14E-01
NO	1.61E+01	1.84E-01	3.77E+01	1.32E+01	2.75E+01	1.27E-02	7.97E-01	2.09E-01	4.73E-01	7.17E-02	1.23E+02	1.74E+03	1.99E+03	3.12E+01	1.75E+01	4.12E+01	3.80E+02	2.17E+02	1.15E+01	2.79E+01	1.88E+00	3.45E+00	5.51E+00	1.00E+01	9.59E+00
PL	1.23E+01	1.64E+00	2.29E+02	4.84E+01	1.02E+02	5.30E-02	1.79E+01	4.32E+00	8.42E+00	4.24E-01	1.44E+02	5.48E+01	1.06E+05	4.29E+01	3.94E+02	8.66E+02	2.67E+02	1.27E+02	1.64E+02	7.73E+02	3.04E-01	2.82E+00	2.32E+01	1.40E+02	2.96E+00
PT	8.55E-02	8.61E-03	8.14E-02	8.04E-01	8.75E-02	3.38E-03	1.01E-01	8.90E-02	3.85E-01	1.44E-01	2.23E+00	2.34E-01	5.75E+00	5.53E+03	3.05E+00	3.75E+00	1.58E+00	2.22E-01	5.59E-01	2.05E-01	1.75E-03	1.75E-02	1.14E+00	3.70E-01	1.35E-02
RO	2.22E+01	4.21E-01	2.91E+01	4.58E+00	1.61E+01	5.94E-02	1.28E+02	1.40E+01	5.88E+01	2.63E+00	8.92E+00	5.43E+00	4.46E+03	3.41E+01	1.23E+04	3.69E+03	7.23E+02	1.01E+01	1.16E+02	3.85E+02	2.07E+00	9.91E+00	1.89E+02	3.25E+02	1.67E+01
RS	2.37E+00	1.41E-01	7.34E+00	1.80E+00	3.91E+00	4.08E-02	9.28E+00	5.52E+01	2.00E+02	2.55E+00	3.80E+00	1.53E+00	1.29E+03	1.67E+01	8.55E+02	1.04E+04	7.59E+01	3.54E+00	5.35E+01	1.62E+02	2.45E-01	1.30E+00	5.93E+01	3.21E+01	1.99E+00
RU	2.89E+04	2.21E+00	9.30E+02	4.57E+01	1.09E+03	2.29E-01	2.89E+02	2.27E+01	1.26E+02	7.97E+00	1.52E+02	3.43E+02	2.48E+04	1.82E+02	4.60E+03	2.51E+03	1.55E+05	9.50E+02	2.89E+02	5.84E+02	2.00E+03	5.08E+03	8.50E+03	6.53E+03	1.16E+04
SE	2.16E+01	3.15E-01	1.80E+02	2.77E+01	1.59E+02	1.57E-02	1.53E+00	3.31E-01	6.06E-01	1.03E-01	1.86E+02	5.89E+02	4.50E+03	3.31E+01	3.04E+01	5.93E+01	6.53E+02	2.09E+03	1.46E+01	4.05E+01	1.21E+00	5.10E+00	9.00E+00	2.52E+01	9.39E+00
SI	1.82E-01	1.24E-01	7.64E-01	1.48E+00	5.87E-01	4.11E-02	2.85E-01	9.07E-01	1.29E+00	6.28E-01	2.80E+00	2.74E-01	2.06E+02	8.50E+00	3.32E+01	1.46E+02	3.31E+00	7.22E-01	1.01E+03	1.24E+01	7.53E-03	9.57E-02	2.21E+00	1.29E+00	6.47E-02
SK	9.93E-01	3.30E-01	9.96E+00	4.56E+00	5.31E+00	2.23E-02	1.55E+00	3.28E+00	5.25E+00	3.12E-01	7.27E+00	2.69E+00	7.39E+03	1.15E+01	2.09E+02	7.51E+02	2.17E+01	5.37E+00	9.30E+01	1.44E+03	2.59E-02	4.92E-01	3.44E+00	1.46E+01	3.79E-01
TJ	2.33E+02	4.44E-03	1.64E-01	3.09E-02	1.46E-01	1.10E-03	2.40E-01	6.84E-02	5.40E-01	2.97E-02	6.42E-02	7.58E-02	1.41E+01	6.85E-01	5.75E+00	4.88E+00	4.10E+01	1.30E-01	6.73E-01	5.12E-01	1.51E+04	4.97E+02	6.00E+01	3.54E+00	6.06E+03
TM	4.91E+02	1.22E-02	8.12E-01	9.26E-02	7.09E-01	2.20E-03	1.07E+00	1.50E-01	9.95E-01	7.97E-02	2.10E-01	3.16E-01	5.30E+01	1.34E+00	2.24E+01	1.42E+01	2.20E+02	5.91E-01	1.82E+00	1.69E+00	8.94E+02	5.10E+03	1.74E+02	1.76E+01	4.83E+03
TR	7.93E+01	2.41E-01	2.14E+01	1.95E+00	1.49E+01	5.98E-02	8.70E+01	5.65E+00	4.37E+01	9.90E+00	4.09E+00	5.92E+00	1.62E+03	4.80E+01	1.70E+03	6.59E+02	3.33E+03	1.15E+01	4.41E+01	6.70E+01	3.25E+00	1.18E+02	2.89E+04	7.78E+02	7.98E+01
UA	2.54E+02	9.88E-01	1.74E+02	1.61E+01	1.13E+02	1.09E-01	4.03E+02	1.39E+01	5.83E+01	4.11E+00	3.41E+01	2.70E+01	1.98E+04	5.12E+01	3.96E+03	2.01E+03	8.01E+03	6.60E+01	1.98E+02	7.08E+02	1.94E+01	1.42E+02	2.56E+03	5.96E+03	1.55E+02
UZ	1.82E+03	2.06E-02	1.56E+00	1.73E-01	1.35E+00	3.73E-03	1.85E+00	2.26E-01	1.44E+00	9.07E-02	4.57E-01	5.95E-01	1.09E+02	1.96E+00	3.67E+01	2.01E+01	3.72E+02	1.19E+00	2.89E+00	2.95E+00	4.87E+03	1.83E+03	1.93E+02	3.33E+01	2.84E+04

Table B3. *Source-receptor matrix of Cd deposition to EMEP countries in 2022. Columns and rows are sources and receptors, receptively.*

Code	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KY
AL	3.25E+01	8.81E-04	7.52E-01	1.92E-03	5.07E+00	8.94E-02	7.92E+00	6.79E-02	3.05E-01	8.87E-04	5.74E-01	1.90E+00	2.33E-02	1.36E-02	6.81E+00	1.82E-02	2.36E+00	3.56E-01	4.29E-03	1.40E+01	1.56E+00	2.07E+00	1.04E-02	1.42E-03	2.07E+01	8.61E-05
AM	2.62E-02	1.13E+01	7.22E-02	4.93E+00	1.75E-01	1.27E-02	6.42E-01	4.75E-02	3.99E-02	8.11E-02	5.06E-02	2.42E-01	6.67E-03	1.08E-02	4.29E-01	1.13E-02	1.10E-01	5.84E-02	6.31E+00	3.80E-01	6.81E-02	9.44E-02	1.43E-03	4.67E-04	4.90E-01	2.64E-03
AT	2.29E-01	8.80E-04	2.27E+02	1.90E-03	1.04E+01	6.14E+00	1.47E+00	2.12E-01	2.61E+01	4.72E-04	3.50E+01	2.18E+02	4.99E-01	2.54E-01	1.63E+01	2.21E-01	1.70E+01	9.83E+00	3.45E-03	2.66E-01	2.24E+01	2.77E+01	2.22E-01	2.54E-02	5.74E+01	8.29E-05
AZ	3.91E-02	3.34E+00	1.36E-01	3.04E+01	2.76E-01	3.01E-02	9.35E-01	1.79E-01	7.61E-02	7.56E-02	1.15E-01	5.76E-01	2.21E-02	5.54E-02	6.36E-01	5.63E-02	1.86E-01	1.35E-01	6.60E+00	4.92E-01	1.20E-01	1.79E-01	3.18E-03	1.36E-03	7.41E-01	1.62E-02
BA	3.51E+00	1.36E-03	1.10E+01	2.89E-03	4.65E+02	7.49E-01	8.75E+00	4.75E-01	1.51E+00	7.96E-04	8.12E+00	1.71E+01	1.98E-01	1.10E-01	1.52E+01	1.16E-01	6.57E+00	1.78E+00	5.63E-03	2.63E+00	5.18E+01	3.04E+01	5.47E-02	6.79E-03	5.46E+01	2.55E-04
BE	8.07E-03	4.61E-04	6.38E-01	7.66E-04	1.83E-01	1.65E+02	6.27E-02	4.74E-02	1.23E+00	6.40E-05	1.07E+00	8.34E+01	4.94E-01	8.60E-02	9.64E+00	1.21E-01	5.26E+01	4.47E+01	1.50E-03	1.72E-02	1.29E-01	3.73E-01	7.84E-01	5.49E-02	1.20E+00	5.87E-05
BG	2.58E+00	4.07E-02	6.01E+00	6.80E-02	1.63E+01	5.69E-01	5.87E+02	2.02E+00	1.12E+00	4.60E-02	5.62E+00	1.46E+01	2.87E-01	2.30E-01	1.17E+01	2.38E-01	3.58E+00	1.90E+00	1.88E-01	4.74E+01	6.46E+00	2.03E+01	5.18E-02	8.83E-03	1.84E+01	3.87E-03
BY	3.53E-01	5.31E-02	1.30E+01	2.34E-01	9.00E+00	5.99E+00	1.16E+01	2.48E+02	3.45E+00	2.94E-02	2.46E+01	1.05E+02	8.13E+00	7.96E+00	9.74E+00	5.73E+00	9.12E+00	2.27E+01	2.26E-01	3.26E+00	6.79E+00	2.37E+01	5.98E-01	8.46E-02	1.08E+01	5.73E-03
CH	3.20E-02	1.20E-04	3.60E+00	3.13E-04	5.89E-01	2.53E+00	1.00E-01	1.82E-02	9.30E+01	4.75E-05	9.27E-01	6.38E+01	9.73E-02	2.01E-02	1.54E+01	2.48E-02	2.33E+01	3.85E+00	4.22E-04	5.65E-02	9.22E-01	3.23E-01	1.13E-01	1.01E-02	4.20E+01	1.29E-05
CY	3.15E-02	1.52E-03	6.87E-02	1.94E-03	1.47E-01	4.46E-03	4.74E-01	1.39E-02	2.34E-02	1.29E+00	5.25E-02	1.38E-01	4.27E-03	2.47E-03	1.95E-01	2.47E-03	8.78E-02	1.68E-02	4.16E-03	7.84E-01	7.86E-02	8.98E-02	6.76E-04	2.18E-04	5.55E-01	3.47E-05
CZ	1.54E-01	1.68E-03	5.76E+01	3.07E-03	1.02E+01	7.22E+00	1.76E+00	8.41E-01	1.04E+01	3.65E-04	3.90E+02	3.43E+02	1.92E+00	5.70E-01	1.03E+01	4.39E-01	1.46E+01	1.37E+01	6.67E-03	2.55E-01	1.20E+01	3.64E+01	3.31E-01	4.49E-02	1.38E+01	1.92E-04
DE	1.29E-01	6.92E-03	5.68E+01	1.19E-02	3.51E+00	1.72E+02	1.70E+00	2.10E+00	7.76E+01	1.02E-03	1.08E+02	4.21E+03	1.76E+01	1.52E+00	6.25E+01	1.67E+00	1.75E+02	2.04E+02	2.46E-02	4.27E-01	4.30E+00	1.17E+01	4.31E+00	3.93E-01	3.46E+01	8.74E-04
DK	2.06E-03	8.12E-04	1.16E+00	1.35E-03	1.36E-01	1.09E+01	4.30E-02	3.88E-01	7.74E-01	4.63E-05	3.10E+00	8.96E+01	7.31E+01	2.25E-01	4.64E+00	3.17E-01	9.90E+00	4.28E+01	2.42E-03	9.59E-03	1.90E-01	8.16E-01	1.07E+00	9.91E-02	6.87E-01	1.42E-04
EE	2.52E-02	6.68E-03	1.18E+00	2.39E-02	5.64E-01	1.99E+00	4.07E-01	3.75E+00	4.26E-01	8.60E-04	3.26E+00	2.63E+01	3.92E+00	1.14E+02	1.70E+00	1.37E+01	2.11E+00	8.88E+00	2.11E-02	8.41E-02	4.38E-01	1.36E+00	2.40E-01	3.67E-02	6.53E-01	5.41E-04
ES	6.77E-01	6.70E-03	1.65E+00	1.17E-02	4.22E+00	8.37E+00	3.14E+00	1.74E-01	2.92E+00	9.05E-04	1.74E+00	3.83E+01	3.50E-01	7.38E-02	2.37E+03	1.19E-01	7.67E+01	3.52E+01	1.57E-02	2.94E+00	2.27E+00	1.14E+00	1.87E+00	7.08E-02	4.60E+01	1.72E-04
FI	8.53E-02	2.45E-02	4.33E+00	8.53E-02	1.91E+00	9.18E+00	1.36E+00	6.87E+00	1.64E+00	2.10E-03	1.16E+01	1.03E+02	1.05E+01	5.39E+01	7.81E+00	3.71E+02	9.40E+00	3.42E+01	7.49E-02	2.46E-01	1.48E+00	4.87E+00	8.43E-01	2.36E-01	2.71E+00	2.18E-02
FR	5.04E-01	4.17E-03	1.11E+01	1.03E-02	9.18E+00	9.22E+01	1.68E+00	4.43E-01	4.48E+01	1.16E-03	1.26E+01	4.17E+02	3.27E+00	5.47E-01	5.13E+02	7.34E-01	8.86E+02	1.71E+02	1.36E-02	1.15E+00	7.51E+00	4.67E+00	4.81E+00	2.46E-01	1.13E+02	3.10E-04
GB	2.00E-02	3.96E-03	1.27E+00	6.24E-03	3.45E-01	2.45E+01	1.24E-01	4.22E-01	1.93E+00	3.12E-04	2.36E+00	8.94E+01	3.42E+00	4.15E-01	4.58E+01	6.12E-01	5.93E+01	1.36E+03	1.10E-02	5.54E-02	2.67E-01	4.63E-01	3.03E+01	8.74E-01	2.27E+00	5.78E-04
GE	7.93E-02	2.92E+00	5.34E-01	2.59E+00	9.05E-01	7.73E-02	4.99E+00	5.34E-01	2.26E-01	1.26E-01	4.46E-01	1.65E+00	7.48E-02	9.06E-02	1.43E+00	7.90E-02	4.56E-01	3.29E-01	4.15E+01	1.55E+00	4.96E-01	9.37E-01	9.50E-03	2.45E-03	1.87E+00	4.49E-03
GR	6.98E+00	1.61E-02	2.79E+00	2.80E-02	1.04E+01	3.22E-01	8.37E+01	7.03E-01	1.05E+00	6.26E-02	2.22E+00	6.76E+00	1.29E-01	1.16E-01	1.64E+01	1.08E-01	5.98E+00	1.15E+00	9.64E-02	2.63E+02	3.96E+00	7.12E+00	3.34E-02	5.68E-03	4.25E+01	1.19E-03
HR	1.75E+00	1.15E-03	1.93E+01	2.12E-03	8.57E+01	7.08E-01	4.02E+00	3.01E-01	1.59E+00	4.71E-04	8.80E+00	1.79E+01	1.77E-01	9.24E-02	1.46E+01	1.04E-01	6.75E+00	1.62E+00	5.02E-03	1.20E+00	1.74E+02	3.50E+01	4.52E-02	6.45E-03	6.10E+01	1.01E-04
HU	1.45E+00	1.66E-03	4.75E+01	3.27E-03	5.24E+01	1.26E+00	1.04E+01	1.00E+00	2.79E+00	5.06E-04	2.70E+01	4.00E+01	4.64E-01	3.31E-01	9.39E+00	3.76E-01	5.04E+00	2.93E+00	7.36E-03	2.41E+00	4.66E+01	3.50E+02	7.15E-02	1.54E-02	2.89E+01	1.57E-04
IE	5.72E-03	7.62E-04	6.59E-02	1.21E-03	6.55E-02	1.52E+00	3.08E-02	5.05E-02	9.64E-02	6.48E-05	1.42E-01	5.09E+00	3.57E-01	7.61E-02	8.58E+00	1.34E-01	4.98E+00	4.88E+01	2.06E-03	1.47E-02	2.91E-02	3.90E-02	4.79E+01	2.15E-01	3.09E-01	8.02E-05
IS	8.47E-03	6.09E-04	3.64E-01	1.21E-03	9.71E-02	1.12E+00	5.90E-02	4.25E-02	2.49E-01	5.51E-05	5.98E-01	8.83E+00	6.45E-01	6.38E-02	2.91E+00	1.54E-01	2.22E+00	1.03E+01	1.39E-03	2.67E-02	7.56E-02	1.55E-01	5.74E-01	2.63E+01	4.54E-01	7.21E-04
IT	6.77E+00	4.37E-03	2.58E+01	9.21E-03	6.56E+01	4.82E+00	9.58E+00	5.01E-01	2.75E+01	2.78E-03	9.29E+00	7.97E+01	4.06E-01	1.24E-01	1.04E+02	1.71E-01	8.25E+01	9.13E+00	1.26E-02	1.04E+01	4.89E+01	1.70E+01	2.54E-01	2.72E-02	1.08E+03	4.39E-04
KY	6.82E-02	3.62E-01	1.59E-01	1.04E+00	3.07E-01	4.13E-02	7.84E-01	7.39E-02	1.32E-01	4.42E-02	1.11E-01	7.36E-01	1.70E-02	2.19E-02	1.22E+00	3.20E-02	3.10E-01	1.23E-01	6.19E-01	5.75E-01	1.42E-01	1.85E-01	4.09E-03	1.31E-03	1.22E+00	5.60E+01
KZ	8.71E-01	5.66E+00	5.10E+00	1.82E+01	6.89E+00	2.50E+00	2.59E+01	6.79E+00	2.72E+00	3.58E-01	6.16E+00	3.93E+01	1.55E+00	2.40E+00	2.38E+01	3.21E+00	8.25E+00	8.78E+00	1.14E+01	9.22E+00	3.76E+00	8.15E+00	2.75E-01	6.98E-02	1.89E+01	4.67E+01
LI	1.18E-04	5.91E-07	5.44E-02	1.50E-06	2.34E-03	1.72E-02	4.89E-04	1.06E-04	6.41E-01	2.05E-07	6.79E-03	4.89E-01	3.89E-04	1.19E-04	7.64E-02	1.18E-04	9.40E-02	2.83E-02	1.97E-06	2.76E-04	4.21E-03	1.70E-03	7.09E-04	5.68E-05	1.60E-01	8.90E-08
LT	5.19E-02	5.59E-03	3.61E+00	1.76E-02	1.36E+00	3.44E+00	1.20E+00	3.00E+01	1.01E+00	1.47E-03	9.21E+00	5.25E+01	8.91E+00	3.54E+00	3.43E+00	3.08E+00	3.95E+00	1.52E+01	2.41E-02	2.23E-01	1.20E+00	4.05E+00	3.80E-01	5.08E-02	1.71E+00	5.76E-04
LU	1.13E-03	2.34E-05	1.10E-01	5.29E-05	2.66E-02	4.06E+00	5.55E-03	5.29E-03	2.87E-01	5.89E-06	1.58E-01	1.35E+01	2.70E-02	8.34E-03	1.01E+00	1.28E-02	4.01E+00	1.60E+00	7.76E-05	2.44E-03	2.46E-02	3.78E-02	3.78E-02	2.69E-03	2.67E-01	3.18E-06
LV	4.97E-02	7.86E-03	2.55E+00	2.90E-02	1.14E+00	3.38E+00	9.25E-01	1.10E+01	8.24E-01	1.53E-03	6.87E+00	4.83E+01	8.01E+00	1.55E+01	3.35E+00	6.30E+00	3.70E+00	1.47E+01	2.73E-02	2.01E-01	9.64E-01	3.02E+00	3.75E-01	5.35E-02	1.35E+00	6.13E-04
MC	2.94E-05	8.51E-08	3.97E-04	1.73E-07	5.49E-04	2.35E-04	6.38E-05	1.03E-05	8.12E-04	2.12E-08	1.96E-04	1.93E-03	9.87E-06	3.03E-06	4.75E-03	4.14E-06	1.39E-02	2.61E-04	2.36E-07	3.86E-05	6.73E-04	2.32E-04	7.92E-06	1.14E-06	1.69E-02	8.33E-09
MD	1.61E-01	6.28E-03	1.08E+00	1.70E-02	1.75E+00	1.47E-01	1.07E+01	1.53E+00	2.56E-01	6.93E-03	1.28E+00	3.99E+00	1.88E-01	1.73E-01	1.32E+00	1.41E-01	5.67E-01	8.03E-01	2.54E-02	1.82E+00	9.36E-01	3.79E+00	1.52E-02	4.24E-03	2.38E+00	3.46E-03
ME	6.15E+00	5.49E-04	1.04E+00	9.77E-04	1.86E+01	9.45E-02	3.99E+00	7.39E-02	2.77E-01	4.23E-04	8.23E-01	2.22E+00	2.53E-02	1.65E-02	4.49E+00	2.25E-02	1.56E+00	2.91E-01	2.35E-03	2.71E+00	2.66E+00	3.45E+00	9.28E-03	1.32E-03	1.64E+01	6.57E-05
MK	6.49E+00	1.47E-03	9.55E-01	3.24E-03	4.46E+00	9.23E-02	2.01E+01	1.11E-01	2.63E-01	3.00E-03	7.70E-01	2.18E+00	2.71E-02	1.69E-02	3.65E+00	2.08E-02	1.24E+00	2.55E-01	6.56E-03	2.39E+01	1.36E+00	3.08E+00	8.25E-03	1.27E-03	7.90E+00	1.42E-04
MT	7.65E-03	3.00E-06	3.79E-03	2.39E-06	2.02E-02	3.06E-04	1.21E-02	2.46E-04	1.54E-03	8.28E-06	2.22E-03	5.32E-03	9.61E-05	4.69E-05	4.16E-02	4.41E-05	1.28E-02	1.65E-03	1.95E-05	1.38E-02	7.90E-03	5.64E-03	5.64E-05	7.15E-06	2.18E-01	1.09E-07
NL	3.82E-03	4.63E-04	4.44E-01	7.14E-04	7.81E-02	8.40E+01	3.86E-02	5.15E-02	1.08E+00	3.69E-05	9.60E-01	1.25E+02	1.00E+00	6.85E-02	7.92E+00	9.48E-02	3.08E+01	5.93E+01	1.43E-03	1.12E-02	7.96E-02	2.63E-01	9.31E-01	7.03E-02	7.08E-01	8.79E-05
NO	3.85E-02	7.89E-03	3.34E+00	2.54E-02	1.24E+00	1.85E+01	3.81E-01	1.75E+00	1.90E+00	8.81E-04	7.61E+00	1.24E+02	2.66E+01	1.91E+00	1.42E+01	5.53E+00	2.10E+01	1.28E+02	2.18E-02	1.60E-01	1.07E+00	3.27E+00	3.65E+00	1.31E+00	3.09E+00	1.38E-02
PL	5.22E-01	1.39E-02	5.06E+01	3.87E-02	2.35E+01	2.60E+01	7.15E+00	3.11E+01	1.26E+01	2.77E-03	2.26E+02	6.84E+02	2.99E+01	4.14E+00	2.52E+01	4.13E+00	3.30E+01	7.29E+01	5.69E-02	1.06E+00	2.07E+01	7.31E+01	1.90E+00	1.94E-01	2.43E+01	1.62E-03
PT	3.75E-02	4.30E-04	6.08E-02	8.01E-04	1.86E-01	5.78E-01	1.71E-01	9.81E-03	1.26E-01	9.28E-05	8.16E-02	2.55E+00	3.24E-02	8.20E-03	1.07E+02	1.20E-02	2.82E+00	2.80E+00	1.07E-03	1.59E-01	8.37E-02	4.81E-02	1.92E-01	1.31E-02	1.28E+00	8.88E-06
RO	3.04E+00	2.87E-02	2.33E+01	6.54E-02	4.83E+01	1.78E+00	1.21E+02	4.78E+00	3.71E+00	1.88E-02	1.95E+01	4.89E+01	1.21E+00	6.69E-01	1.80E+01	6.41E-01	7.84E+00	5.44E+00	1.28E-01	1.61E+01	2.29E+01	1.12E+02	1.44E-01	2.65E-02	3.64E+01	7.44E-03
RS	6.99E+00	3.89E-03	1.11E+01	7.62E-03	7.84E+01	6.98E-01	5.33E+01	8.50E-01	1.36E+00	8.16E-03	8.94E+00	1.89E+01	2.97E-01	1.75E-01	9.75E+00	1.84E-01	4.37E+00	1.72E+00	1.79E-02	1.28E+01	2.20E+01	5.73E+01	5.03E-02	1.00E-02	2.78E+01	6.94E-04
RU	5.48E+00	1.17E+01	5.22E+01	3.83E+01	6.24E+01	2.89E+01	2.11E+02	1.64E+02	1.94E+01	1.14E+00	7.71E+01	4.36E+02	3.94E+01	1.47E+02	1.05E+02	1.61E+02	5.74E+01	1.14E+02	3.80E+01	7.51E+01	3.59E+01	8.85E+01	3.19E+00	1.11E+00	1.04E+02	1.38E+01
SE	4.53E-02	1.19E-02	5.10E+00	3.69E-02	1.92E+00	3.09E+01	6.35E-01	8.69E+00	2.86E+00	1.41E-03	1.55E+01	3.23E+02	9.68E+01	1.33E+01	1.60E+01	4.37E+01	2.83E+01	1.26E+02	3.76E-02	1.49E-01	1.49E+00	4.87E+00	3.09E+00	5.00E-01	4.26E+00	7.65E-03
SI	2.01E-01	3.10E-04	2.09E+01	6.12E-04	6.38E+00	5.36E-01	8.25E-01	5.79E-02	1.14E+00	1.56E-04	3.43E+00	1.61E+01	6.55E-02	2.79E-02	5.64E+00	3.30E-02	3.28E+00	1.11E+00	1.31E-03	1.80E-01	4.26E+01	8.05E+00	2.53E-02	2.77E-03	3.24E+01	2.21E-05
SK	4.83E-01	1.25E-03	2.87E+01	2.76E-03	1.93E+01	1.27E+00	3.63E+00	1.06E+00	2.93E+00	3.35E-04	5.56E+01	4.95E+01	9.58E-01	2.69E-01	6.37E+00	2.87E-01	4.34E+00	3.19E+00	5.17E-03	5.51E-01	1.36E+01	9.56E+01	8.77E-02	1.58E-02	1.46E+01	1.20E-04
TJ	2.66E-02	1.85E-01	7.20E-02	5.60E-01	1.44E-01	1.30E-02	3.47E-01	3.10E-02	5.83E-02	2.31E-02	4.64E-02	2.54E-01	6.06E-03	7.35E-03	5.47E-01	1.02E-02	1.26E-01	4.29E-02	2.78E-01	2.33E-01	6.82E-02	8.69E-02	1.53E-03	4.74E-04	5.59E-01	1.27E+00
TM	4.55E-02	8.23E-01	2.35E-01	3.48E+00	4.01E-01	4.74E-02	1.21E+00	1.63E-01	1.34E-01	5.69E-02	1.86E-01	8.77E-01	2.88E-02	4.69E-02	1.03E+00	5.57E-02	2.92E-01	1.65E-01	1.41E+00	5.17E-01	2.01E-01	3.08E-01	5.69E-03	2.14E-03	1.16E+00	4.20E-01
TR	2.31E+00	5.96E+00	6.47E+00	3.96E+00	1.41E+01	8.77E-01	1.69E+02	5.01E+00	2.40E+00	4.95E+00	5.86E+00	1.91E+01	9.88E-01	6.79E-01	3.05E+01	6.52E-01	8.14E+00	3.66E+00	6.24E+00	8.61E+01	6.71E+00	1.33E+01	9.53E-02	2.85E-02	4.25E+01	1.66E-02
UA	2.89E+00	5.92E-01	3.33E+01	2.22E+00	5.07E+01	6.73E+00	1.48E+02	5.89E+01	7.99E+00	2.42E-01	4.74E+01	1.55E+02	6.93E+00	4.99E+00	3.16E+01	4.18E+00	1.86E+01	2.40E+01	3.19E+00	3.88E+01	2.75E+01	9.90E+01	5.69E-01	1.05E-01	5.57E+01	1.03E-01
UZ	6.90E-02	8.52E-01	3.73E-01	2.53E+00	6.02E-01	9.55E-02	1.77E+00	2.98E-01	2.25E-01	5.40E-02	3.19E-01	1.69E+00	6.12E-02	9.51E-02	1.72E+00	1.14E-01	4.98E-01	3.18E-01	1.49E+00	6.76E-01	3.02E-01	4.79E-01	1.07E-02	3.24E-03	1.80E+00	5.45E+00

Table B3 *(continued)*

Code	KZ	LI	LT	LU	LV	MC	MD	ME	MK	MT	NL	NO	PL	PT	RO	RS	RU	SE	SI	SK	TJ	TM	TR	UA	UZ
AL	2.68E-02	1.98E-03	2.08E-02	6.55E-03	2.97E-02	2.79E-04	2.07E-01	3.79E+00	8.37E+00	3.80E-02	6.32E-02	2.04E-02	2.99E+00	4.71E-01	3.10E+00	2.64E+01	3.24E+00	1.81E-02	5.37E-01	4.61E-01	2.00E-04	1.87E-03	1.67E+00	5.38E-01	5.66E-03
AM	1.36E+00	2.56E-04	7.13E-03	6.97E-04	1.90E-02	1.89E-05	1.15E-01	1.58E-02	4.80E-02	5.49E-04	9.51E-03	8.62E-03	5.72E-01	5.61E-02	6.50E-01	2.82E-01	8.09E+00	8.36E-03	5.38E-02	3.13E-02	5.54E-03	2.74E-01	2.85E+01	6.24E-01	3.83E-01
AT	4.10E-02	3.81E-01	2.43E-01	5.00E-01	4.55E-01	1.46E-03	1.65E-01	3.09E-01	1.96E-01	8.46E-03	5.10E+00	2.32E-01	4.82E+01	1.77E+00	6.29E+00	1.56E+01	1.82E+00	2.97E-01	6.11E+01	1.00E+01	1.50E-04	1.89E-03	4.03E-01	7.40E-01	4.18E-03
AZ	8.44E+00	5.17E-04	2.89E-02	1.62E-03	8.02E-02	2.95E-05	2.43E-01	2.69E-02	7.90E-02	7.34E-04	2.29E-02	3.14E-02	1.39E+00	7.56E-02	1.07E+00	4.83E-01	3.29E+01	3.63E-02	9.56E-02	6.23E-02	2.91E-02	1.67E+00	2.13E+01	1.74E+00	2.28E+00
BA	5.47E-02	1.10E-02	1.94E-01	5.01E-02	2.49E-01	1.34E-03	6.13E-01	7.45E+00	1.07E+00	4.11E-02	6.29E-01	1.26E-01	3.40E+01	1.49E+00	1.38E+01	6.99E+01	3.89E+00	1.52E-01	5.76E+00	5.89E+00	4.86E-04	3.29E-03	9.44E-01	1.91E+00	1.22E-02
BE	2.18E-02	5.63E-03	6.01E-02	2.28E+00	1.08E-01	1.25E-04	1.89E-02	1.40E-02	1.70E-02	1.95E-04	2.70E+01	1.59E-01	5.29E+00	9.70E-01	3.14E-01	3.50E-01	6.51E-01	1.49E-01	1.31E-01	2.02E-01	6.12E-05	4.07E-04	4.13E-02	2.08E-01	1.29E-03
BG	1.55E+00	7.95E-03	3.77E-01	3.70E-02	5.50E-01	5.27E-04	1.04E+01	1.76E+00	8.34E+00	2.51E-02	4.63E-01	2.25E-01	3.66E+01	1.16E+00	1.52E+02	9.32E+01	6.92E+01	2.31E-01	2.86E+00	4.84E+00	5.89E-03	5.77E-02	4.21E+01	2.06E+01	1.74E-01
BY	1.84E+00	3.02E-02	2.36E+01	2.74E-01	3.14E+01	4.36E-04	8.63E+00	4.55E-01	7.03E-01	4.01E-03	5.17E+00	3.03E+00	4.73E+02	1.20E+00	3.54E+01	1.71E+01	1.22E+02	5.12E+00	5.30E+00	1.24E+01	6.80E-03	8.02E-02	1.16E+01	8.82E+01	1.62E-01
CH	3.77E-03	7.81E-01	2.07E-02	2.70E-01	4.45E-02	1.52E-03	1.02E-02	2.85E-02	2.15E-02	4.06E-03	1.65E+00	3.51E-02	1.58E+00	1.58E+00	1.75E-01	3.71E-01	1.71E-01	3.27E-02	9.50E-01	1.05E-01	2.36E-05	1.65E-04	3.68E-02	3.76E-02	5.17E-04
CY	1.20E-02	2.08E-04	3.28E-03	3.51E-04	5.50E-03	1.14E-05	4.07E-02	2.05E-02	4.49E-02	1.33E-03	3.34E-03	3.02E-03	3.07E-01	1.08E-02	3.20E-01	2.21E-01	9.19E-01	3.12E-03	5.27E-02	2.89E-02	6.20E-05	6.07E-04	8.11E+00	1.44E-01	1.91E-03
CZ	1.12E-01	9.81E-02	6.08E-01	6.87E-01	1.09E+00	4.70E-04	1.95E-01	3.11E-01	2.58E-01	2.22E-03	6.98E+00	6.20E-01	3.52E+02	1.11E+00	8.02E+00	1.80E+01	3.37E+00	6.45E-01	9.89E+00	2.58E+01	2.36E-04	2.61E-03	3.69E-01	1.77E+00	6.61E-03
DE	3.48E-01	7.42E-01	1.83E+00	1.33E+01	3.09E+00	1.77E-03	4.23E-01	2.07E-01	4.00E-01	4.30E-03	1.85E+02	3.82E+00	2.69E+02	6.99E+00	6.72E+00	6.96E+00	1.03E+01	2.68E+00	5.22E+00	6.97E+00	9.08E-04	7.38E-03	7.52E-01	3.62E+00	2.07E-02
DK	5.26E-02	5.65E-03	5.03E-01	2.18E-01	4.85E-01	6.35E-05	3.06E-02	3.04E-03	4.94E-03	8.10E-05	1.04E+01	2.69E+00	2.28E+01	4.80E-01	2.98E-01	2.16E-01	1.40E+00	1.65E+00	1.85E-01	5.60E-01	1.25E-04	8.95E-04	4.01E-02	3.02E-01	3.31E-03
EE	4.13E-01	3.88E-03	6.52E+00	5.75E-02	3.72E+01	3.01E-05	2.40E-01	3.53E-02	4.87E-02	1.56E-04	1.87E+00	2.38E+00	4.03E+01	1.82E-01	1.66E+00	1.09E+00	1.58E+01	5.89E+00	3.17E-01	9.06E-01	4.20E-04	1.33E-02	4.32E-01	1.43E+00	2.17E-02
ES	1.03E-01	1.37E-02	4.21E-02	3.40E-01	9.47E-02	2.05E-03	3.93E-01	4.03E-01	6.05E-01	4.54E-02	5.07E+00	3.58E-01	4.25E+00	2.45E+02	3.28E+00	3.77E+00	3.42E+00	1.86E-01	1.51E+00	2.89E-01	1.44E-04	1.48E-03	1.02E+00	9.91E-01	3.92E-03
FI	2.89E+00	1.40E-02	8.32E+00	2.44E-01	2.41E+01	1.46E-04	5.70E-01	1.15E-01	1.40E-01	6.98E-04	8.22E+00	1.54E+01	1.17E+02	1.17E+00	4.28E+00	3.69E+00	2.46E+02	4.57E+01	1.12E+00	2.85E+00	1.39E-02	6.31E-02	1.16E+00	3.57E+00	2.65E-01
FR	1.04E-01	1.28E-01	4.90E-01	6.59E+00	8.47E-01	2.28E-02	2.40E-01	5.08E-01	3.91E-01	3.71E-02	4.16E+01	1.58E+00	3.83E+01	3.83E+01	4.14E+00	6.19E+00	5.09E+00	1.18E+00	6.26E+00	1.85E+00	4.35E-04	4.14E-03	6.84E-01	1.20E+00	1.05E-02
GB	2.08E-01	1.16E-02	4.14E-01	5.10E-01	6.79E-01	2.19E-04	3.97E-02	2.11E-02	2.18E-02	5.56E-04	1.63E+01	2.06E+00	1.26E+01	6.04E+00	4.34E-01	4.21E-01	3.52E+00	9.77E-01	2.48E-01	2.84E-01	6.27E-04	3.94E-03	1.70E-01	4.48E-01	1.47E-02
GE	1.74E+00	1.68E-03	1.06E-01	4.64E-03	2.12E-01	7.26E-05	1.41E+00	7.54E-02	2.41E-01	1.71E-03	5.86E-02	6.38E-02	6.00E+00	1.70E-01	6.08E+00	2.12E+00	4.88E+01	7.05E-02	3.84E-01	3.25E-01	5.38E-03	3.58E-01	6.17E+01	6.34E+00	5.13E-01
GR	5.42E-01	7.19E-03	1.26E-01	2.32E-02	2.23E-01	7.79E-04	2.98E+00	1.63E+00	1.63E+01	9.61E-02	2.14E-01	1.00E-01	1.30E+01	1.14E+00	2.67E+01	3.78E+01	3.14E+01	1.03E-01	1.87E+00	1.74E+00	2.08E-03	2.04E-02	6.13E+01	7.84E+00	5.97E-02
HR	4.60E-02	1.24E-02	1.40E-01	4.92E-02	2.01E-01	1.38E-03	2.89E-01	1.90E+00	6.66E-01	3.07E-02	5.72E-01	1.14E-01	2.96E+01	1.26E+00	1.04E+01	4.51E+01	2.27E+00	1.47E-01	3.27E+01	4.84E+00	2.00E-04	2.19E-03	6.06E-01	1.13E+00	5.26E-03
HU	1.10E-01	2.22E-02	4.89E-01	9.16E-02	6.46E-01	7.64E-04	6.66E-01	2.12E+00	2.02E+00	1.33E-02	1.17E+00	2.46E-01	1.27E+02	9.79E-01	6.35E+01	1.29E+02	7.31E+00	3.03E-01	2.03E+01	5.09E+01	2.30E-04	2.96E-03	6.07E-01	5.61E+00	7.35E-03
IE	3.47E-02	4.82E-04	5.03E-02	3.82E-02	9.38E-02	2.75E-05	8.02E-03	4.98E-03	6.00E-03	7.46E-05	8.68E-01	2.17E-01	8.62E-01	1.89E+00	7.43E-02	6.65E-02	6.98E-01	1.57E-01	1.87E-02	2.16E-02	8.22E-05	6.75E-04	3.31E-02	5.99E-02	2.04E-03
IS	5.17E-02	2.02E-03	4.39E-02	3.59E-02	7.74E-02	3.60E-05	1.06E-02	6.43E-03	1.01E-02	1.51E-04	8.09E-01	1.28E+00	3.17E+00	5.98E-01	1.09E-01	1.25E-01	1.62E+00	3.20E-01	6.93E-02	9.46E-02	5.53E-04	1.31E-03	4.40E-02	6.55E-02	9.22E-03
IT	9.72E-02	1.83E-01	2.34E-01	3.45E-01	3.03E-01	2.18E-02	5.73E-01	4.96E+00	3.37E+00	2.41E-01	3.65E+00	2.59E-01	4.04E+01	8.23E+00	1.14E+01	3.38E+01	4.76E+00	2.62E-01	4.21E+01	4.27E+00	7.33E-04	5.53E-03	3.44E+00	1.82E+00	1.96E-02
KY	1.71E+02	7.97E-04	1.56E-02	2.54E-03	3.27E-02	5.64E-05	9.90E-02	4.00E-02	1.24E-01	8.08E-04	3.17E-02	2.77E-02	9.93E-01	1.38E-01	7.21E-01	5.00E-01	1.43E+01	2.33E-02	1.25E-01	6.60E-02	2.59E+01	3.56E+00	9.39E+00	5.80E-01	3.95E+02
KZ	3.93E+03	1.80E-02	1.44E+00	1.26E-01	3.00E+00	9.11E-04	6.52E+00	6.96E-01	1.86E+00	1.44E-02	2.05E+00	1.86E+00	6.61E+01	2.68E+00	3.70E+01	1.45E+01	2.32E+03	2.08E+00	3.02E+00	3.28E+00	3.22E+01	3.78E+01	1.35E+02	5.74E+01	6.00E+02
LI	2.14E-05	4.33E-02	1.17E-04	1.58E-03	2.79E-04	5.26E-06	4.95E-05	1.03E-04	8.76E-05	1.32E-05	1.12E-02	1.44E-04	9.23E-03	8.84E-03	8.34E-04	1.77E-03	7.64E-04	1.43E-04	4.40E-03	6.16E-04	1.67E-07	8.77E-07	1.68E-04	1.77E-04	3.55E-06
LT	3.71E-01	9.28E-03	5.77E+01	1.21E-01	2.66E+01	7.00E-05	7.53E-01	7.87E-02	1.01E-01	4.76E-04	3.15E+00	2.15E+00	1.57E+02	4.30E-01	4.53E+00	2.85E+00	1.64E+01	4.35E+00	9.67E-01	2.85E+00	4.88E-04	6.76E-03	7.72E-01	5.26E+00	1.56E-02
LU	1.00E-03	1.16E-03	6.64E-03	2.65E+00	1.24E-02	2.37E-05	1.65E-03	1.42E-03	1.15E-03	3.92E-05	1.20E+00	1.01E-02	5.05E-01	9.87E-02	2.54E-02	3.05E-02	4.37E-02	1.21E-02	2.72E-02	1.86E-02	3.63E-06	2.77E-05	3.65E-03	1.07E-02	7.87E-05
LV	5.16E-01	7.53E-03	2.89E+01	1.06E-01	1.81E+02	5.10E-05	4.77E-01	6.66E-02	8.92E-02	3.99E-04	3.10E+00	2.77E+00	9.54E+01	3.52E-01	3.25E+00	2.26E+00	1.88E+01	6.55E+00	7.35E-01	1.99E+00	5.39E-04	1.52E-02	7.21E-01	3.46E+00	2.65E-02
MC	1.32E-06	3.63E-06	3.91E-06	1.82E-05	7.06E-06	8.93E-05	8.39E-06	3.08E-05	1.99E-05	2.90E-06	1.50E-04	6.76E-06	7.12E-04	3.68E-04	1.93E-04	4.32E-04	7.42E-05	6.75E-06	5.93E-04	5.51E-05	1.44E-08	1.21E-07	2.38E-05	3.42E-05	4.09E-07
MD	5.46E-01	1.85E-03	2.79E-01	9.91E-03	4.67E-01	7.33E-05	6.19E+01	1.30E-01	3.46E-01	2.03E-03	1.30E-01	1.23E-01	1.96E+01	1.59E-01	4.29E+01	3.86E+00	3.42E+01	1.42E-01	6.87E-01	1.33E+00	4.51E-03	1.87E-02	4.06E+00	2.09E+01	1.03E-01
ME	2.22E-02	1.92E-03	2.91E-02	6.84E-03	3.61E-02	2.47E-04	1.48E-01	2.77E+01	1.12E+00	2.88E-02	7.45E-02	2.10E-02	4.12E+00	3.96E-01	2.73E+00	2.51E+01	1.54E+00	2.32E-02	6.13E-01	7.07E-01	1.33E-04	9.62E-04	6.02E-01	3.79E-01	3.51E-03
MK	4.60E-02	1.72E-03	2.48E-02	6.52E-03	3.57E-02	1.94E-04	3.87E-01	9.65E-01	4.25E+01	1.16E-02	6.83E-02	2.11E-02	4.11E+00	3.39E-01	5.26E+00	3.72E+01	3.17E+00	2.11E-02	5.26E-01	6.77E-01	3.12E-04	2.91E-03	2.98E+00	9.64E-01	9.34E-03
MT	4.16E-05	1.03E-05	5.87E-05	2.53E-05	1.03E-04	1.22E-06	4.23E-04	4.41E-03	5.08E-03	2.12E-02	1.84E-04	6.70E-05	1.08E-02	2.12E-03	9.55E-03	2.24E-02	2.13E-03	6.65E-05	3.71E-03	1.57E-03	1.01E-07	8.04E-07	5.09E-03	1.56E-03	2.91E-06
NL	2.51E-02	5.42E-03	6.83E-02	5.36E-01	9.46E-02	8.21E-05	2.23E-02	5.90E-03	9.13E-03	1.40E-04	1.15E+02	2.56E-01	4.78E+00	1.12E+00	2.41E-01	1.75E-01	6.63E-01	1.76E-01	8.73E-02	1.57E-01	8.21E-05	4.10E-04	2.59E-02	1.78E-01	1.75E-03
NO	1.36E+00	1.28E-02	1.81E+00	3.46E-01	2.77E+00	2.14E-04	1.62E-01	4.41E-02	4.28E-02	7.43E-04	1.66E+01	2.55E+02	6.87E+01	2.03E+00	1.38E+00	1.65E+00	6.39E+01	1.62E+01	9.65E-01	2.05E+00	8.88E-03	2.27E-02	4.37E-01	1.52E+00	1.54E-01
PL	9.35E-01	1.15E-01	1.07E+01	1.30E+00	1.13E+01	9.59E-04	3.80E+00	9.70E-01	9.56E-01	4.33E-03	2.46E+01	7.00E+00	4.60E+03	2.78E+00	4.11E+01	4.34E+01	3.45E+01	9.95E+00	1.55E+01	7.81E+01	1.44E-03	1.78E-02	1.88E+00	3.25E+01	4.54E-02
PT	6.14E-03	6.72E-04	4.28E-03	2.05E-02	9.28E-03	6.20E-05	1.94E-02	2.19E-02	3.23E-02	1.53E-03	3.64E-01	2.98E-02	1.64E-01	4.29E+02	1.62E-01	1.73E-01	2.09E-01	1.62E-02	4.57E-02	1.16E-02	8.73E-06	1.11E-04	7.89E-02	5.09E-02	2.21E-04
RO	1.87E+00	3.06E-02	1.30E+00	1.30E-01	1.70E+00	1.14E-03	3.40E+01	3.31E+00	6.20E+00	2.82E-02	1.48E+00	7.03E-01	1.57E+02	2.11E+00	1.03E+03	1.79E+02	1.24E+02	7.17E-01	1.10E+01	2.29E+01	1.10E-02	6.76E-02	1.64E+01	5.05E+01	2.97E-01
RS	1.80E-01	1.04E-02	3.03E-01	4.92E-02	3.93E-01	7.61E-04	2.11E+00	1.39E+01	2.17E+01	2.75E-02	6.29E-01	1.95E-01	4.64E+01	9.93E-01	6.24E+01	5.90E+02	1.29E+01	2.39E-01	5.05E+00	9.43E+00	1.23E-03	8.33E-03	4.64E+00	5.16E+00	3.31E-02
RU	2.58E+03	1.56E-01	4.51E+01	1.22E+00	1.25E+02	4.34E-03	6.30E+01	5.15E+00	1.27E+01	8.66E-02	2.45E+01	4.15E+01	8.82E+02	1.24E+01	3.12E+02	1.30E+02	2.62E+04	6.14E+01	2.63E+01	3.76E+01	1.04E+01	3.43E+01	6.85E+02	5.99E+02	2.04E+02
SE	1.95E+00	2.19E-02	9.32E+00	7.60E-01	1.64E+01	2.65E-04	3.35E-01	7.04E-02	5.76E-02	1.04E-03	2.96E+01	7.76E+01	1.64E+02	2.07E+00	2.69E+00	2.63E+00	1.03E+02	1.81E+02	1.22E+00	3.17E+00	5.58E-03	3.28E-02	7.22E-01	4.10E+00	1.46E-01
SI	1.12E-02	8.77E-03	3.72E-02	3.59E-02	5.99E-02	7.32E-04	6.30E-02	2.13E-01	1.23E-01	6.40E-03	5.17E-01	4.11E-02	8.19E+00	4.88E-01	2.71E+00	6.95E+00	4.97E-01	5.38E-02	1.05E+02	1.24E+00	3.91E-05	5.51E-04	1.61E-01	2.38E-01	1.11E-03
SK	8.64E-02	2.46E-02	4.65E-01	1.25E-01	5.91E-01	4.20E-04	3.64E-01	7.57E-01	5.79E-01	3.28E-03	1.20E+00	3.52E-01	2.75E+02	7.01E-01	2.21E+01	3.65E+01	3.43E+00	4.05E-01	8.96E+00	1.44E+02	1.44E-04	3.04E-03	2.92E-01	4.52E+00	6.13E-03
TJ	2.14E+01	3.70E-04	6.10E-03	8.08E-04	1.22E-02	2.63E-05	4.58E-02	1.73E-02	5.27E-02	3.44E-04	1.02E-02	9.33E-03	4.58E-01	5.39E-02	3.39E-01	2.40E-01	5.31E+00	7.65E-03	5.87E-02	3.08E-02	7.43E+01	3.26E+00	5.01E+00	2.54E-01	1.08E+02
TM	4.66E+01	9.75E-04	3.53E-02	2.72E-03	7.19E-02	5.12E-05	2.25E-01	3.69E-02	1.02E-01	9.17E-04	3.67E-02	4.43E-02	1.81E+00	1.06E-01	1.37E+00	7.29E-01	3.54E+01	4.00E-02	1.69E-01	1.09E-01	5.10E+00	4.01E+01	1.45E+01	1.40E+00	9.76E+01
TR	6.94E+00	1.75E-02	9.18E-01	5.58E-02	1.53E+00	1.16E-03	2.04E+01	1.47E+00	4.49E+00	1.08E-01	6.72E-01	7.67E-01	5.78E+01	3.11E+00	1.08E+02	3.48E+01	5.67E+02	7.89E-01	4.05E+00	4.15E+00	1.65E-02	7.27E-01	2.71E+03	7.86E+01	1.21E+00
UA	2.07E+01	6.93E-02	7.83E+00	4.39E-01	1.22E+01	1.98E-03	9.69E+01	3.11E+00	5.81E+00	4.34E-02	5.73E+00	3.44E+00	7.66E+02	3.37E+00	3.16E+02	1.00E+02	1.46E+03	4.76E+00	1.77E+01	4.27E+01	9.94E-02	9.41E-01	2.16E+02	1.05E+03	2.71E+00
UZ	1.75E+02	1.61E-03	6.83E-02	4.91E-03	1.38E-01	8.42E-05	3.77E-01	5.39E-02	1.40E-01	1.04E-03	7.77E-02	8.11E-02	3.62E+00	1.53E-01	2.23E+00	1.01E+00	6.02E+01	8.04E-02	2.64E-01	1.84E-01	2.67E+01	1.38E+01	1.59E+01	2.73E+00	5.52E+02

Table B4. *Source-receptor matrix of Hg deposition to EMEP countries in 2022. Columns and rows are sources and receptors, receptively.*

Code	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KY
AL	1.07E+01	7.71E-04	4.91E-01	3.26E-03	4.34E+00	1.07E-01	3.02E+00	2.96E-02	2.62E-01	3.40E-04	9.16E-01	1.42E+00	2.61E-02	1.83E-02	1.53E+00	2.20E-02	1.10E+00	4.16E-01	4.16E-03	5.11E+00	5.10E-01	9.05E-01	2.34E-02	8.16E-04	1.15E+01	7.67E-05
AM	1.86E-02	3.05E+00	8.33E-02	3.19E+00	2.42E-01	2.78E-02	2.18E-01	4.67E-02	6.99E-02	2.12E-02	1.61E-01	3.94E-01	2.82E-02	2.83E-02	2.21E-01	3.61E-02	1.55E-01	1.57E-01	4.57E+00	1.77E-01	3.79E-02	9.25E-02	8.81E-03	7.58E-04	5.60E-01	1.92E-03
AT	1.21E-01	5.64E-04	8.96E+01	2.74E-03	6.86E+00	2.27E+00	7.74E-01	5.35E-02	1.41E+01	4.14E-04	2.74E+01	6.09E+01	1.99E-01	7.45E-02	3.72E+00	7.91E-02	8.27E+00	3.71E+00	3.13E-03	2.42E-01	3.03E+00	6.73E+00	1.85E-01	7.18E-03	2.75E+01	1.53E-04
AZ	3.11E-02	1.14E+00	1.71E-01	2.01E+01	4.23E-01	6.76E-02	4.00E-01	1.55E-01	1.45E-01	2.37E-02	3.77E-01	1.00E+00	8.46E-02	1.10E-01	3.74E-01	1.26E-01	2.99E-01	4.03E-01	4.52E+00	2.73E-01	6.72E-02	1.84E-01	2.29E-02	2.09E-03	9.23E-01	9.08E-03
BA	9.97E-01	1.08E-03	5.13E+00	4.35E-03	2.60E+02	5.63E-01	2.29E+00	8.89E-02	1.06E+00	4.54E-04	8.34E+00	9.99E+00	9.71E-02	4.91E-02	3.17E+00	6.53E-02	2.94E+00	1.42E+00	5.67E-03	1.27E+00	6.85E+00	1.01E+01	8.27E-02	3.07E-03	2.58E+01	2.00E-04
BE	7.08E-03	2.20E-04	2.65E-01	9.87E-04	1.89E-01	6.09E+01	2.77E-02	7.27E-03	4.94E-01	3.31E-05	9.36E-01	2.34E+01	1.38E-01	2.03E-02	1.95E+00	2.11E-02	1.92E+01	1.21E+01	1.07E-03	1.85E-02	4.29E-02	5.47E-02	4.13E-01	8.53E-03	7.02E-01	9.57E-05
BG	8.24E-01	1.55E-02	2.79E+00	6.64E-02	1.14E+01	4.42E-01	1.10E+02	6.58E-01	9.71E-01	1.92E-02	6.37E+00	8.92E+00	3.33E-01	2.37E-01	3.09E+00	2.93E-01	2.28E+00	1.94E+00	9.03E-02	8.59E+00	1.13E+00	6.57E+00	1.13E-01	7.35E-03	1.02E+01	1.80E-03
BY	1.53E-01	3.28E-02	4.55E+00	2.76E-01	5.97E+00	1.97E+00	3.20E+00	3.94E+01	2.25E+00	6.01E-03	1.89E+01	4.73E+01	4.53E+00	4.07E+00	3.25E+00	3.33E+00	4.61E+00	1.19E+01	1.95E-01	1.04E+00	9.03E-01	5.79E+00	6.58E-01	4.47E-02	6.13E+00	4.58E-03
CH	2.26E-02	1.46E-04	1.39E+00	6.70E-04	7.09E-01	1.01E+00	9.82E-02	5.89E-03	3.88E+01	4.09E-05	1.29E+00	1.40E+01	3.71E-02	7.69E-03	3.13E+00	9.54E-03	1.10E+01	1.53E+00	7.85E-04	5.97E-02	3.80E-01	1.85E-01	1.10E-01	2.73E-03	1.81E+01	3.70E-05
CY	2.08E-02	7.42E-04	3.89E-02	2.39E-03	1.53E-01	4.61E-03	1.60E-01	7.51E-03	2.18E-02	3.81E-01	6.38E-02	8.87E-02	4.53E-03	3.28E-03	6.67E-02	4.29E-03	5.53E-02	2.23E-02	3.28E-03	3.05E-01	2.55E-02	4.19E-02	1.59E-03	1.20E-04	4.46E-01	2.38E-05
CZ	5.40E-02	8.25E-04	1.59E+01	4.06E-03	4.46E+00	2.30E+00	3.31E-01	1.33E-01	5.11E+00	2.67E-04	2.53E+02	1.16E+02	6.62E-01	1.77E-01	2.34E+00	1.42E-01	6.29E+00	5.35E+00	4.43E-03	9.98E-02	1.11E+00	6.92E+00	2.74E-01	9.86E-03	6.50E+00	3.03E-04
DE	1.06E-01	2.98E-03	1.89E+01	1.39E-02	3.50E+00	4.88E+01	5.72E-01	3.61E-01	2.94E+01	6.85E-04	9.53E+01	1.05E+03	5.20E+00	4.42E-01	1.38E+01	4.29E-01	6.34E+01	6.43E+01	1.57E-02	3.21E-01	9.39E-01	2.65E+00	2.56E+00	7.22E-02	1.66E+01	1.32E-03
DK	2.86E-03	3.07E-04	3.41E-01	1.34E-03	1.25E-01	2.59E+00	2.65E-02	7.19E-02	3.92E-01	3.38E-05	2.81E+00	2.54E+01	1.87E+01	1.06E-01	1.03E+00	1.27E-01	3.30E+00	1.56E+01	1.53E-03	1.03E-02	3.16E-02	1.82E-01	6.35E-01	2.17E-02	3.23E-01	2.18E-04
EE	8.53E-03	2.77E-03	2.83E-01	1.80E-02	2.80E-01	5.48E-01	1.19E-01	5.59E-01	1.92E-01	2.77E-04	2.23E+00	9.68E+00	1.75E+00	2.23E+01	4.00E-01	3.19E+00	8.42E-01	4.50E+00	1.34E-02	3.89E-02	4.46E-02	2.14E-01	2.36E-01	1.75E-02	3.41E-01	4.73E-04
ES	4.10E-01	6.69E-03	1.53E+00	2.41E-02	5.16E+00	3.88E+00	1.81E+00	6.25E-02	3.17E+00	5.82E-04	3.42E+00	1.73E+01	2.39E-01	7.83E-02	3.76E+02	1.04E-01	3.59E+01	1.83E+01	3.07E-02	2.07E+00	1.21E+00	6.70E-01	1.90E+00	3.63E-02	3.37E+01	5.64E-04
FI	2.56E-02	1.04E-02	1.22E+00	7.94E-02	1.01E+00	3.24E+00	3.40E-01	1.48E+00	8.90E-01	8.73E-04	9.44E+00	4.18E+01	5.77E+00	1.94E+01	2.28E+00	9.65E+01	4.88E+00	1.94E+01	5.01E-02	1.03E-01	1.92E-01	9.99E-01	1.02E+00	8.82E-02	1.67E+00	7.60E-03
FR	3.64E-01	3.98E-03	4.84E+00	1.72E-02	8.79E+00	3.96E+01	1.24E+00	1.01E-01	2.29E+01	6.14E-04	1.43E+01	1.25E+02	1.07E+00	1.73E-01	8.80E+01	2.09E-01	3.60E+02	6.88E+01	1.99E-02	1.10E+00	2.78E+00	1.63E+00	4.09E+00	7.78E-02	6.26E+01	6.68E-04
GB	2.44E-02	2.33E-03	4.35E-01	9.80E-03	4.75E-01	7.71E+00	1.19E-01	8.36E-02	1.11E+00	2.50E-04	1.90E+00	2.35E+01	1.48E+00	1.89E-01	1.04E+01	2.63E-01	2.13E+01	4.64E+02	1.15E-02	7.96E-02	9.74E-02	1.61E-01	1.92E+01	1.62E-01	1.65E+00	1.24E-03
GE	5.06E-02	2.07E+00	3.64E-01	2.24E+00	9.55E-01	9.17E-02	1.42E+00	2.91E-01	2.52E-01	3.95E-02	7.47E-01	1.67E+00	1.32E-01	1.33E-01	6.70E-01	1.54E-01	4.79E-01	5.51E-01	1.70E+01	6.47E-01	1.49E-01	4.60E-01	3.19E-02	2.47E-03	1.72E+00	3.38E-03
GR	2.73E+00	1.01E-02	1.69E+00	4.12E-02	9.66E+00	3.14E-01	2.55E+01	2.85E-01	9.04E-01	2.59E-02	3.39E+00	5.15E+00	1.65E-01	1.36E-01	3.73E+00	1.57E-01	2.82E+00	1.26E+00	5.99E-02	9.06E+01	1.16E+00	3.14E+00	7.64E-02	4.67E-03	2.29E+01	1.15E-03
HR	5.33E-01	6.83E-04	8.63E+00	2.73E-03	4.91E+01	5.30E-01	1.17E+00	6.24E-02	1.13E+00	4.05E-04	8.80E+00	9.88E+00	8.32E-02	4.01E-02	2.73E+00	5.49E-02	2.81E+00	1.22E+00	3.84E-03	7.63E-01	2.11E+01	1.20E+01	6.70E-02	2.75E-03	2.71E+01	1.42E-04
HU	4.17E-01	1.47E-03	1.66E+01	7.07E-03	2.80E+01	7.46E-01	2.40E+00	2.15E-01	2.01E+00	3.74E-04	2.31E+01	1.99E+01	2.65E-01	1.25E-01	2.34E+00	1.55E-01	2.93E+00	2.20E+00	7.35E-03	9.74E-01	4.29E+00	7.91E+01	1.22E-01	5.56E-03	1.38E+01	2.42E-04
IE	7.66E-03	5.51E-04	5.37E-02	2.60E-03	1.22E-01	5.48E-01	3.67E-02	1.35E-02	9.41E-02	6.45E-05	2.47E-01	1.94E+00	1.70E-01	3.84E-02	2.21E+00	6.21E-02	2.07E+00	1.73E+01	2.68E-03	2.33E-02	1.88E-02	2.20E-02	2.83E+01	3.56E-02	2.77E-01	2.07E-04
IS	8.41E-03	7.16E-04	1.62E-01	2.77E-03	1.46E-01	4.75E-01	4.49E-02	1.96E-02	1.81E-01	5.40E-05	7.02E-01	3.51E+00	3.29E-01	3.91E-02	9.27E-01	9.74E-02	1.17E+00	4.95E+00	2.68E-03	2.97E-02	3.02E-02	6.61E-02	6.37E-01	2.25E+00	3.94E-01	7.70E-04
IT	3.07E+00	3.78E-03	1.31E+01	1.39E-02	5.49E+01	2.63E+00	4.62E+00	1.51E-01	1.48E+01	1.32E-03	1.24E+01	3.19E+01	2.40E-01	9.27E-02	2.07E+01	1.30E-01	2.92E+01	5.44E+00	1.81E-02	6.04E+00	1.67E+01	7.31E+00	3.54E-01	1.17E-02	5.42E+02	5.07E-04
KY	5.51E-02	1.70E-01	2.81E-01	9.33E-01	6.79E-01	1.16E-01	5.15E-01	1.29E-01	2.81E-01	2.20E-02	5.51E-01	1.51E+00	8.64E-02	1.02E-01	7.94E-01	1.36E-01	5.51E-01	5.22E-01	5.70E-01	4.21E-01	1.15E-01	2.65E-01	3.33E-02	3.09E-03	1.67E+00	1.17E+01
KZ	6.09E-01	2.37E+00	5.43E+00	1.63E+01	1.02E+01	3.27E+00	1.04E+01	5.34E+00	4.49E+00	1.61E-01	1.56E+01	4.37E+01	3.25E+00	4.58E+00	1.25E+01	6.07E+00	1.04E+01	1.70E+01	9.04E+00	5.47E+00	1.74E+00	6.00E+00	1.10E+00	1.20E-01	2.18E+01	1.32E+01
LI	9.76E-05	6.83E-07	1.85E-02	3.22E-06	3.11E-03	5.51E-03	5.60E-04	3.18E-05	3.00E-01	1.91E-07	8.97E-03	1.03E-01	2.01E-04	4.25E-05	1.48E-02	4.92E-05	4.21E-02	8.99E-03	3.48E-06	3.39E-04	1.58E-03	1.02E-03	5.68E-04	1.50E-05	6.68E-02	2.26E-07
LT	1.78E-02	3.99E-03	8.91E-01	2.70E-02	7.33E-01	9.19E-01	3.36E-01	3.86E+00	4.95E-01	5.11E-04	6.51E+00	2.12E+01	3.34E+00	1.33E+00	1.02E+00	1.18E+00	1.65E+00	6.16E+00	2.33E-02	8.65E-02	1.09E-01	7.95E-01	3.03E-01	2.13E-02	8.87E-01	6.48E-04
LU	9.18E-04	1.87E-05	4.00E-02	8.55E-05	2.64E-02	1.18E+00	3.14E-03	6.81E-04	1.02E-01	3.14E-06	1.49E-01	3.31E+00	6.52E-03	1.76E-03	2.08E-01	1.88E-03	1.53E+00	5.36E-01	9.34E-05	2.49E-03	7.83E-03	7.70E-03	2.51E-02	4.78E-04	1.36E-01	6.45E-06
LV	1.62E-02	4.44E-03	6.08E-01	3.36E-02	5.69E-01	8.59E-01	2.76E-01	1.65E+00	3.76E-01	4.20E-04	5.04E+00	1.88E+01	3.05E+00	4.34E+00	8.23E-01	1.93E+00	1.39E+00	6.25E+00	2.11E-02	7.76E-02	8.68E-02	5.52E-01	3.29E-01	2.22E-02	6.56E-01	6.22E-04
MC	1.88E-05	7.14E-08	1.85E-04	2.73E-07	5.24E-04	9.40E-05	4.80E-05	2.55E-06	4.40E-04	1.39E-08	2.00E-04	6.62E-04	5.30E-06	1.72E-06	9.51E-04	2.82E-06	9.39E-03	1.42E-04	3.67E-07	3.33E-05	2.56E-04	8.09E-05	1.18E-05	3.97E-07	8.84E-03	9.30E-09
MD	6.44E-02	2.45E-03	5.55E-01	1.21E-02	1.53E+00	1.28E-01	1.84E+00	4.64E-01	2.14E-01	1.09E-03	1.51E+00	2.80E+00	1.92E-01	1.77E-01	4.56E-01	1.63E-01	4.42E-01	7.29E-01	1.51E-02	4.24E-01	1.94E-01	1.32E+00	3.28E-02	2.66E-03	1.55E+00	5.66E-04
ME	1.82E+00	3.56E-04	5.51E-01	1.46E-03	1.37E+01	8.62E-02	1.38E+00	1.73E-02	2.11E-01	1.59E-04	1.04E+00	1.36E+00	1.96E-02	1.05E-02	1.05E+00	1.50E-02	7.51E-01	2.90E-01	1.94E-03	1.10E+00	5.99E-01	1.14E+00	1.76E-02	6.10E-04	8.75E+00	4.47E-05
MK	2.07E+00	1.40E-03	5.32E-01	5.84E-03	3.55E+00	8.74E-02	8.53E+00	3.84E-02	2.24E-01	1.92E-03	1.10E+00	1.51E+00	3.06E-02	1.89E-02	8.98E-01	2.43E-02	6.74E-01	3.08E-01	7.12E-03	6.25E+00	3.50E-01	1.19E+00	1.94E-02	8.38E-04	4.36E+00	1.03E-04
MT	3.41E-03	3.44E-06	4.32E-03	1.23E-05	2.91E-02	5.24E-04	6.93E-03	8.45E-05	2.03E-03	1.85E-06	6.11E-03	7.52E-03	1.87E-04	5.39E-05	1.26E-02	7.97E-05	1.03E-02	2.75E-03	1.60E-05	8.82E-03	4.41E-03	3.25E-03	2.01E-04	6.80E-06	2.03E-01	5.73E-07
NL	3.97E-03	2.55E-04	1.60E-01	1.14E-03	1.06E-01	2.31E+01	1.92E-02	1.06E-02	3.43E-01	2.88E-05	1.06E+00	3.20E+01	4.08E-01	2.82E-02	1.62E+00	3.52E-02	9.16E+00	1.77E+01	1.24E-03	1.18E-02	2.29E-02	5.13E-02	4.84E-01	1.18E-02	3.91E-01	1.34E-04
NO	5.04E-02	5.42E-03	1.45E+00	3.21E-02	1.44E+00	5.99E+00	2.80E-01	5.00E-01	1.46E+00	4.83E-04	9.30E+00	5.07E+01	1.12E+01	1.32E+00	4.22E+00	4.66E+00	9.60E+00	5.87E+01	2.42E-02	1.92E-01	2.83E-01	1.12E+00	3.36E+00	2.92E-01	2.73E+00	6.30E-03
PL	1.86E-01	7.40E-03	1.37E+01	4.95E-02	1.23E+01	7.04E+00	1.62E+00	4.55E+00	5.96E+00	1.19E-03	1.42E+02	3.10E+02	9.83E+00	1.62E+00	6.27E+00	1.72E+00	1.30E+01	2.89E+01	4.16E-02	4.18E-01	2.09E+00	1.45E+01	1.36E+00	6.32E-02	1.16E+01	2.22E-03
PT	2.70E-02	5.59E-04	6.92E-02	2.21E-03	3.04E-01	3.28E-01	1.21E-01	5.30E-03	1.74E-01	6.58E-05	1.88E-01	1.26E+00	2.34E-02	8.46E-03	1.86E+01	1.15E-02	1.81E+00	1.97E+00	2.65E-03	1.45E-01	6.03E-02	3.44E-02	2.44E-01	6.53E-03	1.51E+00	5.28E-05
RO	1.01E+00	1.58E-02	9.00E+00	7.36E-02	3.45E+01	1.12E+00	2.15E+01	1.44E+00	2.59E+00	7.45E-03	1.89E+01	2.52E+01	9.18E-01	6.14E-01	5.13E+00	7.03E-01	4.91E+00	4.63E+00	9.06E-02	4.07E+00	3.56E+00	3.01E+01	2.52E-01	1.59E-02	2.08E+01	2.23E-03
RS	1.86E+00	3.16E-03	4.75E+00	1.33E-02	4.78E+01	4.33E-01	1.47E+01	1.91E-01	1.07E+00	2.91E-03	9.47E+00	1.01E+01	1.77E-01	8.82E-02	2.44E+00	1.15E-01	2.35E+00	1.43E+00	1.61E-02	3.08E+00	2.93E+00	1.60E+01	8.39E-02	4.07E-03	1.40E+01	3.83E-04
RU	2.65E+00	4.73E+00	2.72E+01	3.06E+01	5.48E+01	1.72E+01	5.89E+01	4.64E+01	1.87E+01	3.75E-01	9.14E+01	2.58E+02	3.12E+01	8.41E+01	4.07E+01	9.60E+01	4.46E+01	1.09E+02	2.32E+01	2.93E+01	8.18E+00	3.28E+01	6.56E+00	6.70E-01	8.35E+01	3.66E+00
SE	3.18E-02	6.72E-03	1.94E+00	4.31E-02	1.68E+00	8.84E+00	3.04E-01	1.75E+00	1.46E+00	7.13E-04	1.64E+01	1.01E+02	3.04E+01	6.24E+00	4.04E+00	2.26E+01	1.12E+01	5.24E+01	3.38E-02	1.05E-01	3.34E-01	1.70E+00	2.55E+00	1.72E-01	2.83E+00	5.01E-03
SI	8.08E-02	1.72E-04	7.81E+00	7.46E-04	4.06E+00	2.74E-01	2.92E-01	1.49E-02	6.76E-01	1.45E-04	3.35E+00	5.72E+00	2.92E-02	1.17E-02	9.90E-01	1.69E-02	1.25E+00	5.54E-01	1.02E-03	1.34E-01	5.66E+00	2.37E+00	2.90E-02	1.15E-03	1.37E+01	4.11E-05
SK	1.60E-01	9.62E-04	8.28E+00	5.11E-03	1.06E+01	5.91E-01	7.47E-01	1.81E-01	1.81E+00	1.97E-04	3.71E+01	2.06E+01	3.51E-01	1.05E-01	1.47E+00	1.21E-01	2.24E+00	1.94E+00	4.88E-03	2.87E-01	1.54E+00	2.00E+01	1.12E-01	4.71E-03	7.00E+00	1.84E-04
TJ	2.57E-02	9.88E-02	1.31E-01	5.77E-01	3.34E-01	4.67E-02	2.58E-01	6.24E-02	1.37E-01	1.30E-02	2.41E-01	6.47E-01	4.26E-02	4.65E-02	3.71E-01	6.13E-02	2.53E-01	2.35E-01	3.12E-01	2.01E-01	5.71E-02	1.23E-01	1.56E-02	1.40E-03	8.51E-01	3.00E-01
TM	8.23E-02	5.33E-01	5.42E-01	4.48E+00	1.18E+00	2.37E-01	1.05E+00	5.68E-01	4.92E-01	4.24E-02	1.28E+00	3.46E+00	3.67E-01	3.88E-01	1.19E+00	4.98E-01	9.77E-01	1.39E+00	1.83E+00	7.45E-01	2.01E-01	5.87E-01	9.10E-02	1.14E-02	2.77E+00	2.58E-01
TR	1.19E+00	1.96E+00	4.54E+00	3.21E+00	1.43E+01	1.01E+00	2.90E+01	2.45E+00	2.81E+00	1.39E+00	9.01E+00	1.72E+01	1.27E+00	9.99E-01	9.52E+00	1.21E+00	6.62E+00	5.38E+00	4.52E+00	1.85E+01	2.14E+00	6.16E+00	3.04E-01	2.63E-02	3.31E+01	1.30E-02
UA	1.12E+00	2.12E-01	1.25E+01	1.35E+00	3.43E+01	3.21E+00	2.86E+01	1.57E+01	5.47E+00	6.88E-02	3.99E+01	7.29E+01	4.99E+00	4.08E+00	9.57E+00	3.86E+00	1.03E+01	1.62E+01	1.40E+00	1.02E+01	4.47E+00	2.58E+01	8.49E-01	6.18E-02	3.27E+01	2.96E-02
UZ	8.36E-02	4.32E-01	5.57E-01	2.75E+00	1.20E+00	2.55E-01	1.03E+00	5.40E-01	5.11E-01	3.36E-02	1.31E+00	3.66E+00	3.23E-01	4.28E-01	1.23E+00	5.43E-01	1.01E+00	1.46E+00	1.51E+00	6.83E-01	2.05E-01	5.62E-01	9.86E-02	1.15E-02	2.78E+00	1.22E+00

Table B4 *(continued)*

Code	KZ	LI	LT	LU	LV	MC	MD	ME	MK	MT	NL	NO	PL	PT	RO	RS	RU	SE	SI	SK	TJ	TM	TR	UA	UZ
AL	4.07E-02	1.39E-04	1.73E-02	2.78E-02	9.63E-03	3.04E-04	3.09E-02	4.68E-01	5.19E+00	4.28E-03	5.00E-02	1.56E-02	1.50E+00	1.38E-01	1.56E+00	7.01E+00	6.82E-01	2.27E-02	2.13E-01	4.30E-01	2.80E-04	3.49E-03	7.81E-01	4.86E-01	7.05E-03
AM	1.49E+00	3.67E-05	2.13E-02	6.97E-03	1.09E-02	4.28E-05	3.37E-02	1.03E-02	5.38E-02	1.09E-04	1.48E-02	1.72E-02	7.51E-01	3.15E-02	4.23E-01	2.01E-01	2.31E+00	3.03E-02	3.57E-02	6.33E-02	6.10E-03	2.90E-01	9.36E+00	8.86E-01	2.65E-01
AT	6.17E-02	1.98E-02	7.21E-02	9.08E-01	3.56E-02	1.36E-03	3.45E-02	1.57E-01	2.10E-01	8.90E-04	1.05E+00	7.58E-02	1.32E+01	4.06E-01	2.86E+00	5.87E+00	5.44E-01	1.26E-01	1.20E+01	6.01E+00	2.55E-04	2.84E-03	3.87E-01	3.72E-01	7.03E-03
AZ	7.57E+00	7.92E-05	7.28E-02	1.54E-02	4.06E-02	7.59E-05	8.92E-02	2.03E-02	9.75E-02	1.72E-04	3.96E-02	5.55E-02	1.90E+00	5.02E-02	8.50E-01	3.77E-01	8.28E+00	9.92E-02	6.65E-02	1.31E-01	1.85E-02	1.59E+00	9.81E+00	2.63E+00	1.21E+00
BA	7.34E-02	6.46E-04	7.57E-02	1.57E-01	2.92E-02	1.09E-03	7.10E-02	2.25E+00	8.14E-01	4.09E-03	2.96E-01	5.45E-02	1.00E+01	3.29E-01	4.30E+00	2.32E+01	9.00E-01	8.74E-02	1.59E+00	3.71E+00	4.09E-04	3.87E-03	5.74E-01	7.92E-01	1.06E-02
BE	2.21E-02	1.75E-04	2.57E-02	3.66E+00	1.31E-02	1.23E-04	2.30E-03	5.77E-03	1.10E-02	5.10E-05	5.77E+00	3.75E-02	9.50E-01	2.33E-01	6.93E-02	8.42E-02	1.11E-01	5.85E-02	3.86E-02	4.90E-02	9.58E-05	5.49E-04	2.90E-02	4.11E-02	2.26E-03
BG	8.20E-01	5.28E-04	3.33E-01	1.30E-01	1.46E-01	6.12E-04	1.44E+00	6.00E-01	4.87E+00	2.53E-03	2.41E-01	1.61E-01	1.68E+01	3.83E-01	5.10E+01	3.20E+01	9.83E+00	2.87E-01	8.45E-01	3.45E+00	3.66E-03	4.76E-02	1.97E+01	9.72E+00	1.09E-01
BY	2.01E+00	1.29E-03	1.26E+01	4.35E-01	3.85E+00	4.99E-04	1.10E+00	2.28E-01	5.56E-01	8.07E-04	1.52E+00	1.33E+00	1.62E+02	4.18E-01	1.13E+01	6.04E+00	2.21E+01	3.55E+00	1.07E+00	5.17E+00	6.43E-03	1.36E-01	5.85E+00	2.51E+01	2.25E-01
CH	1.13E-02	3.86E-02	6.35E-03	4.72E-01	3.32E-03	1.31E-03	3.61E-03	1.67E-02	3.34E-02	4.01E-04	3.21E-01	1.22E-02	6.53E-01	3.23E-01	1.63E-01	3.11E-01	7.54E-02	1.41E-02	3.12E-01	1.08E-01	5.45E-05	4.66E-04	5.70E-02	4.32E-02	1.26E-03
CY	1.36E-02	1.34E-05	3.96E-03	1.29E-03	1.85E-03	1.89E-05	1.05E-02	1.00E-02	4.61E-02	3.07E-04	2.50E-03	2.69E-03	1.66E-01	6.19E-03	1.84E-01	1.12E-01	1.73E-01	4.48E-03	1.71E-02	2.72E-02	5.09E-05	8.50E-04	5.22E+00	1.24E-01	1.61E-03
CZ	1.09E-01	3.80E-03	1.82E-01	9.57E-01	9.71E-02	4.63E-04	2.92E-02	7.83E-02	9.17E-02	2.87E-04	1.49E+00	1.94E-01	7.93E+01	2.71E-01	2.03E+00	4.21E+00	7.46E-01	2.75E-01	1.60E+00	1.19E+01	3.86E-04	3.53E-03	2.28E-01	5.05E-01	1.06E-02
DE	3.76E-01	2.73E-02	7.73E-01	1.73E+01	4.09E-01	1.72E-03	5.89E-02	9.53E-02	1.95E-01	7.92E-04	3.21E+01	9.17E-01	7.63E+01	1.69E+00	2.03E+00	2.11E+00	2.03E+00	1.22E+00	1.25E+00	2.98E+00	1.31E-03	9.59E-03	6.28E-01	1.10E+00	3.39E-02
DK	6.28E-02	2.09E-04	2.12E-01	2.29E-01	7.07E-02	5.75E-05	5.28E-03	3.09E-03	7.20E-03	1.82E-05	2.94E+00	5.89E-01	8.43E+00	1.37E-01	1.25E-01	1.10E-01	3.40E-01	9.36E-01	3.70E-02	1.93E-01	1.69E-04	9.61E-04	2.95E-02	1.37E-01	4.94E-03
EE	4.89E-01	1.10E-04	2.17E+00	7.15E-02	3.24E+00	3.51E-05	1.88E-02	1.40E-02	2.92E-02	3.23E-05	5.23E-01	6.07E-01	1.31E+01	5.63E-02	3.39E-01	2.49E-01	3.08E+00	2.67E+00	4.65E-02	2.46E-01	3.73E-04	1.52E-02	2.32E-01	6.44E-01	2.15E-02
ES	2.88E-01	1.20E-03	4.64E-02	9.16E-01	2.94E-02	2.89E-03	8.56E-02	1.85E-01	7.21E-01	9.83E-03	1.39E+00	1.62E-01	2.25E+00	3.62E+01	2.03E+00	1.87E+00	1.44E+00	1.77E-01	8.74E-01	3.47E-01	7.54E-04	5.27E-03	1.50E+00	8.15E-01	1.51E-02
FI	3.80E+00	4.31E-04	3.54E+00	3.73E-01	2.97E+00	2.07E-04	9.12E-02	3.22E-02	8.22E-02	1.24E-04	2.74E+00	4.95E+00	4.21E+01	3.48E-01	1.24E+00	9.69E-01	3.92E+01	1.89E+01	2.00E-01	1.04E+00	6.34E-03	8.63E-02	6.11E-01	2.42E+00	2.43E-01
FR	2.19E-01	5.07E-03	1.47E-01	1.40E+01	7.83E-02	1.96E-02	5.60E-02	2.49E-01	5.34E-01	6.06E-03	9.86E+00	3.91E-01	9.36E+00	7.12E+00	1.98E+00	2.78E+00	1.46E+00	5.19E-01	2.01E+00	1.10E+00	8.96E-04	8.36E-03	8.05E-01	6.58E-01	2.10E-02
GB	3.21E-01	3.77E-04	1.98E-01	7.69E-01	9.58E-02	2.67E-04	1.16E-02	1.68E-02	4.65E-02	1.71E-04	5.14E+00	6.00E-01	3.91E+00	1.41E+00	2.65E-01	2.41E-01	1.13E+00	5.37E-01	8.91E-02	1.52E-01	9.76E-04	6.24E-03	1.77E-01	3.05E-01	2.85E-02
GE	2.19E+00	1.37E-04	1.38E-01	2.17E-02	6.57E-02	1.37E-04	3.65E-01	4.06E-02	2.28E-01	3.89E-04	5.64E-02	7.05E-02	4.30E+00	9.02E-02	2.81E+00	1.04E+00	8.92E+00	1.25E-01	1.44E-01	3.11E-01	5.39E-03	3.73E-01	3.29E+01	5.16E+00	3.33E-01
GR	5.37E-01	4.98E-04	1.47E-01	9.01E-02	7.12E-02	8.48E-04	5.80E-01	5.28E-01	1.10E+01	1.15E-02	1.53E-01	9.37E-02	7.78E+00	3.62E-01	1.29E+01	1.54E+01	5.33E+00	1.57E-01	6.81E-01	1.66E+00	2.46E-03	2.71E-02	3.43E+01	4.85E+00	6.28E-02
HR	5.48E-02	7.21E-04	5.93E-02	1.57E-01	2.43E-02	1.07E-03	4.19E-02	4.18E-01	4.03E-01	3.11E-03	2.71E-01	4.69E-02	8.94E+00	2.55E-01	3.21E+00	1.27E+01	5.25E-01	8.01E-02	6.47E+00	3.44E+00	2.41E-04	2.26E-03	5.21E-01	4.52E-01	6.29E-03
HU	1.19E-01	1.29E-03	2.13E-01	2.42E-01	7.11E-02	7.43E-04	1.04E-01	7.89E-01	1.03E+00	1.56E-03	4.59E-01	1.12E-01	3.74E+01	2.33E-01	2.11E+01	3.71E+01	1.45E+00	1.82E-01	3.68E+00	2.83E+01	4.52E-04	6.27E-03	3.71E-01	1.62E+00	1.43E-02
IE	6.97E-02	3.75E-05	2.76E-02	6.94E-02	1.46E-02	3.85E-05	2.88E-03	4.92E-03	1.57E-02	2.29E-05	2.79E-01	6.94E-02	4.54E-01	4.73E-01	6.32E-02	5.56E-02	2.90E-01	8.45E-02	1.36E-02	1.94E-02	1.68E-04	1.73E-03	4.68E-02	5.66E-02	5.21E-03
IS	1.07E-01	1.06E-04	3.67E-02	7.13E-02	1.97E-02	4.75E-05	4.30E-03	5.01E-03	1.69E-02	5.20E-05	2.55E-01	3.76E-01	1.49E+00	1.76E-01	8.10E-02	7.28E-02	5.85E-01	1.89E-01	2.66E-02	6.20E-02	6.95E-04	2.04E-03	5.26E-02	7.74E-02	1.58E-02
IT	1.96E-01	1.01E-02	1.60E-01	8.68E-01	6.06E-02	1.51E-02	1.09E-01	1.62E+00	2.97E+00	3.32E-02	1.03E+00	1.32E-01	1.41E+01	1.76E+00	5.06E+00	1.35E+01	1.66E+00	1.96E-01	1.27E+01	3.68E+00	9.22E-04	8.08E-03	2.56E+00	1.20E+00	2.13E-02
KY	9.95E+01	1.42E-04	6.98E-02	3.04E-02	3.48E-02	1.49E-04	6.55E-02	3.27E-02	1.73E-01	2.44E-04	5.79E-02	6.41E-02	1.96E+00	1.05E-01	9.14E-01	5.38E-01	8.08E+00	1.08E-01	1.16E-01	1.87E-01	9.67E+00	2.41E+00	8.46E+00	2.06E+00	1.96E+02
KZ	2.70E+03	2.33E-03	2.92E+00	7.08E-01	1.55E+00	2.13E-03	2.20E+00	5.16E-01	2.31E+00	3.64E-03	1.84E+00	2.83E+00	6.54E+01	1.66E+00	2.42E+01	9.83E+00	5.08E+02	4.67E+00	1.83E+00	4.77E+00	1.38E+01	3.02E+01	9.63E+01	8.30E+01	3.43E+02
LI	6.42E-05	2.14E-03	3.26E-05	2.56E-03	1.79E-05	4.62E-06	2.00E-05	7.30E-05	1.67E-04	1.34E-06	1.80E-03	5.81E-05	3.81E-03	1.61E-03	9.65E-04	1.88E-03	4.23E-04	6.83E-05	1.38E-03	6.54E-04	3.49E-07	2.56E-06	2.99E-04	2.54E-04	7.99E-06
LT	4.67E-01	2.98E-04	2.05E+01	1.74E-01	2.33E+00	8.34E-05	8.08E-02	3.04E-02	6.06E-02	8.15E-05	8.19E-01	5.87E-01	4.66E+01	1.39E-01	1.27E+00	8.32E-01	3.41E+00	2.14E+00	1.37E-01	9.64E-01	5.82E-04	1.66E-02	5.45E-01	2.24E+00	2.63E-02
LU	1.59E-03	3.80E-05	1.35E-03	3.47E+00	9.19E-04	2.11E-05	2.68E-04	7.17E-04	1.43E-03	9.12E-06	1.87E-01	2.22E-03	8.74E-02	2.30E-02	8.17E-03	1.03E-02	9.30E-03	3.60E-03	6.87E-03	7.18E-03	6.88E-06	4.65E-05	3.05E-03	3.84E-03	1.57E-04
LV	8.14E-01	2.24E-04	9.45E+00	1.38E-01	1.27E+01	5.94E-05	4.80E-02	2.65E-02	5.63E-02	6.74E-05	7.90E-01	7.41E-01	3.02E+01	1.11E-01	9.27E-01	6.25E-01	4.13E+00	3.00E+00	1.02E-01	6.41E-01	5.39E-04	2.88E-02	4.09E-01	1.53E+00	3.88E-02
MC	3.58E-06	1.57E-07	1.99E-06	3.48E-05	8.94E-07	5.47E-05	1.74E-06	1.48E-05	2.40E-05	3.18E-07	2.86E-05	3.72E-06	1.94E-04	7.36E-05	8.83E-05	1.91E-04	2.73E-05	4.23E-06	1.72E-04	3.83E-05	1.43E-08	1.35E-07	2.44E-05	1.61E-05	3.40E-07
MD	2.75E-01	1.20E-04	2.48E-01	3.45E-02	1.13E-01	1.00E-04	6.88E+00	7.50E-02	2.39E-01	2.86E-04	8.33E-02	8.10E-02	1.12E+01	5.43E-02	9.50E+00	1.63E+00	3.88E+00	1.54E-01	2.03E-01	9.23E-01	7.87E-04	8.03E-03	1.39E+00	7.01E+00	2.47E-02
ME	2.31E-02	1.17E-04	1.31E-02	2.40E-02	5.61E-03	2.44E-04	1.68E-02	3.72E+00	7.49E-01	3.07E-03	4.25E-02	1.17E-02	1.43E+00	1.03E-01	1.06E+00	8.03E+00	2.97E-01	1.76E-02	2.16E-01	4.98E-01	1.33E-04	1.52E-03	2.99E-01	2.18E-01	3.46E-03
MK	5.40E-02	1.19E-04	2.16E-02	2.61E-02	1.02E-02	2.10E-04	6.42E-02	2.26E-01	2.12E+01	1.27E-03	4.27E-02	1.60E-02	2.14E+00	9.71E-02	2.63E+00	9.25E+00	6.67E-01	2.57E-02	1.93E-01	5.96E-01	4.00E-04	5.04E-03	1.47E+00	6.05E-01	1.04E-02
MT	2.95E-04	1.07E-06	5.54E-05	1.55E-04	2.67E-05	2.65E-06	1.03E-04	1.91E-03	4.13E-03	9.50E-03	2.42E-04	1.98E-04	6.18E-03	7.48E-04	4.61E-03	8.17E-03	1.32E-03	1.76E-04	2.55E-03	2.02E-03	7.25E-07	4.47E-06	4.83E-03	9.14E-04	1.76E-05
NL	3.93E-02	1.47E-04	5.94E-02	6.92E-01	2.12E-02	7.62E-05	2.38E-03	3.49E-03	7.17E-03	2.86E-05	3.33E+01	8.73E-02	1.53E+00	2.28E-01	6.38E-02	5.83E-02	1.69E-01	1.25E-01	2.36E-02	5.77E-02	1.31E-04	7.45E-04	2.27E-02	4.68E-02	3.57E-03
NO	1.91E+00	6.93E-04	1.08E+00	5.79E-01	6.14E-01	3.47E-04	5.00E-02	3.97E-02	9.97E-02	2.01E-04	5.95E+00	3.70E+01	3.27E+01	6.35E-01	9.57E-01	1.01E+00	1.43E+01	9.80E+00	2.97E-01	1.07E+00	5.34E-03	3.09E-02	3.81E-01	1.12E+00	1.49E-01
PL	9.95E-01	4.06E-03	3.98E+00	1.79E+00	1.18E+00	9.21E-04	4.49E-01	3.26E-01	4.43E-01	7.06E-04	5.72E+00	1.80E+00	1.15E+03	8.03E-01	1.18E+01	1.26E+01	7.46E+00	4.64E+00	2.49E+00	2.37E+01	2.37E-03	3.27E-02	1.11E+00	8.23E+00	7.57E-02
PT	2.64E-02	6.70E-05	5.31E-03	6.78E-02	3.34E-03	1.24E-04	5.96E-03	1.15E-02	4.52E-02	5.88E-04	1.25E-01	1.81E-02	1.44E-01	5.49E+01	1.35E-01	1.06E-01	1.25E-01	1.76E-02	3.74E-02	1.65E-02	6.85E-05	6.43E-04	1.33E-01	6.25E-02	1.40E-03
RO	1.17E+00	1.52E-03	9.68E-01	3.42E-01	3.88E-01	1.28E-03	4.45E+00	1.57E+00	3.41E+00	3.19E-03	6.60E-01	4.10E-01	6.77E+01	5.96E-01	2.91E+02	6.27E+01	1.78E+01	7.17E-01	2.84E+00	1.44E+01	4.65E-03	5.96E-02	6.86E+00	2.05E+01	1.53E-01
RS	1.65E-01	6.32E-04	1.36E-01	1.33E-01	5.06E-02	7.58E-04	2.71E-01	4.42E+00	9.11E+00	2.67E-03	2.64E-01	9.00E-02	1.61E+01	2.61E-01	1.88E+01	1.72E+02	2.36E+00	1.39E-01	1.34E+00	5.91E+00	1.03E-03	1.16E-02	1.51E+00	2.17E+00	2.86E-02
RU	1.63E+03	9.93E-03	3.23E+01	3.17E+00	2.26E+01	7.33E-03	1.14E+01	2.71E+00	1.12E+01	1.73E-02	1.19E+01	2.29E+01	4.56E+02	5.34E+00	1.26E+02	5.58E+01	3.72E+03	4.75E+01	8.36E+00	2.59E+01	4.21E+00	2.85E+01	3.82E+02	4.50E+02	1.13E+02
SE	2.49E+00	7.93E-04	4.52E+00	9.56E-01	2.61E+00	3.36E-04	8.07E-02	3.83E-02	7.54E-02	1.90E-04	8.16E+00	1.41E+01	6.66E+01	6.02E-01	1.56E+00	1.45E+00	1.83E+01	6.78E+01	3.54E-01	1.80E+00	4.23E-03	4.63E-02	5.10E-01	2.46E+00	1.73E-01
SI	1.65E-02	4.48E-04	1.59E-02	8.97E-02	7.06E-03	4.71E-04	1.11E-02	7.18E-02	7.91E-02	6.58E-04	1.36E-01	1.51E-02	2.57E+00	9.62E-02	9.49E-01	2.20E+00	1.34E-01	2.69E-02	2.16E+01	8.72E-01	6.45E-05	6.47E-04	1.55E-01	1.08E-01	1.68E-03
SK	9.20E-02	1.21E-03	1.78E-01	2.28E-01	6.17E-02	3.82E-04	5.08E-02	2.36E-01	2.76E-01	5.13E-04	3.94E-01	1.10E-01	6.09E+01	1.65E-01	6.63E+00	1.06E+01	8.09E-01	1.90E-01	1.63E+00	6.02E+01	3.04E-04	5.03E-03	1.91E-01	9.47E-01	1.10E-02
TJ	1.54E+01	7.04E-05	3.35E-02	1.21E-02	1.64E-02	7.93E-05	3.26E-02	1.61E-02	8.34E-02	1.23E-04	2.51E-02	2.99E-02	9.30E-01	4.67E-02	4.51E-01	2.59E-01	3.62E+00	4.91E-02	5.51E-02	8.54E-02	2.40E+01	2.23E+00	4.76E+00	1.01E+00	5.71E+01
TM	7.52E+01	2.71E-04	3.28E-01	5.50E-02	1.57E-01	2.62E-04	2.29E-01	6.33E-02	2.95E-01	4.45E-04	1.38E-01	2.65E-01	6.01E+00	1.54E-01	2.37E+00	1.06E+00	3.20E+01	4.23E-01	2.06E-01	4.49E-01	3.09E+00	4.22E+01	1.74E+01	8.03E+00	9.73E+01
TR	8.08E+00	1.54E-03	1.12E+00	2.58E-01	4.97E-01	1.96E-03	3.95E+00	6.89E-01	3.91E+00	1.64E-02	5.73E-01	6.38E-01	4.11E+01	1.15E+00	4.15E+01	1.61E+01	7.88E+01	1.16E+00	1.79E+00	4.01E+00	1.79E-02	8.40E-01	1.06E+03	5.21E+01	8.98E-01
UA	1.36E+01	3.26E-03	5.87E+00	8.23E-01	2.45E+00	2.13E-03	1.24E+01	1.36E+00	4.16E+00	7.30E-03	2.10E+00	1.97E+00	3.11E+02	1.14E+00	8.65E+01	3.55E+01	1.65E+02	4.11E+00	4.33E+00	2.11E+01	4.08E-02	7.08E-01	9.28E+01	3.28E+02	1.38E+00
UZ	1.58E+02	2.84E-04	2.92E-01	5.69E-02	1.57E-01	2.70E-04	2.21E-01	6.14E-02	2.86E-01	4.01E-04	1.54E-01	2.67E-01	6.03E+00	1.53E-01	2.29E+00	1.02E+00	3.62E+01	4.29E-01	2.08E-01	4.34E-01	1.10E+01	1.13E+01	1.51E+01	8.56E+00	3.21E+02

Table B5. *Source-receptor matrix of B(a)P deposition to EMEP countries in 2022. Columns and rows are sources and receptors, receptively.*

Code	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KY
AL	4.59E+00	2.45E-07	1.79E-02	1.43E-08	3.54E-01	8.58E-04	7.53E-01	8.89E-04	2.63E-04	4.47E-06	1.15E-01	3.22E-02	1.97E-04	5.50E-06	1.68E-03	8.12E-06	3.00E-03	8.59E-04	4.94E-06	8.05E+00	1.94E-01	3.21E-01	6.01E-05	4.36E-08	2.02E+00	9.42E-11
AM	1.92E-07	1.26E+02	4.84E-06	1.02E+00	8.45E-06	3.17E-07	2.48E-04	2.47E-04	3.20E-06	1.47E-05	3.27E-05	1.13E-05	1.58E-06	4.20E-06	3.80E-06	7.42E-06	9.17E-06	6.24E-07	1.22E+01	5.25E-05	1.26E-05	2.45E-05	8.26E-08	1.09E-09	2.49E-04	8.01E-09
AT	1.05E-04	9.70E-09	4.20E+02	8.39E-10	5.02E-01	4.70E-01	1.43E-02	1.02E-02	6.00E+00	8.85E-09	1.60E+02	1.30E+02	1.60E-02	3.39E-04	2.34E-02	1.24E-04	1.98E+00	3.69E-01	7.94E-08	1.88E-03	1.12E+01	4.22E+01	2.28E-02	7.67E-06	3.77E+01	2.59E-12
AZ	1.83E-07	1.67E+01	5.18E-06	4.10E+01	1.21E-05	8.73E-07	3.23E-04	4.94E-04	2.80E-06	1.35E-05	6.48E-05	2.09E-05	3.09E-06	1.11E-05	4.01E-06	3.01E-05	8.53E-06	1.59E-06	1.94E+01	9.58E-05	1.24E-05	3.59E-05	2.15E-07	1.43E-09	2.13E-04	8.20E-07
BA	3.17E-02	3.36E-08	1.27E+00	6.16E-09	7.58E+02	1.90E-02	2.37E-01	1.39E-02	6.82E-03	4.30E-07	5.85E+00	8.52E-01	3.46E-03	5.44E-05	3.53E-03	3.97E-05	3.74E-02	1.57E-02	3.82E-07	8.77E-02	1.34E+02	1.77E+01	1.04E-03	5.18E-07	5.19E+00	8.39E-12
BE	8.34E-08	6.72E-10	2.16E-02	6.39E-10	3.13E-05	4.73E+02	4.94E-06	1.84E-03	1.80E-01	2.52E-11	1.88E-01	3.56E+01	4.41E-02	6.59E-05	4.08E-01	7.96E-05	7.69E+01	1.00E+01	1.41E-08	7.02E-07	2.01E-04	3.63E-03	2.39E-01	2.45E-05	1.93E-02	7.10E-13
BG	7.92E-03	3.43E-05	1.49E-01	2.29E-06	1.07E+00	5.80E-03	9.56E+02	4.32E-02	2.93E-03	4.98E-05	9.53E-01	2.39E-01	2.83E-03	9.28E-05	5.60E-04	1.41E-04	1.15E-02	6.22E-03	8.43E-04	2.51E+01	8.45E-01	2.13E+00	4.24E-04	3.44E-07	1.17E-01	2.32E-08
BY	7.61E-05	1.86E-05	4.77E-01	3.47E-05	1.30E-01	2.61E-01	8.21E-02	2.95E+03	3.26E-02	1.74E-06	2.20E+01	7.77E+00	8.89E-01	2.34E+00	1.65E-02	2.22E+00	2.55E-01	4.24E-01	1.47E-03	1.70E-02	3.40E-01	5.05E+00	3.12E-02	2.59E-05	5.81E-02	3.10E-08
CH	6.80E-06	5.01E-11	3.73E+00	6.24E-11	5.51E-04	9.52E-02	1.24E-06	5.95E-05	1.38E+02	7.71E-11	1.12E-01	4.40E+01	1.51E-04	5.28E-06	7.90E-02	1.80E-06	3.51E+01	1.85E-01	2.54E-10	6.31E-05	6.14E-03	6.57E-04	1.30E-02	1.44E-06	4.24E+01	4.62E-15
CY	1.93E-06	3.96E-07	1.66E-05	1.08E-08	8.04E-05	1.06E-06	1.69E-03	6.26E-05	4.49E-07	2.86E+01	1.54E-04	4.82E-05	3.12E-06	5.04E-07	7.01E-06	6.13E-07	4.85E-06	9.52E-07	8.70E-07	1.22E-02	6.93E-05	1.66E-04	6.88E-08	6.73E-10	5.78E-04	2.75E-15
CZ	8.71E-05	1.46E-08	4.94E+01	1.28E-09	6.43E-01	1.10E+00	3.29E-02	2.04E-01	1.13E+00	1.33E-09	4.94E+03	2.47E+02	1.98E-01	3.11E-03	8.47E-02	1.44E-03	3.30E+00	5.98E-01	3.22E-07	2.73E-03	4.20E+00	3.41E+01	3.11E-02	2.47E-05	1.04E+00	4.23E-11
DE	1.45E-05	7.88E-08	4.92E+01	3.58E-08	2.29E-02	9.42E+01	3.29E-03	4.58E-01	4.91E+01	2.06E-09	4.82E+02	6.78E+03	1.07E+01	2.23E-02	1.22E+00	4.04E-02	1.50E+02	2.62E+01	1.92E-06	4.09E-04	2.94E-01	1.90E+00	1.17E+00	2.86E-04	1.13E+01	8.37E-11
DK	1.14E-07	2.31E-08	8.26E-02	2.70E-08	2.61E-03	3.16E+00	8.02E-06	4.96E-02	4.75E-02	6.54E-11	3.46E+00	4.30E+01	3.01E+02	4.83E-02	8.32E-02	1.03E-01	1.94E+00	7.42E+00	4.21E-07	3.38E-06	1.17E-02	6.08E-02	5.56E-01	5.95E-04	1.50E-02	7.90E-12
EE	2.35E-06	1.14E-06	3.89E-02	1.10E-05	1.59E-03	8.89E-02	1.27E-03	3.44E+00	7.61E-03	3.76E-08	1.50E+00	1.90E+00	5.15E-01	3.38E+02	3.12E-03	2.69E+01	7.62E-02	2.07E-01	1.63E-04	3.40E-04	7.92E-03	8.87E-02	1.79E-02	1.84E-05	4.80E-03	9.24E-09
ES	3.86E-07	8.88E-11	1.46E-04	3.98E-11	2.75E-04	1.44E-02	8.07E-07	3.91E-07	2.14E-03	3.23E-11	1.69E-04	1.61E-02	5.81E-05	5.95E-07	3.79E+03	1.09E-05	2.89E+01	1.11E-01	1.60E-10	1.85E-05	8.47E-04	2.07E-05	5.64E-02	3.67E-05	2.61E-01	9.17E-16
FI	2.75E-06	1.92E-06	4.19E-02	3.67E-05	1.71E-03	2.47E-01	4.61E-03	1.77E+00	8.90E-03	9.25E-08	1.63E+00	2.81E+00	1.05E+00	2.91E+01	1.97E-02	2.86E+03	1.68E-01	6.76E-01	1.57E-04	1.14E-03	8.88E-03	1.15E-01	9.17E-02	3.73E-04	5.38E-03	6.91E-08
FR	5.93E-06	1.41E-09	3.12E-01	1.47E-09	1.87E-02	5.90E+01	1.30E-04	1.34E-03	3.25E+01	6.75E-10	7.55E-01	1.44E+02	5.42E-02	5.92E-05	7.32E+01	7.16E-05	3.68E+03	2.51E+01	1.55E-08	6.30E-05	1.41E-01	1.59E-02	1.13E+00	2.04E-04	2.96E+01	8.00E-13
GB	2.46E-08	4.21E-08	7.92E-03	1.75E-08	5.51E-05	5.53E+00	1.78E-06	1.83E-02	1.76E-02	7.41E-11	2.21E-01	4.69E+00	1.33E+00	1.10E-02	3.10E+00	2.60E-02	2.69E+01	2.87E+03	3.83E-07	6.03E-07	2.60E-04	1.68E-03	1.29E+02	7.21E-03	2.86E-03	1.69E-11
GE	3.49E-06	6.51E+00	2.60E-04	6.08E-01	4.72E-04	6.78E-05	2.68E-02	3.15E-02	4.25E-05	4.30E-05	4.26E-03	1.41E-03	1.78E-04	5.14E-04	3.90E-05	8.03E-04	1.56E-04	7.07E-05	3.82E+02	2.96E-03	5.13E-04	2.71E-03	2.60E-06	1.99E-08	2.22E-03	1.13E-09
GR	2.30E-01	8.61E-06	3.63E-02	3.81E-07	1.82E-01	2.04E-03	3.60E+01	9.51E-03	6.70E-04	1.02E-03	2.86E-01	7.36E-02	7.31E-04	1.86E-05	1.91E-03	2.41E-05	5.35E-03	2.32E-03	2.88E-04	1.16E+03	1.64E-01	4.51E-01	1.60E-04	1.71E-07	1.40E+00	5.77E-09
HR	1.10E-02	2.99E-08	6.55E+00	3.80E-09	1.20E+02	2.30E-02	1.28E-01	1.25E-02	1.59E-02	1.14E-07	1.07E+01	1.50E+00	4.27E-03	6.75E-05	5.78E-03	4.64E-05	6.07E-02	1.73E-02	3.05E-07	3.97E-02	9.75E+02	6.66E+01	1.07E-03	5.99E-07	1.38E+01	4.13E-12
HU	5.86E-03	3.06E-08	2.60E+01	4.52E-09	1.29E+01	6.81E-02	4.71E-01	3.32E-01	5.45E-02	4.64E-09	5.50E+01	4.97E+00	2.47E-02	8.03E-04	4.28E-03	4.15E-04	1.48E-01	5.70E-02	6.38E-07	1.10E-01	1.04E+02	1.57E+03	3.51E-03	2.90E-06	1.43E+00	3.22E-11
IE	7.76E-10	7.77E-09	5.77E-05	2.67E-09	9.25E-07	6.74E-02	2.77E-07	7.25E-04	1.84E-04	1.31E-11	9.58E-04	9.61E-02	8.06E-02	7.16E-04	4.27E-01	2.83E-03	1.11E+00	3.34E+01	6.48E-08	2.96E-08	1.30E-06	1.72E-05	1.19E+03	2.60E-03	4.10E-05	3.52E-12
IS	3.30E-08	9.60E-10	4.69E-03	4.18E-09	3.30E-04	1.16E-01	2.14E-06	2.79E-03	2.16E-03	7.90E-11	1.19E-01	5.06E-01	2.96E-01	5.99E-03	2.36E-02	3.71E-02	1.35E-01	1.17E+00	1.01E-07	1.73E-06	1.07E-03	2.67E-03	1.03E+00	4.17E+00	1.74E-03	7.66E-11
IT	6.82E-02	2.96E-08	1.53E+01	6.93E-09	5.90E+00	5.36E-02	7.24E-02	2.47E-03	8.66E+00	3.11E-06	1.86E+00	7.49E+00	5.38E-04	1.35E-05	7.95E-01	3.13E-05	1.62E+01	8.73E-02	5.11E-07	7.02E-01	1.97E+01	1.62E+00	6.58E-03	1.08E-06	4.37E+03	2.23E-12
KY	5.34E-08	9.81E-05	8.55E-08	9.99E-05	6.46E-07	4.09E-08	4.58E-05	1.36E-06	1.96E-07	1.34E-08	2.15E-07	4.33E-07	2.59E-08	1.02E-07	6.02E-07	5.13E-07	6.18E-07	9.31E-08	9.78E-05	1.94E-05	1.42E-07	2.11E-07	7.86E-08	5.00E-11	7.73E-06	9.01E+02
KZ	7.61E-06	1.07E-02	3.98E-04	3.27E-01	1.05E-03	2.81E-04	1.83E-02	1.81E-01	6.22E-05	7.14E-06	1.26E-02	6.66E-03	2.63E-03	1.38E-02	3.33E-04	7.14E-02	5.50E-04	2.35E-03	3.25E-02	6.97E-03	8.00E-04	6.36E-03	1.91E-03	1.31E-06	2.50E-03	2.21E+02
LI	3.01E-08	1.45E-13	8.56E-02	4.63E-13	2.34E-06	5.31E-04	9.16E-09	5.34E-07	4.54E-01	1.88E-13	1.23E-03	1.40E-01	3.85E-07	5.38E-08	1.54E-04	1.56E-08	1.50E-02	9.19E-04	7.64E-13	2.99E-07	3.41E-05	5.81E-06	6.52E-05	7.03E-09	1.25E-01	1.64E-17
LT	5.21E-06	8.08E-07	1.86E-01	2.48E-06	1.01E-02	2.86E-01	3.57E-03	8.74E+01	2.22E-02	1.64E-07	8.29E+00	6.55E+00	2.07E+00	1.68E+00	9.15E-03	1.73E+00	2.30E-01	5.90E-01	1.62E-04	1.21E-03	5.69E-02	6.75E-01	4.48E-02	2.11E-05	1.55E-02	3.86E-10
LU	1.11E-08	2.38E-11	6.50E-03	1.58E-11	4.42E-06	6.45E+00	3.48E-07	5.86E-05	6.34E-02	5.32E-12	4.64E-02	1.01E+01	1.12E-03	1.56E-06	3.16E-02	2.27E-06	9.62E+00	2.62E-01	5.91E-10	6.99E-08	3.30E-05	6.29E-04	1.06E-02	1.31E-06	5.76E-03	4.50E-14
LV	4.73E-06	2.70E-06	1.12E-01	7.75E-06	4.83E-03	2.32E-01	2.93E-03	3.03E+01	2.02E-02	1.27E-07	4.55E+00	5.22E+00	1.56E+00	3.29E+01	6.48E-03	6.58E+00	2.01E-01	4.80E-01	3.70E-04	9.93E-04	2.69E-02	2.97E-01	3.83E-02	2.50E-05	1.43E-02	5.06E-09
MC	2.53E-10	9.77E-14	3.13E-06	1.96E-14	1.05E-06	5.62E-07	1.15E-09	1.47E-09	7.40E-05	9.34E-14	5.80E-07	1.26E-05	3.34E-09	2.37E-11	3.25E-05	3.52E-10	4.22E-02	2.43E-06	2.68E-13	7.02E-10	1.31E-05	4.56E-07	2.06E-07	3.07E-11	3.93E-02	1.07E-18
MD	3.49E-05	2.64E-06	1.40E-02	1.44E-06	1.79E-02	1.39E-03	1.02E+00	4.64E-01	5.60E-04	6.37E-07	3.47E-01	6.97E-02	8.65E-03	1.88E-03	3.64E-04	2.15E-03	2.49E-03	2.07E-03	6.53E-05	2.98E-02	2.54E-02	3.23E-01	2.01E-04	1.70E-07	6.81E-03	4.13E-09
ME	3.65E-01	4.36E-08	3.38E-02	4.58E-09	7.97E+00	1.33E-03	3.41E-01	1.25E-03	4.05E-04	5.60E-07	1.85E-01	5.08E-02	2.79E-04	7.01E-06	9.49E-04	8.16E-06	3.44E-03	1.18E-03	4.56E-07	1.73E-01	1.14E+00	6.46E-01	8.02E-05	4.95E-08	1.81E+00	1.34E-11
MK	5.30E-01	3.54E-07	3.01E-02	1.32E-08	2.36E-01	1.57E-03	1.08E+01	8.39E-04	4.62E-04	8.98E-06	2.35E-01	5.85E-02	5.37E-04	5.32E-06	3.68E-04	1.01E-05	2.55E-03	1.66E-03	8.47E-06	1.66E+01	1.68E-01	4.84E-01	1.17E-04	9.83E-08	2.15E-01	3.71E-10
MT	3.87E-06	2.95E-11	8.90E-06	3.77E-12	7.68E-05	7.61E-07	1.37E-05	9.25E-08	1.65E-06	3.95E-10	1.29E-05	1.30E-05	1.22E-08	5.00E-10	4.85E-05	7.05E-10	9.70E-05	1.01E-06	1.72E-09	4.14E-04	1.25E-04	1.88E-05	9.60E-08	2.15E-11	3.92E-02	5.02E-19
NL	1.74E-08	2.45E-09	2.49E-02	1.01E-09	2.50E-05	1.44E+02	5.80E-06	7.76E-03	1.18E-01	1.03E-11	2.82E-01	8.40E+01	3.00E-01	7.12E-04	3.32E-01	9.47E-04	1.85E+01	1.61E+01	5.33E-08	3.92E-07	3.83E-04	4.57E-03	3.92E-01	5.66E-05	1.25E-02	2.10E-12
NO	7.75E-08	2.18E-07	3.71E-02	1.88E-06	2.02E-03	2.06E+00	1.42E-04	5.38E-02	1.90E-02	5.60E-09	1.38E+00	9.85E+00	1.13E+01	1.73E-01	2.13E-01	5.84E+00	1.67E+00	1.37E+01	4.51E-06	3.78E-05	7.28E-03	3.09E-02	1.68E+00	7.14E-03	5.41E-03	8.91E-08
PL	4.15E-04	1.36E-06	1.16E+01	7.27E-07	1.05E+00	3.24E+00	6.20E-02	7.51E+01	6.33E-01	1.78E-08	1.31E+03	2.51E+02	1.01E+01	3.09E-01	1.32E-01	3.81E-01	3.56E+00	3.73E+00	4.47E-05	9.69E-03	4.40E+00	5.74E+01	2.60E-01	1.20E-04	6.92E-01	1.38E-09
PT	5.60E-10	4.59E-13	1.35E-06	4.45E-13	6.45E-08	3.08E-04	2.48E-09	1.61E-07	8.04E-06	1.02E-12	1.16E-06	2.64E-04	2.69E-05	1.70E-06	6.12E+01	3.38E-05	1.72E-02	5.98E-03	7.16E-12	2.25E-08	2.47E-07	2.91E-08	3.66E-03	5.82E-06	8.61E-05	1.65E-16
RO	6.18E-03	1.23E-05	1.62E+00	2.89E-06	5.78E+00	4.16E-02	7.74E+01	7.63E-01	2.96E-02	1.09E-06	1.14E+01	2.24E+00	5.11E-02	3.20E-03	4.25E-03	4.66E-03	8.81E-02	3.86E-02	2.73E-04	7.88E-01	7.61E+00	1.09E+02	2.53E-03	2.87E-06	4.68E-01	1.54E-08
RS	2.92E-01	4.46E-07	8.38E-01	5.65E-08	5.38E+01	1.77E-02	2.72E+01	3.32E-02	8.25E-03	5.03E-06	5.55E+00	8.91E-01	7.20E-03	9.55E-05	1.50E-03	1.11E-04	3.33E-02	1.57E-02	8.74E-06	2.45E+00	3.76E+01	5.15E+01	1.03E-03	9.64E-07	7.79E-01	2.65E-10
RU	2.18E-04	2.32E-01	2.33E-01	1.02E+00	9.72E-02	3.52E-01	8.89E-01	2.72E+02	2.90E-02	2.79E-04	9.50E+00	7.27E+00	1.75E+00	5.64E+01	3.37E-02	1.46E+02	3.12E-01	8.42E-01	1.08E+01	1.60E-01	1.79E-01	1.53E+00	1.16E-01	3.27E-04	8.38E-02	2.27E-01
SE	2.42E-07	3.31E-07	1.32E-01	1.97E-06	1.71E-03	3.68E+00	3.76E-04	8.49E-01	9.43E-02	7.06E-09	5.00E+00	5.11E+01	8.81E+01	2.39E+00	1.52E-01	5.40E+01	2.46E+00	1.01E+01	8.80E-06	8.82E-05	9.26E-03	8.73E-02	8.34E-01	2.27E-03	3.69E-02	9.42E-10
SI	1.92E-04	4.21E-09	2.28E+01	5.24E-10	9.18E-01	8.57E-03	7.55E-03	1.31E-03	1.65E-02	7.18E-09	2.63E+00	1.08E+00	6.43E-04	1.67E-05	1.95E-03	1.91E-05	3.38E-02	7.32E-03	3.44E-08	1.56E-03	1.16E+02	7.04E+00	4.69E-04	1.75E-07	2.16E+01	2.84E-13
SK	1.11E-03	2.42E-08	1.25E+01	6.03E-09	1.45E+00	1.20E-01	8.78E-02	7.20E-01	7.87E-02	7.36E-10	3.25E+02	8.89E+00	1.27E-01	2.15E-03	1.02E-02	1.88E-03	2.64E-01	9.19E-02	7.14E-07	1.91E-02	4.40E+00	1.87E+02	5.50E-03	6.34E-06	4.43E-01	9.35E-11
TJ	4.03E-09	5.12E-05	3.10E-08	4.28E-05	5.05E-08	8.61E-09	1.79E-06	1.68E-07	8.51E-08	6.15E-09	3.80E-08	2.04E-07	4.52E-09	8.65E-09	8.46E-08	4.01E-08	2.37E-07	3.73E-08	2.78E-05	9.31E-07	5.46E-08	2.32E-08	8.32E-08	1.27E-11	2.96E-06	1.92E+01
TM	8.58E-08	1.09E-02	3.28E-06	1.77E-01	2.21E-06	1.98E-06	1.22E-04	9.33E-04	1.68E-06	9.15E-07	6.91E-05	3.17E-05	5.92E-06	3.77E-05	1.14E-06	1.63E-04	5.98E-06	5.24E-06	8.59E-03	1.43E-05	4.29E-06	2.42E-05	1.44E-06	5.59E-09	1.00E-04	1.73E-03
TR	3.64E-04	1.35E+01	2.05E-02	4.22E-02	7.18E-02	1.28E-03	2.15E+01	1.98E-01	7.13E-04	4.36E-01	1.89E-01	5.69E-02	4.59E-03	1.75E-03	1.08E-03	2.73E-03	3.17E-03	1.37E-03	6.53E+00	1.34E+01	7.86E-02	2.59E-01	1.13E-04	2.92E-07	5.48E-02	6.24E-09
UA	1.12E-03	2.25E-03	1.10E+00	5.97E-03	1.53E+00	1.50E-01	3.34E+00	1.46E+02	4.37E-02	1.16E-04	3.49E+01	6.59E+00	5.05E-01	2.89E-01	3.36E-02	4.39E-01	2.38E-01	1.88E-01	2.00E-01	2.71E-01	2.33E+00	5.16E+01	1.37E-02	1.52E-05	3.59E-01	7.76E-06
UZ	7.70E-08	2.17E-03	2.41E-06	1.94E-02	2.84E-06	5.75E-06	1.29E-04	2.70E-03	9.96E-07	3.28E-07	7.33E-05	9.03E-05	2.41E-05	2.42E-04	1.47E-06	1.18E-03	5.62E-06	3.41E-05	2.55E-03	3.00E-05	3.22E-06	1.93E-05	1.94E-05	2.93E-08	4.24E-05	9.74E+01

Table B5 *(continued)*

Code	KZ	LI	LT	LU	LV	MC	MD	ME	MK	MT	NL	NO	PL	PT	RO	RS	RU	SE	SI	SK	TJ	TM	TR	UA	UZ
AL	4.36E-06	9.00E-07	1.63E-04	9.92E-05	4.37E-05	1.20E-07	1.55E-02	3.74E+00	2.57E+01	2.80E-03	9.26E-04	1.23E-05	8.20E-02	1.11E-05	4.00E-01	9.48E+01	2.50E-03	5.27E-05	8.69E-03	8.86E-02	4.12E-12	2.10E-09	1.04E-01	1.84E-02	6.36E-10
AM	3.08E-03	5.62E-09	3.74E-05	2.70E-08	2.24E-05	8.52E-10	7.98E-04	3.08E-07	6.17E-05	3.86E-08	3.68E-07	2.29E-07	8.18E-04	1.84E-07	9.56E-04	1.27E-04	5.40E-02	4.36E-06	1.01E-05	3.32E-05	2.91E-10	2.20E-04	1.42E+01	8.01E-03	7.93E-06
AT	1.38E-07	7.01E-02	7.37E-03	8.23E-02	3.05E-03	4.95E-06	4.90E-04	1.24E-03	7.10E-03	1.81E-05	3.50E-01	1.09E-03	1.63E+01	1.34E-03	5.10E-01	1.52E+00	5.43E-03	1.70E-03	4.94E+01	3.53E+01	1.80E-13	3.85E-10	1.20E-04	2.97E-02	2.06E-10
AZ	4.49E-01	4.60E-09	6.77E-05	6.04E-08	3.99E-05	6.91E-10	7.65E-04	4.53E-07	5.08E-05	3.33E-08	9.09E-07	6.51E-07	1.06E-03	2.66E-07	1.13E-03	1.53E-04	1.90E+01	6.84E-06	9.31E-06	5.34E-05	1.12E-06	2.50E-02	1.65E+00	5.96E-02	1.03E-03
BA	1.82E-06	2.63E-05	2.73E-03	2.45E-03	4.79E-04	1.22E-06	2.53E-02	1.94E+00	1.33E-01	2.01E-03	1.78E-02	1.64E-04	5.24E+00	9.02E-05	2.46E+00	7.49E+01	2.05E-03	6.68E-04	1.17E+00	4.42E+00	1.58E-12	2.11E-09	2.11E-03	1.21E-01	7.82E-10
BE	7.95E-08	1.50E-04	1.87E-03	8.23E+00	4.47E-04	9.80E-07	4.74E-05	4.61E-07	3.50E-06	7.69E-08	3.53E+01	1.11E-03	3.45E-01	1.74E-02	3.03E-04	3.36E-04	2.25E-03	3.70E-03	2.47E-04	8.48E-03	1.44E-14	2.77E-11	1.63E-07	4.28E-03	8.16E-12
BG	1.92E-03	1.12E-05	1.99E-03	6.91E-04	6.83E-04	1.50E-07	6.45E+00	3.08E-02	8.47E+00	1.48E-04	5.71E-03	1.41E-04	1.26E+00	1.25E-05	1.41E+02	6.65E+01	3.62E-01	8.85E-04	7.88E-02	7.75E-01	7.30E-10	4.92E-07	2.48E+01	3.89E+00	1.49E-07
BY	1.17E-02	1.26E-04	1.23E+02	1.74E-02	3.89E+01	1.29E-07	4.05E+00	7.65E-04	7.59E-03	1.05E-05	3.51E-01	4.79E-02	8.37E+02	5.81E-03	5.82E+00	7.63E-01	8.85E+01	1.07E+00	1.18E-01	1.33E+01	5.45E-09	3.65E-06	8.50E-01	1.44E+03	1.58E-06
CH	9.87E-10	3.23E-01	2.08E-04	3.21E-02	8.54E-05	1.58E-05	5.77E-07	2.37E-05	1.09E-05	2.21E-06	2.04E-02	8.09E-05	2.15E-02	2.63E-03	2.93E-05	2.03E-04	1.43E-04	2.57E-05	9.99E-03	6.72E-04	8.79E-15	6.02E-11	4.95E-07	1.46E-05	3.59E-11
CY	7.55E-08	1.64E-09	1.70E-05	1.08E-07	4.59E-06	1.39E-10	1.09E-03	6.02E-06	1.40E-04	1.34E-05	1.40E-06	2.43E-07	1.26E-03	6.82E-08	4.94E-03	5.90E-04	2.23E-04	3.53E-06	8.49E-06	1.24E-04	2.90E-14	1.98E-10	4.11E+00	1.54E-03	6.11E-12
CZ	1.38E-06	4.98E-03	8.81E-02	2.48E-01	2.56E-02	7.33E-07	3.67E-03	1.60E-03	1.41E-02	2.26E-06	1.10E+00	9.96E-03	6.88E+02	4.09E-03	1.17E+00	2.96E+00	6.97E-02	3.29E-02	2.26E+00	1.50E+02	8.35E-13	3.37E-10	1.10E-04	4.70E-01	1.26E-10
DE	1.42E-05	1.66E-01	3.30E-01	2.41E+01	1.06E-01	6.51E-06	1.82E-02	1.11E-04	1.85E-03	1.34E-06	1.33E+02	1.47E-01	3.45E+02	6.63E-02	1.14E-01	1.39E-01	3.72E-01	6.11E-01	3.51E-01	3.45E+00	1.57E-12	1.41E-08	5.00E-05	4.44E-01	8.01E-09
DK	4.83E-06	1.20E-04	3.16E-01	9.01E-02	1.70E-01	1.02E-07	1.31E-03	1.08E-06	4.85E-06	9.11E-10	6.52E+00	1.03E+00	2.27E+01	8.38E-03	3.19E-03	2.09E-03	3.60E-01	4.03E+00	7.80E-03	2.53E-01	1.34E-12	2.63E-08	1.14E-05	6.02E-02	1.69E-08
EE	2.76E-04	2.72E-05	1.26E+01	4.06E-03	7.37E+01	3.08E-09	2.25E-02	2.20E-05	3.39E-04	3.42E-07	1.44E-01	5.29E-02	2.69E+01	4.67E-04	5.15E-02	1.22E-02	3.10E+01	2.51E+00	4.00E-03	3.09E-01	4.14E-10	2.24E-06	1.41E-02	9.19E-01	1.13E-06
ES	8.57E-11	1.21E-06	1.47E-06	1.59E-03	8.73E-07	7.18E-06	4.48E-08	1.12E-06	4.62E-06	1.09E-04	1.88E-03	8.72E-05	8.81E-05	8.71E+01	1.83E-06	6.00E-05	2.22E-06	1.21E-05	2.61E-04	5.80E-06	7.04E-16	1.64E-12	1.59E-06	8.00E-07	3.88E-13
FI	4.51E-04	2.95E-05	4.53E+00	7.51E-03	1.02E+01	1.21E-08	2.29E-02	2.66E-05	4.45E-04	2.87E-07	3.95E-01	1.51E+00	2.27E+01	1.02E-02	5.69E-02	1.25E-02	1.31E+02	2.93E+01	4.55E-03	3.35E-01	4.36E-09	3.06E-06	2.53E-02	6.73E-01	9.77E-07
FR	6.60E-08	4.56E-03	1.62E-03	1.49E+01	4.30E-04	2.35E-02	4.69E-05	5.63E-05	7.25E-05	2.09E-04	4.40E+00	2.44E-03	3.75E-01	8.04E-01	1.47E-03	6.77E-03	1.66E-03	3.59E-03	8.41E-02	1.87E-02	4.17E-14	2.32E-10	2.57E-06	3.26E-03	1.19E-10
GB	1.74E-06	3.24E-05	1.13E-01	7.73E-02	4.85E-02	7.10E-08	3.94E-05	2.21E-07	1.03E-06	2.67E-08	5.02E+00	2.69E-01	2.47E+00	4.52E-01	2.06E-04	1.13E-04	1.07E-01	2.62E-01	2.82E-04	6.37E-03	1.99E-12	6.87E-09	4.30E-06	6.02E-03	4.44E-09
GE	1.30E-02	7.92E-08	5.10E-03	4.10E-06	2.98E-03	6.58E-09	5.32E-02	1.67E-05	8.18E-04	4.57E-07	6.72E-05	2.52E-05	7.93E-02	2.40E-06	8.80E-02	9.29E-03	1.90E+01	5.26E-04	1.90E-04	3.71E-03	4.36E-10	1.44E-05	2.07E+01	8.31E-01	2.04E-06
GR	2.37E-04	2.34E-06	3.57E-04	2.30E-04	1.38E-04	1.28E-07	5.89E-01	1.45E-02	2.52E+01	1.06E-02	2.26E-03	3.92E-05	2.27E-01	9.73E-06	3.20E+00	1.13E+01	6.73E-02	1.72E-04	1.63E-02	1.76E-01	1.36E-10	5.72E-08	6.59E+01	5.72E-01	1.65E-08
HR	1.49E-06	7.12E-05	3.22E-03	3.18E-03	5.80E-04	3.13E-06	8.04E-03	5.44E-01	1.03E-01	1.00E-03	2.25E-02	1.83E-04	7.95E+00	1.46E-04	2.82E+00	4.85E+01	2.42E-03	7.60E-04	8.37E+01	6.66E+00	6.98E-13	1.11E-09	6.28E-04	1.11E-01	3.98E-10
HU	8.22E-06	2.20E-04	5.89E-02	9.61E-03	7.22E-03	9.59E-07	1.02E-01	7.47E-02	5.47E-01	2.21E-04	7.63E-02	1.18E-03	7.32E+01	1.79E-04	9.79E+01	1.00E+02	3.16E-02	6.23E-03	1.89E+01	3.23E+02	6.04E-12	1.43E-09	1.20E-03	7.08E+00	6.63E-10
IE	2.46E-07	3.41E-07	4.15E-03	1.20E-03	1.80E-03	1.95E-09	3.49E-06	1.05E-08	1.23E-07	9.41E-10	6.44E-02	2.06E-02	5.91E-02	6.37E-02	1.70E-05	3.39E-06	4.47E-03	2.31E-02	1.07E-06	7.27E-05	5.73E-13	3.01E-10	3.44E-07	3.55E-04	1.89E-10
IS	1.48E-06	5.73E-06	1.94E-02	3.33E-03	1.33E-02	4.62E-09	1.33E-05	2.22E-07	1.09E-06	7.83E-11	1.71E-01	4.68E-01	6.27E-01	5.11E-03	7.73E-05	1.53E-04	2.80E-02	1.25E-01	6.38E-04	1.35E-02	1.58E-11	1.35E-08	1.12E-05	1.79E-03	8.86E-09
IT	9.19E-07	1.82E-02	6.48E-04	1.11E-02	1.42E-04	7.99E-03	3.86E-03	2.90E-01	5.17E-01	2.85E-01	2.20E-02	1.21E-04	1.28E+00	3.01E-03	2.45E-01	3.27E+00	8.42E-04	1.11E-04	2.63E+01	7.89E-01	8.83E-13	1.59E-09	2.18E-02	2.34E-02	5.60E-10
KY	2.10E+02	2.91E-10	1.56E-07	1.88E-09	1.11E-07	6.28E-11	2.23E-06	7.51E-08	1.34E-05	1.45E-09	4.50E-08	5.40E-08	1.11E-06	6.87E-08	2.29E-05	2.38E-05	3.06E-03	4.28E-08	1.13E-07	2.68E-07	5.35E+01	9.99E-03	4.47E-04	2.28E-04	4.24E+01
KZ	1.52E+04	1.54E-07	2.80E-02	1.24E-05	2.24E-02	2.31E-08	8.55E-02	3.24E-05	1.21E-03	8.83E-07	4.58E-04	1.43E-03	3.05E-01	1.09E-04	1.08E-01	1.00E-02	3.28E+02	7.29E-03	2.82E-04	1.06E-02	7.75E+00	2.65E+00	4.22E-01	1.19E+01	5.98E+01
LI	5.27E-12	2.00E-02	1.72E-06	1.03E-04	7.86E-07	4.36E-08	3.71E-09	9.82E-08	4.87E-08	7.37E-09	1.26E-04	5.47E-07	1.95E-04	7.23E-06	2.70E-07	1.35E-06	1.14E-06	1.49E-07	6.53E-05	5.43E-06	6.00E-17	4.07E-13	2.06E-09	8.89E-08	2.46E-13
LT	4.17E-04	8.50E-05	8.33E+02	1.35E-02	5.30E+01	8.82E-09	1.09E-01	6.33E-05	8.40E-04	5.69E-07	4.64E-01	3.95E-02	3.45E+02	2.22E-03	2.66E-01	6.65E-02	5.40E+01	1.83E+00	2.80E-02	2.49E+00	2.67E-11	2.88E-07	5.28E-02	8.66E+00	9.27E-08
LU	2.61E-09	4.80E-05	5.84E-05	1.43E+01	1.21E-05	1.57E-07	1.71E-06	6.36E-08	2.14E-07	1.13E-08	2.74E-01	3.26E-05	2.33E-02	1.21E-03	2.54E-05	4.17E-05	6.72E-05	9.17E-05	5.64E-05	9.56E-04	1.37E-15	4.73E-12	2.39E-08	1.29E-04	2.78E-12
LV	5.44E-04	7.58E-05	1.31E+02	1.11E-02	8.36E+02	6.97E-09	6.18E-02	4.43E-05	6.28E-04	7.68E-07	3.68E-01	5.69E-02	1.07E+02	8.08E-04	1.43E-01	3.47E-02	2.31E+01	3.33E+00	1.32E-02	1.03E+00	2.48E-10	1.92E-06	4.48E-02	3.72E+00	1.03E-06
MC	3.11E-13	4.38E-08	7.77E-10	1.38E-07	1.54E-10	2.68E-04	4.30E-10	2.16E-09	9.47E-10	6.35E-09	1.44E-07	1.08E-09	3.68E-07	2.34E-07	2.97E-08	2.16E-07	6.79E-10	6.76E-10	1.08E-05	1.49E-07	2.21E-18	1.42E-14	2.66E-10	5.59E-09	8.69E-15
MD	1.70E-03	2.03E-06	6.72E-02	1.26E-04	1.63E-02	3.08E-08	8.60E+02	2.01E-04	5.87E-03	2.87E-06	2.19E-03	5.42E-04	5.95E+00	2.23E-05	1.22E+02	1.37E-01	3.22E-01	7.85E-03	5.69E-03	4.65E-01	1.32E-09	3.06E-07	1.27E+00	4.69E+01	1.22E-07
ME	1.37E-06	1.38E-06	2.41E-04	1.59E-04	5.63E-05	1.73E-07	7.32E-03	1.66E+01	7.35E-01	1.04E-03	1.40E-03	1.41E-05	1.57E-01	1.42E-05	3.49E-01	3.96E+01	7.12E-04	6.91E-05	1.71E-02	1.68E-01	1.32E-12	9.93E-10	5.16E-03	1.49E-02	3.06E-10
MK	7.38E-06	1.69E-06	1.52E-04	1.75E-04	4.89E-05	5.24E-08	3.64E-02	3.54E-02	2.43E+02	3.82E-04	1.68E-03	3.12E-05	1.47E-01	3.76E-06	8.54E-01	9.08E+01	3.07E-03	1.32E-04	1.22E-02	1.58E-01	7.92E-12	1.08E-09	1.35E-01	2.72E-02	3.46E-10
MT	8.34E-11	5.76E-09	1.45E-08	6.81E-08	3.97E-09	3.32E-09	5.10E-07	1.24E-05	5.60E-05	1.25E-01	5.85E-07	1.25E-09	1.24E-05	1.50E-07	1.20E-05	2.32E-04	8.73E-08	2.82E-09	2.97E-05	7.08E-06	7.20E-18	2.75E-13	2.44E-05	1.31E-06	3.15E-14
NL	3.25E-07	2.02E-04	9.96E-03	8.02E-01	3.38E-03	4.32E-07	1.85E-04	1.73E-07	3.48E-06	1.60E-08	3.80E+02	4.89E-03	1.04E+00	2.37E-02	5.97E-04	3.74E-04	1.03E-02	2.47E-02	5.21E-04	1.43E-02	4.06E-14	5.13E-11	2.21E-07	1.31E-02	1.50E-11
NO	1.29E-04	4.85E-05	2.92E-01	5.17E-02	2.63E-01	8.01E-08	4.57E-04	9.70E-07	1.08E-05	7.33E-09	3.17E+00	3.98E+02	8.90E+00	7.81E-02	1.93E-03	1.35E-03	4.95E+00	1.70E+01	4.35E-03	1.53E-01	1.55E-08	2.00E-07	7.79E-04	2.82E-02	9.69E-08
PL	6.45E-04	2.54E-03	2.60E+01	2.64E-01	2.94E+00	7.74E-07	1.31E+00	5.24E-03	5.24E-02	8.50E-06	4.92E+00	2.89E-01	2.67E+04	1.22E-02	1.61E+01	5.83E+00	7.20E+01	4.59E+00	2.02E+00	4.86E+02	9.95E-11	6.55E-08	9.29E-03	6.82E+01	1.46E-08
PT	6.09E-11	1.10E-08	7.94E-07	1.26E-05	1.62E-06	1.13E-09	2.27E-09	2.02E-09	6.46E-09	9.63E-08	1.06E-04	1.31E-04	7.41E-06	1.24E+03	1.51E-08	3.58E-08	3.67E-06	1.24E-05	2.43E-07	6.00E-08	1.63E-17	1.52E-14	4.66E-09	1.19E-07	2.26E-15
RO	5.30E-03	1.12E-04	1.04E-01	5.10E-03	2.59E-02	8.07E-07	1.23E+02	5.43E-02	1.18E+00	2.02E-04	4.70E-02	3.11E-03	4.06E+01	2.00E-04	4.59E+03	1.37E+02	6.43E-01	2.75E-02	8.19E-01	2.26E+01	1.13E-09	6.19E-07	4.41E+00	5.48E+01	2.41E-07
RS	7.99E-05	3.10E-05	5.37E-03	2.16E-03	9.04E-04	5.95E-07	1.85E-01	3.34E+00	6.73E+01	6.41E-04	2.03E-02	4.03E-04	6.91E+00	4.68E-05	6.55E+01	2.35E+03	1.21E-02	1.81E-03	4.91E-01	7.32E+00	1.58E-11	1.33E-08	5.41E-02	3.24E-01	3.79E-09
RU	1.04E+03	1.05E-04	4.76E+01	1.63E-02	7.58E+01	3.44E-07	5.98E+00	1.40E-03	2.88E-02	3.08E-05	5.51E-01	1.01E+00	3.63E+02	1.70E-02	7.05E+00	6.05E-01	4.36E+04	4.98E+00	5.48E-02	3.59E+00	2.29E-02	7.88E-02	2.18E+01	1.29E+03	7.92E-02
SE	1.22E-04	2.61E-04	4.29E+00	1.29E-01	4.16E+00	1.00E-07	5.90E-03	2.70E-06	4.70E-05	2.03E-08	6.62E+00	2.40E+01	7.48E+01	3.31E-02	1.37E-02	2.77E-03	5.88E+00	1.01E+03	7.56E-03	4.70E-01	1.66E-10	6.70E-07	1.59E-03	4.46E-01	3.95E-07
SI	8.19E-08	7.94E-05	5.53E-04	1.33E-03	1.32E-04	2.01E-06	4.63E-04	1.84E-03	6.14E-03	5.45E-05	6.97E-03	4.05E-05	1.49E+00	5.47E-05	2.79E-01	1.09E+00	4.61E-04	1.14E-04	3.43E+02	9.55E-01	7.06E-14	1.57E-10	4.44E-05	1.10E-02	5.66E-11
SK	8.85E-06	3.13E-04	1.55E-01	1.73E-02	1.96E-02	5.37E-07	1.02E-01	1.36E-02	1.08E-01	1.66E-05	1.49E-01	6.67E-03	7.34E+02	5.47E-04	1.38E+01	8.48E+00	9.38E-02	3.98E-02	1.61E+00	1.54E+03	7.39E-12	1.93E-09	4.84E-04	8.15E+00	7.48E-10
TJ	3.76E+00	1.42E-10	2.10E-08	8.02E-10	1.30E-08	4.46E-11	1.18E-07	5.14E-09	9.91E-07	1.53E-10	1.03E-08	9.60E-09	1.49E-07	2.82E-08	7.15E-07	1.44E-06	6.96E-04	5.53E-09	5.42E-08	1.70E-08	6.76E+02	2.86E-01	7.26E-05	2.87E-05	2.32E+01
TM	5.35E+00	2.78E-09	1.04E-04	1.29E-07	6.46E-05	2.52E-10	3.46E-04	7.81E-08	2.96E-05	8.31E-10	2.12E-06	2.81E-06	9.73E-04	1.93E-07	4.63E-04	5.31E-05	7.45E-01	1.41E-05	4.58E-06	4.58E-05	3.11E+00	2.24E+02	1.29E-02	1.17E-01	4.43E+01
TR	6.97E-03	2.52E-06	3.25E-02	1.39E-04	1.11E-02	7.54E-08	5.25E+00	1.17E-03	6.46E-02	8.13E-04	1.54E-03	3.08E-04	2.07E+00	1.84E-05	1.63E+01	1.03E+00	3.17E+00	5.06E-03	1.01E-02	1.75E-01	2.44E-10	5.24E-05	1.01E+04	9.33E+00	2.48E-06
UA	4.58E-01	1.62E-04	6.10E+00	1.47E-02	1.80E+00	1.08E-06	2.93E+02	1.26E-02	1.17E-01	5.37E-05	1.94E-01	4.28E-02	8.88E+02	3.59E-03	2.58E+02	8.73E+00	3.67E+02	5.79E-01	4.74E-01	8.76E+01	7.12E-07	5.18E-04	2.74E+01	1.66E+04	1.33E-04
UZ	2.38E+02	1.76E-09	4.05E-04	1.25E-07	3.39E-04	1.26E-10	8.40E-04	1.52E-07	1.94E-05	1.61E-09	8.66E-06	1.82E-05	2.35E-03	7.06E-07	8.56E-04	5.61E-05	1.06E+00	8.32E-05	2.73E-06	5.25E-05	9.51E+01	5.41E+01	5.01E-03	3.56E-01	4.77E+02

Table B6. *Source-receptor matrix of B(b)F deposition to EMEP countries in 2022. Columns and rows are sources and receptors, receptively.*

Code	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KY
AL	7.05E+00	1.45E-04	1.63E-01	3.46E-05	1.86E+00	1.45E-02	2.89E+00	9.50E-02	1.06E-02	6.07E-04	6.00E-01	5.21E-01	3.80E-03	5.62E-04	8.32E-02	8.31E-04	1.37E-01	2.43E-02	1.29E-03	1.54E+01	9.58E-01	1.85E+00	3.30E-03	3.45E-06	8.60E+00	2.66E-06
AM	2.11E-05	1.22E+02	6.64E-04	1.90E+00	1.81E-03	9.06E-05	1.45E-02	2.83E-02	1.74E-04	3.72E-03	4.12E-03	3.11E-03	2.00E-04	4.42E-04	2.53E-04	8.09E-04	6.59E-04	2.05E-04	3.17E+01	6.16E-03	1.67E-03	4.49E-03	3.27E-05	2.33E-07	1.05E-02	3.20E-05
AT	2.89E-03	5.01E-05	4.62E+02	1.10E-05	3.75E+00	1.92E+00	2.21E-01	4.84E-01	1.09E+01	2.53E-05	1.69E+02	3.12E+02	8.62E-02	2.53E-02	3.50E-01	1.59E-02	9.27E+00	2.47E+00	2.81E-04	8.03E-02	2.81E+01	6.30E+01	2.95E-01	1.55E-04	8.88E+01	7.09E-07
AZ	3.46E-05	2.12E+01	1.39E-03	6.09E+01	3.07E-03	3.06E-04	2.55E-02	8.11E-02	2.78E-04	3.47E-03	1.08E-02	9.30E-03	6.26E-04	1.27E-03	3.86E-04	2.70E-03	1.24E-03	6.75E-04	4.04E+01	1.21E-02	2.78E-03	9.34E-03	9.64E-05	5.24E-07	1.39E-02	7.73E-04
BA	1.49E-01	7.35E-05	4.98E+00	2.71E-05	1.01E+03	1.94E-01	1.68E+00	8.09E-01	1.17E-01	8.65E-05	1.80E+01	8.03E+00	3.58E-02	7.94E-03	1.72E-01	6.40E-03	6.87E-01	2.62E-01	4.67E-04	9.09E-01	1.60E+02	4.54E+01	3.17E-02	3.30E-05	2.78E+01	1.10E-06
BE	1.90E-05	7.39E-06	2.37E-01	2.00E-06	9.12E-03	4.42E+02	1.57E-03	1.09E-01	7.29E-01	5.61E-07	1.39E+00	8.02E+01	2.21E-01	2.94E-03	1.84E+00	3.93E-03	1.12E+02	2.42E+01	5.07E-05	2.79E-04	1.77E-02	1.41E-01	1.25E+00	4.25E-04	4.75E-01	2.75E-07
BG	6.69E-02	5.25E-03	1.32E+00	9.66E-04	6.70E+00	9.55E-02	9.19E+02	2.23E+00	6.74E-02	6.96E-03	5.58E+00	4.04E+00	5.41E-02	9.83E-03	4.19E-02	1.49E-02	3.21E-01	1.61E-01	5.13E-02	4.29E+01	4.61E+00	1.20E+01	2.16E-02	2.03E-05	2.72E+00	2.15E-04
BY	2.81E-03	2.84E-03	4.68E+00	3.98E-03	2.77E+00	2.46E+00	1.45E+00	6.07E+03	5.48E-01	2.12E-03	6.63E+01	6.57E+01	4.00E+00	6.87E+00	3.35E-01	7.10E+00	3.92E+00	4.74E+00	6.57E-02	4.68E-01	4.67E+00	2.86E+01	5.71E-01	4.87E-04	3.05E+00	1.42E-04
CH	3.20E-04	1.26E-06	4.81E+00	4.64E-07	3.01E-02	4.99E-01	7.46E-04	2.19E-02	1.36E+02	7.88E-07	8.87E-01	9.16E+01	8.61E-03	1.52E-03	6.60E-01	5.18E-04	5.38E+01	9.95E-01	5.18E-06	4.95E-03	1.50E-01	4.51E-02	1.55E-01	3.46E-05	8.52E+01	9.11E-09
CY	1.85E-04	1.76E-04	2.54E-03	2.54E-05	1.00E-02	3.42E-04	4.25E-02	8.27E-03	2.24E-04	7.90E+01	1.14E-02	1.15E-02	4.07E-04	5.58E-05	1.32E-03	1.12E-04	2.59E-03	5.97E-04	5.08E-04	1.82E-01	8.48E-03	1.32E-02	8.73E-05	2.45E-07	4.87E-02	1.42E-08
CZ	2.77E-03	6.55E-05	7.52E+01	1.21E-05	4.97E+00	3.82E+00	5.03E-01	2.97E+00	4.06E+00	8.24E-06	3.13E+03	5.36E+02	7.47E-01	7.47E-02	5.91E-01	6.12E-02	1.45E+01	3.52E+00	5.53E-04	9.57E-02	1.55E+01	7.64E+01	3.60E-01	3.25E-04	8.74E+00	2.84E-06
DE	1.04E-03	2.57E-04	7.63E+01	9.08E-05	5.02E-01	1.70E+02	1.58E-01	7.02E+00	7.54E+01	1.93E-05	4.82E+02	9.72E+03	1.86E+01	2.61E-01	7.54E+00	3.78E-01	3.18E+02	8.78E+01	1.93E-03	4.45E-02	2.22E+00	1.14E+01	7.31E+00	3.10E-03	4.25E+01	7.50E-06
DK	1.83E-05	3.29E-05	5.74E-01	2.08E-05	3.65E-02	8.03E+00	1.79E-03	8.63E-01	2.83E-01	4.84E-07	9.72E+00	9.44E+01	2.84E+02	1.98E-01	6.36E-01	4.37E-01	7.90E+00	2.06E+01	2.36E-04	1.01E-03	1.16E-01	6.43E-01	2.46E+00	4.15E-03	2.81E-01	7.85E-07
EE	2.03E-04	3.15E-04	5.66E-01	6.85E-04	1.28E-01	8.09E-01	5.57E-02	2.30E+01	1.21E-01	6.01E-05	7.98E+00	1.63E+01	2.34E+00	2.84E+02	8.13E-02	3.58E+01	1.09E+00	1.90E+00	7.11E-03	1.59E-02	2.62E-01	1.37E+00	2.44E-01	3.27E-04	2.09E-01	7.71E-06
ES	7.64E-04	3.05E-05	2.54E-02	6.03E-06	1.18E-01	2.67E-01	1.03E-02	1.64E-03	8.04E-02	1.42E-06	3.34E-02	9.15E-01	1.07E-02	1.08E-04	3.76E+03	4.14E-04	5.53E+01	1.70E+00	6.91E-05	5.81E-02	1.54E-01	2.35E-02	6.82E-01	3.64E-04	5.26E+00	3.54E-09
FI	4.57E-04	8.70E-04	9.69E-01	3.10E-03	2.42E-01	2.59E+00	1.46E-01	2.36E+01	2.18E-01	1.37E-04	1.34E+01	3.32E+01	5.52E+00	5.23E+01	3.55E-01	2.47E+03	3.00E+00	6.68E+00	1.45E-02	3.81E-02	4.69E-01	2.59E+00	9.00E-01	4.30E-03	3.91E-01	1.35E-04
FR	1.40E-03	6.65E-05	2.52E+00	1.61E-05	7.76E-01	1.04E+02	2.41E-02	2.10E-01	4.55E+01	1.09E-05	8.16E+00	3.74E+02	7.19E-01	7.67E-03	1.53E+02	9.25E-03	4.32E+03	7.44E+01	2.39E-04	3.99E-02	1.88E+00	7.28E-01	6.71E+00	1.94E-03	9.59E+01	5.06E-07
GB	3.96E-05	9.22E-05	1.91E-01	3.15E-05	1.83E-02	1.63E+01	1.70E-03	8.13E-01	3.03E-01	1.43E-06	2.26E+00	3.30E+01	3.87E+00	1.54E-01	1.11E+01	3.20E-01	6.90E+01	3.33E+03	4.56E-04	1.30E-03	2.35E-02	1.17E-01	2.77E+02	4.09E-02	2.38E-01	3.05E-06
GE	2.53E-04	1.12E+01	2.30E-02	1.06E+00	4.67E-02	5.49E-03	4.61E-01	1.16E+00	2.94E-03	8.34E-03	1.60E-01	1.43E-01	7.71E-03	1.52E-02	3.43E-03	2.73E-02	1.59E-02	8.82E-03	5.33E+02	1.17E-01	4.58E-02	1.59E-01	1.06E-03	4.96E-06	9.49E-02	1.23E-05
GR	4.71E-01	2.80E-03	5.34E-01	3.71E-04	1.99E+00	5.57E-02	5.89E+01	8.75E-01	3.53E-02	3.80E-02	2.26E+00	1.94E+00	2.38E-02	4.80E-03	1.58E-01	7.26E-03	3.36E-01	1.01E-01	3.40E-02	1.35E+03	1.67E+00	4.04E+00	1.42E-02	1.49E-05	9.26E+00	8.56E-05
HR	5.94E-02	7.28E-05	1.62E+01	2.12E-05	1.90E+02	2.10E-01	9.42E-01	6.60E-01	1.97E-01	4.83E-05	2.74E+01	1.17E+01	3.86E-02	9.36E-03	2.72E-01	7.53E-03	9.73E-01	2.68E-01	5.05E-04	5.10E-01	8.64E+02	9.87E+01	3.13E-02	3.47E-05	6.24E+01	1.23E-06
HU	4.92E-02	7.00E-05	4.53E+01	1.38E-05	4.52E+01	3.97E-01	3.26E+00	4.19E+00	4.03E-01	1.13E-05	9.10E+01	2.62E+01	1.30E-01	3.94E-02	1.24E-01	3.01E-02	1.33E+00	5.15E-01	7.44E-04	1.41E+00	1.37E+02	1.52E+03	6.14E-02	6.90E-05	1.52E+01	2.19E-06
IE	6.06E-06	2.25E-05	5.62E-03	6.94E-06	1.73E-03	5.75E-01	2.11E-04	7.61E-02	6.91E-03	3.34E-07	6.07E-02	1.52E+00	3.53E-01	1.98E-02	3.08E+00	4.65E-02	5.72E+00	5.80E+01	1.02E-04	5.52E-04	1.58E-03	4.50E-03	1.89E+03	1.50E-02	4.40E-02	5.70E-07
IS	9.48E-06	5.18E-06	9.12E-02	9.43E-06	1.44E-02	6.79E-01	7.94E-04	8.83E-02	3.96E-02	7.98E-07	8.58E-01	3.98E+00	7.23E-01	4.98E-02	4.14E-01	1.92E-01	1.29E+00	3.98E+00	6.64E-05	9.26E-04	2.99E-02	6.28E-02	3.04E+00	1.43E+01	9.32E-02	2.30E-06
IT	2.69E-01	1.85E-04	2.61E+01	6.84E-05	3.25E+01	4.28E-01	1.37E+00	4.08E-01	1.41E+01	8.39E-04	1.25E+01	3.87E+01	2.37E-02	5.31E-03	6.67E+00	4.02E-03	3.73E+01	9.16E-01	7.54E-04	3.96E+00	6.03E+01	1.20E+01	1.40E-01	4.95E-05	5.44E+03	8.23E-07
KY	9.92E-06	1.99E-02	7.28E-05	1.34E-02	3.02E-04	1.52E-05	3.32E-03	1.97E-03	8.47E-05	5.00E-05	2.87E-04	3.30E-04	1.81E-05	6.12E-05	2.03E-04	1.85E-04	3.33E-04	4.13E-05	2.74E-02	3.50E-03	1.60E-04	3.41E-04	9.92E-06	9.28E-08	3.63E-03	1.39E+03
KZ	1.03E-03	7.09E-01	7.18E-02	2.11E+00	1.22E-01	4.41E-02	7.98E-01	6.85E+00	1.14E-02	4.46E-03	8.24E-01	8.79E-01	8.61E-02	2.29E-01	2.45E-02	7.64E-01	8.67E-02	1.26E-01	1.68E+00	3.68E-01	1.23E-01	5.82E-01	2.19E-02	5.34E-05	3.03E-01	4.21E+02
LI	1.67E-06	3.90E-09	9.83E-02	3.54E-09	1.61E-04	2.15E-03	4.21E-06	1.81E-04	5.07E-01	2.07E-09	7.85E-03	4.23E-01	1.58E-05	1.31E-05	1.98E-03	4.17E-06	5.42E-02	4.83E-03	1.80E-08	2.73E-05	9.47E-04	3.30E-04	7.49E-04	1.76E-07	3.61E-01	4.80E-11
LT	4.13E-04	3.64E-04	1.65E+00	3.35E-04	3.99E-01	1.82E+00	1.29E-01	2.40E+02	2.58E-01	2.33E-04	2.52E+01	3.91E+01	6.37E+00	3.90E+00	1.56E-01	4.24E+00	2.39E+00	4.11E+00	1.03E-02	4.26E-02	9.63E-01	4.96E+00	5.01E-01	3.10E-04	6.00E-01	6.41E-06
LU	2.77E-06	3.54E-07	5.29E-02	1.02E-07	1.34E-03	8.33E+00	1.28E-04	5.24E-03	2.05E-01	8.97E-08	2.73E-01	1.91E+01	8.11E-03	1.38E-04	1.71E-01	1.83E-04	1.41E+01	8.46E-01	2.89E-06	3.26E-05	2.97E-03	2.25E-02	6.92E-02	2.32E-05	9.57E-02	1.72E-08
LV	3.69E-04	5.55E-04	1.29E+00	6.90E-04	2.85E-01	1.67E+00	1.04E-01	1.10E+02	2.59E-01	1.61E-04	1.85E+01	3.53E+01	5.71E+00	3.58E+01	1.45E-01	1.27E+01	2.34E+00	3.69E+00	1.45E-02	3.38E-02	6.63E-01	3.34E+00	4.85E-01	4.19E-04	5.10E-01	8.76E-06
MC	6.59E-08	2.66E-09	5.03E-05	6.65E-10	6.21E-05	7.16E-06	8.99E-07	1.49E-06	2.39E-04	9.10E-10	3.54E-05	1.93E-04	9.23E-07	4.62E-08	3.04E-04	1.97E-08	4.39E-02	2.47E-05	7.81E-09	6.01E-07	2.53E-04	4.10E-05	3.90E-06	1.26E-09	6.14E-02	3.69E-12
MD	1.27E-03	4.00E-04	1.78E-01	2.32E-04	4.35E-01	2.59E-02	3.42E+00	5.92E+00	1.67E-02	3.67E-04	1.82E+00	1.08E+00	6.70E-02	3.01E-02	7.90E-03	3.31E-02	8.16E-02	5.81E-02	3.98E-03	3.81E-01	4.01E-01	2.21E+00	9.10E-03	6.09E-06	4.17E-01	1.87E-05
ME	7.17E-01	3.58E-05	2.39E-01	1.17E-05	1.65E+01	1.97E-02	1.48E+00	1.07E-01	1.19E-02	8.06E-05	9.03E-01	7.03E-01	4.30E-03	7.51E-04	5.00E-02	8.06E-04	9.64E-02	2.92E-02	2.30E-04	1.09E+00	2.60E+00	2.96E+00	3.79E-03	4.03E-06	7.22E+00	6.27E-07
MK	8.91E-01	1.67E-04	2.41E-01	2.68E-05	1.38E+00	2.14E-02	1.54E+01	1.19E-01	1.21E-02	1.28E-03	1.02E+00	8.04E-01	8.59E-03	6.99E-04	1.97E-02	1.08E-03	7.45E-02	3.57E-02	1.84E-03	2.82E+01	8.46E-01	2.56E+00	4.89E-03	5.69E-06	1.53E+00	7.36E-06
MT	8.18E-05	1.70E-07	3.49E-04	1.62E-08	2.42E-03	3.36E-05	8.67E-04	1.72E-04	8.12E-05	5.89E-07	7.25E-04	7.05E-04	2.26E-06	6.78E-07	1.91E-03	6.76E-07	2.63E-03	1.17E-04	1.88E-06	4.85E-03	2.50E-03	1.34E-03	2.54E-05	1.23E-08	1.16E-01	1.00E-11
NL	9.28E-06	1.30E-05	2.09E-01	3.53E-06	5.49E-03	1.55E+02	1.23E-03	2.16E-01	5.09E-01	2.31E-07	1.61E+00	1.46E+02	7.96E-01	1.15E-02	1.44E+00	1.49E-02	3.77E+01	3.48E+01	8.64E-05	2.43E-04	1.84E-02	1.21E-01	1.76E+00	5.79E-04	3.22E-01	4.49E-07
NO	2.14E-05	1.83E-04	6.76E-01	4.79E-04	8.02E-02	9.01E+00	6.80E-03	2.18E+00	3.19E-01	1.05E-05	8.94E+00	5.67E+01	2.67E+01	1.17E+00	1.61E+00	1.13E+01	1.21E+01	4.82E+01	1.54E-03	3.14E-03	2.05E-01	7.45E-01	8.28E+00	5.61E-02	4.87E-01	1.05E-04
PL	1.03E-02	9.52E-04	3.70E+01	4.41E-04	1.07E+01	1.46E+01	1.44E+00	2.33E+02	3.93E+00	7.18E-05	1.23E+03	7.18E+02	2.43E+01	1.79E+00	1.48E+00	2.17E+00	2.48E+01	2.11E+01	1.10E-02	3.57E-01	2.36E+01	1.43E+02	2.43E+00	1.30E-03	1.26E+01	2.83E-05
PT	1.52E-05	6.26E-07	8.95E-04	1.25E-07	1.34E-03	1.29E-02	1.58E-04	1.30E-04	2.89E-03	5.83E-08	8.91E-04	4.43E-02	6.18E-04	8.65E-05	9.44E+01	5.98E-04	3.53E-01	1.23E-01	1.57E-06	6.97E-04	1.78E-03	2.98E-04	6.64E-02	6.34E-05	5.92E-02	2.48E-10
RO	7.13E-02	2.56E-03	9.08E+00	6.95E-04	3.14E+01	4.57E-01	1.11E+02	1.46E+01	4.38E-01	6.57E-04	3.80E+01	2.32E+01	4.10E-01	8.64E-02	1.39E-01	1.08E-01	1.62E+00	7.03E-01	2.34E-02	7.55E+00	2.87E+01	2.09E+02	8.35E-02	7.92E-05	1.10E+01	1.03E-04
RS	6.55E-01	3.05E-04	4.04E+00	7.76E-05	1.08E+02	1.94E-01	4.55E+01	1.40E+00	1.25E-01	9.55E-04	1.73E+01	9.03E+00	7.94E-02	1.05E-02	8.55E-02	1.02E-02	5.99E-01	2.69E-01	2.73E-03	9.89E+00	5.24E+01	9.92E+01	3.40E-02	5.13E-05	8.57E+00	9.53E-06
RU	1.15E-02	2.46E+00	5.55E+00	3.99E+00	4.34E+00	5.19E+00	1.62E+01	1.20E+03	9.03E-01	6.31E-02	6.75E+01	9.96E+01	1.21E+01	1.07E+02	9.20E-01	2.61E+02	7.87E+00	1.22E+01	4.02E+01	5.24E+00	5.98E+00	2.87E+01	1.68E+00	6.66E-03	6.41E+00	7.58E+00
SE	8.42E-05	4.08E-04	1.19E+00	7.14E-04	8.86E-02	1.61E+01	2.33E-02	1.61E+01	8.37E-01	1.72E-05	1.72E+01	1.92E+02	1.36E+02	8.52E+00	1.72E+00	9.71E+01	1.76E+01	4.37E+01	4.20E-03	7.44E-03	2.07E-01	1.16E+00	5.66E+00	1.83E-02	9.26E-01	2.01E-05
SI	3.38E-03	1.90E-05	3.05E+01	5.57E-06	4.42E+00	6.31E-02	1.14E-01	1.02E-01	1.32E-01	1.32E-05	8.49E+00	6.48E+00	7.89E-03	2.85E-03	1.06E-01	2.58E-03	4.46E-01	8.59E-02	1.19E-04	6.34E-02	1.33E+02	1.47E+01	1.04E-02	7.42E-06	5.16E+01	2.77E-07
SK	1.36E-02	5.67E-05	2.39E+01	1.18E-05	9.99E+00	6.11E-01	1.09E+00	6.64E+00	5.62E-01	3.44E-06	3.02E+02	4.14E+01	4.96E-01	5.16E-02	1.34E-01	5.11E-02	2.09E+00	7.95E-01	6.19E-04	3.50E-01	1.65E+01	2.53E+02	8.70E-02	9.84E-05	7.41E+00	2.45E-06
TJ	1.53E-06	8.97E-03	2.91E-05	6.54E-03	6.60E-05	5.46E-06	3.95E-04	3.98E-04	4.28E-05	1.93E-05	9.40E-05	1.35E-04	3.84E-06	7.66E-06	5.86E-05	1.90E-05	1.37E-04	1.12E-05	9.36E-03	3.05E-04	6.02E-05	1.26E-04	2.57E-06	2.72E-08	1.52E-03	2.93E+01
TM	1.60E-05	3.56E-01	1.59E-03	1.17E+00	2.09E-03	7.28E-04	2.14E-02	1.44E-01	4.23E-04	1.12E-03	1.46E-02	1.47E-02	1.00E-03	2.55E-03	6.08E-04	6.28E-03	2.36E-03	1.59E-03	5.05E-01	4.23E-03	2.58E-03	1.06E-02	1.97E-04	5.18E-07	1.44E-02	1.80E-01
TR	1.38E-02	2.26E+01	6.89E-01	2.56E-01	2.08E+00	8.10E-02	4.98E+01	7.15E+00	5.58E-02	4.43E+00	3.86E+00	3.18E+00	1.73E-01	5.43E-02	1.28E-01	9.90E-02	3.48E-01	1.52E-01	1.60E+01	2.95E+01	1.91E+00	5.20E+00	2.29E-02	4.29E-05	3.08E+00	6.77E-05
UA	2.34E-02	8.93E-02	9.00E+00	9.60E-02	1.53E+01	1.69E+00	2.19E+01	5.71E+02	8.05E-01	2.29E-02	9.94E+01	6.41E+01	2.63E+00	1.77E+00	4.71E-01	2.58E+00	4.38E+00	3.03E+00	2.00E+00	5.42E+00	1.68E+01	1.39E+02	3.87E-01	3.70E-04	1.16E+01	3.13E-03
UZ	1.52E-05	1.54E-01	1.67E-03	2.63E-01	2.37E-03	1.59E-03	2.01E-02	2.39E-01	4.05E-04	6.19E-04	1.93E-02	2.46E-02	2.31E-03	7.51E-03	6.55E-04	2.18E-02	2.75E-03	4.84E-03	2.32E-01	4.50E-03	2.69E-03	1.19E-02	6.93E-04	1.41E-06	1.04E-02	1.52E+02

Table B6 *(continued)*

Code	KZ	LI	LT	LU	LV	MC	MD	ME	MK	MT	NL	NO	PL	PT	RO	RS	RU	SE	SI	SK	TJ	TM	TR	UA	UZ
AL	1.23E-02	2.99E-05	1.00E-02	3.09E-03	3.08E-03	5.77E-06	3.33E-01	6.52E+00	3.52E+01	3.75E-02	1.16E-02	1.07E-03	1.34E+00	1.97E-03	3.06E+00	1.24E+02	1.73E-01	2.29E-03	1.13E-01	7.90E-01	6.93E-07	2.26E-05	1.88E+00	1.22E+00	1.00E-05
AM	2.60E-01	3.99E-07	3.08E-03	1.26E-05	1.70E-03	8.41E-08	5.48E-02	9.13E-05	2.30E-03	1.36E-05	9.37E-05	7.60E-05	7.13E-02	1.50E-05	7.45E-02	1.20E-02	6.92E-01	5.05E-04	5.61E-04	4.87E-03	2.41E-06	1.12E-02	3.39E+01	5.74E-01	3.27E-03
AT	2.87E-03	9.38E-02	1.89E-01	5.39E-01	9.80E-02	9.57E-05	6.47E-02	2.94E-02	1.15E-01	7.73E-04	1.17E+00	1.91E-02	7.36E+01	3.57E-02	3.93E+00	8.82E+00	1.65E-01	3.30E-02	6.95E+01	5.87E+01	1.04E-07	6.34E-06	4.52E-02	1.53E+00	2.55E-06
AZ	7.43E+00	6.79E-07	7.98E-03	4.21E-05	4.14E-03	9.75E-08	7.90E-02	1.40E-04	3.61E-03	2.20E-05	3.05E-04	2.45E-04	1.51E-01	2.86E-05	1.20E-01	2.20E-02	3.53E+01	2.20E-03	8.81E-04	1.04E-02	4.60E-04	3.51E-01	1.16E+01	2.57E+00	8.19E-02
BA	9.35E-03	3.95E-04	1.42E-01	4.12E-02	3.79E-02	3.66E-05	5.45E-01	4.70E+00	9.58E-01	3.05E-02	1.42E-01	7.56E-03	3.98E+01	1.01E-02	1.41E+01	1.34E+02	1.86E-01	1.54E-02	3.71E+00	1.90E+01	5.31E-07	2.68E-05	2.11E-01	4.67E+00	1.14E-05
BE	8.66E-04	8.82E-04	3.99E-02	1.75E+01	1.19E-02	2.01E-05	4.38E-03	2.17E-04	1.12E-03	2.17E-05	3.79E+01	2.01E-02	4.85E+00	1.43E-01	4.22E-02	4.41E-02	4.94E-02	4.57E-02	1.38E-02	2.26E-01	1.88E-08	4.62E-07	8.42E-04	3.86E-01	2.10E-07
BG	7.21E-01	2.16E-04	1.22E-01	1.82E-02	4.56E-02	8.47E-06	2.65E+01	2.88E-01	1.55E+01	8.22E-03	8.55E-02	1.09E-02	1.60E+01	1.94E-03	2.58E+02	1.40E+02	7.21E+00	2.72E-02	8.11E-01	6.37E+00	2.23E-05	9.73E-04	5.79E+01	6.55E+01	4.00E-04
BY	1.74E+00	1.89E-03	2.18E+02	3.16E-01	6.07E+01	1.19E-05	2.49E+01	2.99E-02	2.10E-01	4.52E-04	2.36E+00	6.82E-01	1.84E+03	1.02E-01	4.15E+01	9.60E+00	2.73E+02	4.58E+00	1.94E+00	5.08E+01	5.35E-05	2.35E-03	1.19E+01	3.06E+03	9.87E-04
CH	3.75E-05	3.17E-01	2.85E-02	2.81E-01	1.33E-02	1.77E-04	1.19E-03	1.25E-03	1.02E-03	1.49E-04	1.29E-01	1.33E-03	1.01E+00	4.75E-02	1.11E-02	3.11E-02	1.42E-02	2.57E-03	1.60E-01	4.99E-02	2.87E-09	3.20E-07	1.07E-03	1.89E-02	1.59E-07
CY	6.67E-04	6.66E-07	1.01E-03	5.48E-05	3.05E-04	1.05E-07	3.70E-02	7.68E-04	8.54E-03	6.23E-04	3.10E-04	8.77E-05	7.54E-02	2.18E-05	1.33E-01	4.09E-02	3.50E-02	3.21E-04	2.03E-03	9.96E-03	2.72E-08	3.43E-06	1.77E+01	1.92E-01	1.18E-06
CZ	1.12E-02	1.56E-02	9.06E-01	1.32E+00	3.25E-01	2.57E-05	1.25E-01	3.53E-02	2.00E-01	2.21E-04	2.96E+00	1.17E-01	9.83E+02	5.87E-02	8.05E+00	1.60E+01	8.61E-01	2.48E-01	8.06E+00	2.00E+02	2.16E-07	7.08E-06	4.26E-02	7.80E+00	2.46E-06
DE	3.66E-02	2.36E-01	2.70E+00	6.00E+01	1.00E+00	1.48E-04	3.64E-01	8.39E-03	9.28E-02	2.34E-04	1.74E+02	1.23E+00	7.18E+02	7.34E-01	2.78E+00	2.53E+00	3.09E+00	2.12E+00	2.29E+00	1.89E+01	5.63E-07	4.70E-05	4.22E-02	1.33E+01	1.75E-05
DK	6.43E-03	6.67E-04	1.12E+00	4.61E-01	5.47E-01	5.27E-06	3.07E-02	1.35E-04	8.37E-04	1.09E-06	1.15E+01	4.37E+00	7.40E+01	7.23E-02	1.09E-01	5.48E-02	1.46E+00	6.19E+00	8.05E-02	1.81E+00	1.20E-07	5.34E-05	4.37E-03	1.26E+00	2.33E-05
EE	1.35E-01	3.98E-04	3.11E+01	7.56E-02	9.90E+01	6.96E-07	4.86E-01	2.28E-03	2.07E-02	1.71E-05	9.02E-01	7.06E-01	1.18E+02	9.76E-03	1.29E+00	5.12E-01	6.36E+01	7.38E+00	1.20E-01	2.89E+00	3.02E-06	1.36E-03	3.02E-01	1.37E+01	5.61E-04
ES	7.96E-05	8.83E-05	8.88E-04	4.36E-02	4.00E-04	1.20E-04	3.34E-03	3.75E-03	1.57E-02	1.32E-02	6.39E-02	7.05E-03	8.06E-02	1.53E+02	2.03E-02	1.04E-01	1.84E-03	3.80E-03	5.06E-02	1.30E-02	1.02E-09	3.29E-07	2.08E-02	1.18E-02	6.58E-08
FI	3.27E-01	6.96E-04	2.09E+01	1.86E-01	3.01E+01	3.27E-06	7.99E-01	4.54E-03	4.03E-02	4.59E-05	2.91E+00	8.88E+00	1.65E+02	9.32E-02	2.25E+00	9.83E-01	3.30E+02	6.61E+01	2.11E-01	4.96E+00	2.90E-05	3.09E-03	6.69E-01	1.96E+01	1.21E-03
FR	2.17E-03	1.80E-02	1.16E-01	3.85E+01	4.12E-02	3.46E-02	2.03E-02	1.21E-02	2.41E-02	1.10E-02	1.50E+01	1.34E-01	1.29E+01	5.22E+00	2.65E-01	6.40E-01	1.11E-01	1.61E-01	1.04E+00	8.79E-01	5.62E-08	3.94E-06	1.14E-02	8.97E-01	1.55E-06
GB	5.83E-03	5.97E-04	9.36E-01	8.36E-01	4.74E-01	8.63E-06	5.65E-03	3.49E-04	1.03E-03	3.27E-05	1.28E+01	1.77E+00	1.81E+01	1.76E+00	4.48E-02	4.25E-02	1.11E+00	1.14E+00	1.81E-02	2.66E-01	2.59E-07	3.01E-05	3.91E-03	6.41E-01	1.35E-05
GE	6.84E-01	7.82E-06	1.18E-01	6.81E-04	6.51E-02	5.11E-07	1.33E+00	1.60E-03	3.61E-02	7.57E-05	4.80E-03	2.97E-03	2.26E+00	3.86E-04	2.10E+00	3.79E-01	4.53E+01	1.94E-02	1.41E-02	1.58E-01	4.31E-06	3.21E-03	5.71E+01	1.94E+01	1.05E-03
GR	2.41E-01	1.00E-04	4.39E-02	1.06E-02	2.02E-02	1.07E-05	5.75E+00	1.58E-01	4.34E+01	1.10E-01	4.87E-02	5.42E-03	4.59E+00	3.00E-03	2.26E+01	4.00E+01	3.18E+00	1.07E-02	3.30E-01	2.08E+00	6.99E-06	2.44E-04	1.69E+02	2.28E+01	1.09E-04
HR	7.54E-03	7.38E-04	1.43E-01	4.69E-02	4.16E-02	7.56E-05	2.50E-01	1.32E+00	6.92E-01	1.83E-02	1.57E-01	7.35E-03	5.04E+01	1.32E-02	1.29E+01	8.98E+01	1.68E-01	1.74E-02	9.20E+01	2.36E+01	3.47E-07	1.94E-05	1.19E-01	3.59E+00	7.75E-06
HU	2.50E-02	1.49E-03	7.20E-01	9.24E-02	1.74E-01	3.51E-05	1.24E+00	5.52E-01	2.72E+00	7.55E-03	3.49E-01	2.43E-02	2.35E+02	8.17E-03	1.46E+02	1.94E+02	6.97E-01	6.23E-02	3.03E+01	4.59E+02	3.56E-07	1.22E-05	1.31E-01	3.55E+01	5.98E-06
IE	1.10E-03	1.41E-05	9.01E-02	3.35E-02	4.54E-02	1.89E-06	6.98E-04	4.23E-05	1.60E-04	8.06E-06	4.60E-01	1.34E-01	8.99E-01	4.43E-01	4.01E-03	2.41E-03	1.38E-01	1.44E-01	5.80E-04	1.01E-02	2.31E-08	1.69E-06	5.41E-04	7.16E-02	6.88E-07
IS	2.13E-03	1.02E-04	1.34E-01	5.00E-02	9.50E-02	9.56E-07	1.72E-03	5.87E-05	3.41E-04	8.97E-07	6.09E-01	2.12E+00	4.86E+00	9.77E-02	1.02E-02	9.51E-03	2.83E-01	4.18E-01	1.93E-02	1.99E-01	5.79E-07	5.57E-05	5.66E-03	1.15E-01	2.60E-05
IT	1.09E-02	3.60E-02	9.21E-02	1.47E-01	2.98E-02	1.39E-02	3.57E-01	1.60E+00	2.89E+00	9.10E-01	1.81E-01	6.01E-03	2.29E+01	1.08E-01	5.78E+00	2.34E+01	2.14E-01	1.12E-02	4.95E+01	7.97E+00	8.43E-07	4.90E-05	1.24E+00	2.70E+00	1.89E-05
KY	2.16E+02	1.56E-07	1.78E-04	1.72E-06	9.89E-05	4.65E-08	1.44E-03	2.71E-05	1.14E-03	5.01E-06	1.31E-05	1.58E-05	3.54E-03	1.90E-05	3.82E-03	2.45E-03	2.50E-01	3.51E-05	8.44E-05	3.99E-04	6.81E+01	5.87E-01	8.41E-02	6.14E-02	1.32E+02
KZ	2.96E+04	3.31E-05	6.92E-01	3.98E-03	4.36E-01	2.88E-06	2.55E+00	4.50E-03	9.13E-02	3.88E-04	4.64E-02	5.11E-02	1.21E+01	4.30E-03	4.82E+00	8.00E-01	1.04E+03	1.78E-01	4.40E-02	7.32E-01	2.95E+01	3.53E+01	1.39E+01	2.02E+02	2.41E+02
LI	1.50E-07	1.88E-02	1.96E-04	8.54E-04	9.71E-05	6.28E-07	7.05E-06	6.28E-06	5.23E-06	5.41E-07	5.26E-04	6.31E-06	7.99E-03	1.64E-04	6.65E-05	1.87E-04	9.89E-05	1.07E-05	1.09E-03	3.66E-04	1.69E-11	3.42E-09	4.76E-06	1.28E-04	1.92E-09
LT	1.93E-01	8.78E-04	8.61E+02	1.78E-01	6.71E+01	1.63E-06	1.35E+00	4.95E-03	3.91E-02	3.76E-05	2.04E+00	5.01E-01	7.40E+02	3.30E-02	3.50E+00	1.49E+00	9.12E+01	5.21E+00	4.62E-01	1.10E+01	1.77E-06	4.25E-04	9.47E-01	5.53E+01	1.68E-04
LU	5.17E-05	2.13E-04	2.28E-03	2.38E+01	7.03E-04	3.04E-06	2.50E-04	2.91E-05	7.41E-05	4.10E-06	6.07E-01	7.40E-04	3.95E-01	1.38E-02	4.27E-03	5.37E-03	2.19E-03	1.86E-03	2.75E-03	2.63E-02	1.51E-09	5.33E-08	1.04E-04	1.99E-02	2.47E-08
LV	2.33E-01	8.63E-04	2.00E+02	1.64E-01	7.43E+02	1.34E-06	9.91E-01	4.16E-03	3.56E-02	3.53E-05	1.82E+00	7.46E-01	3.47E+02	1.55E-02	2.67E+00	1.12E+00	6.02E+01	8.97E+00	3.12E-01	6.97E+00	3.61E-06	1.27E-03	7.26E-01	3.53E+01	5.25E-04
MC	3.03E-08	2.26E-07	8.59E-07	2.36E-06	3.83E-07	3.23E-04	9.08E-07	5.63E-07	8.05E-07	4.13E-07	2.31E-06	1.44E-07	7.75E-05	4.59E-06	1.56E-05	4.89E-05	9.30E-07	1.84E-07	1.65E-04	2.05E-05	2.60E-12	2.29E-10	6.97E-07	9.29E-06	1.03E-10
MD	2.44E-01	5.26E-05	5.01E-01	4.68E-03	1.59E-01	2.27E-06	8.35E+02	8.37E-03	1.16E-01	3.04E-04	2.85E-02	1.19E-02	2.91E+01	5.87E-04	1.64E+02	1.71E+00	4.23E+00	5.69E-02	1.17E-01	3.04E+00	2.19E-05	4.60E-04	6.25E+00	1.92E+02	3.07E-04
ME	3.85E-03	3.64E-05	1.44E-02	4.07E-03	4.04E-03	5.22E-06	1.84E-01	3.10E+01	2.07E+00	1.86E-02	1.56E-02	1.05E-03	2.18E+00	2.49E-03	2.72E+00	6.20E+01	5.47E-02	2.30E-03	1.41E-01	1.27E+00	2.63E-07	1.01E-05	2.16E-01	8.54E-01	4.36E-06
MK	1.76E-02	3.78E-05	1.08E-02	4.05E-03	3.51E-03	2.45E-06	5.63E-01	1.84E-01	2.50E+02	7.87E-03	1.86E-02	2.17E-03	1.78E+00	5.84E-04	5.06E+00	1.23E+02	2.10E-01	3.93E-03	1.32E-01	1.18E+00	6.72E-07	1.64E-05	2.64E+00	1.82E+00	8.44E-06
MT	1.51E-06	2.26E-07	1.43E-05	5.29E-06	4.43E-06	8.85E-08	1.13E-04	3.29E-04	1.37E-03	2.15E-01	1.97E-05	7.14E-07	2.23E-03	3.89E-05	1.83E-03	6.54E-03	7.74E-05	1.36E-06	7.27E-04	8.24E-04	8.47E-12	7.06E-09	1.52E-03	1.08E-03	2.90E-09
NL	1.40E-03	8.97E-04	1.04E-01	2.40E+00	3.78E-02	1.07E-05	8.79E-03	1.06E-04	8.48E-04	1.48E-05	3.03E+02	6.74E-02	7.57E+00	1.64E-01	4.52E-02	2.93E-02	1.27E-01	1.31E-01	1.78E-02	2.51E-01	3.40E-08	6.23E-07	6.69E-04	5.38E-01	2.87E-07
NO	6.00E-02	7.59E-04	2.96E+00	5.29E-01	2.10E+00	9.55E-06	3.82E-02	2.04E-04	1.75E-03	1.18E-05	1.01E+01	9.70E+02	7.49E+01	3.64E-01	1.33E-01	6.98E-02	1.56E+01	3.62E+01	1.36E-01	2.35E+00	2.18E-05	4.34E-04	5.14E-02	2.06E+00	2.12E-04
PL	3.14E-01	1.36E-02	5.62E+01	2.17E+00	1.03E+01	4.22E-05	7.63E+00	1.19E-01	7.55E-01	7.53E-04	1.56E+01	2.47E+00	2.84E+04	1.93E-01	5.99E+01	3.65E+01	1.07E+02	1.26E+01	1.10E+01	5.95E+02	3.59E-06	1.83E-04	7.05E-01	2.93E+02	6.68E-05
PT	6.29E-06	4.77E-06	8.98E-05	1.37E-03	1.17E-04	8.07E-07	4.49E-05	7.66E-05	2.88E-04	1.59E-04	4.01E-03	1.71E-03	2.45E-03	1.32E+03	2.67E-04	1.40E-03	4.53E-04	3.09E-04	6.93E-04	2.68E-04	1.74E-11	7.95E-09	4.57E-04	3.62E-04	1.75E-09
RO	1.10E+00	1.48E-03	1.44E+00	9.09E-02	4.41E-01	3.97E-05	1.89E+02	6.09E-01	6.88E+00	9.00E-03	4.03E-01	8.24E-02	1.91E+02	1.19E-02	4.67E+03	2.89E+02	1.05E+01	2.59E-01	5.43E+00	8.22E+01	2.72E-05	1.08E-03	2.01E+01	2.86E+02	6.25E-04
RS	8.43E-02	4.16E-04	1.91E-01	3.83E-02	5.06E-02	2.02E-05	2.64E+00	7.88E+00	8.46E+01	1.68E-02	1.83E-01	1.88E-02	4.58E+01	5.13E-03	1.19E+02	2.47E+03	6.30E-01	3.66E-02	2.49E+00	3.03E+01	1.69E-06	6.69E-05	2.06E+00	1.06E+01	2.84E-05
RU	6.72E+03	2.92E-03	1.42E+02	5.10E-01	1.55E+02	3.55E-05	7.20E+01	8.04E-02	1.08E+00	4.13E-03	5.43E+00	7.70E+00	1.27E+03	2.42E-01	1.21E+02	1.91E+01	5.99E+04	2.84E+01	2.30E+00	4.36E+01	9.53E-01	4.43E+00	2.70E+02	5.73E+03	4.45E+00
SE	1.78E-01	2.17E-03	1.88E+01	1.14E+00	1.46E+01	1.16E-05	2.05E-01	8.06E-04	8.30E-03	9.97E-06	1.97E+01	9.61E+01	2.83E+02	2.35E-01	5.73E-01	1.98E-01	3.91E+01	1.09E+03	1.32E-01	3.77E+00	8.20E-06	1.46E-03	1.16E-01	1.16E+01	6.30E-04
SI	1.22E-03	5.32E-04	3.24E-02	1.61E-02	1.19E-02	4.30E-05	3.56E-02	3.19E-02	7.71E-02	1.99E-03	4.38E-02	1.58E-03	1.21E+01	3.92E-03	2.11E+00	5.77E+00	3.59E-02	4.81E-03	3.11E+02	4.56E+00	6.73E-08	4.51E-06	2.33E-02	5.35E-01	1.65E-06
SK	2.19E-02	2.05E-03	1.28E+00	1.48E-01	2.62E-01	2.12E-05	8.03E-01	1.55E-01	7.87E-01	1.09E-03	5.63E-01	8.65E-02	1.06E+03	1.27E-02	4.00E+01	3.55E+01	1.04E+00	2.31E-01	6.30E+00	1.50E+03	2.93E-07	9.84E-06	6.74E-02	3.47E+01	3.75E-06
TJ	2.91E+01	8.00E-08	3.93E-05	7.31E-07	1.83E-05	2.19E-08	3.71E-04	4.69E-06	1.79E-04	4.88E-07	4.06E-06	3.23E-06	1.15E-03	3.95E-06	8.51E-04	4.09E-04	7.09E-02	5.56E-06	3.45E-05	1.43E-04	6.44E+02	3.73E+00	3.34E-02	1.19E-02	6.35E+01
TM	6.91E+01	1.03E-06	1.31E-02	8.89E-05	6.37E-03	7.89E-08	5.67E-02	6.12E-05	2.58E-03	3.49E-06	6.20E-04	4.30E-04	1.90E-01	8.47E-05	9.61E-02	1.85E-02	1.12E+01	1.72E-03	1.18E-03	1.33E-02	1.62E+01	4.82E+02	1.27E+00	4.35E+00	1.35E+02
TR	1.20E+00	1.70E-04	7.35E-01	1.38E-02	2.56E-01	1.05E-05	3.61E+01	6.30E-02	1.20E+00	3.69E-02	7.94E-02	3.69E-02	3.70E+01	6.32E-03	9.84E+01	1.39E+01	4.63E+01	1.54E-01	4.17E-01	3.90E+00	1.60E-05	7.59E-03	1.44E+04	1.99E+02	2.46E-03
UA	1.67E+01	2.73E-03	2.53E+01	2.95E-01	8.14E+00	5.40E-05	5.01E+02	2.33E-01	1.67E+00	4.60E-03	1.55E+00	6.57E-01	2.00E+03	7.14E-02	5.50E+02	5.70E+01	8.50E+02	3.06E+00	4.87E+00	1.90E+02	1.02E-03	7.06E-02	2.02E+02	2.76E+04	2.82E-02
UZ	1.06E+03	1.07E-06	2.27E-02	1.16E-04	1.38E-02	7.89E-08	9.29E-02	7.02E-05	1.91E-03	4.74E-06	1.63E-03	1.25E-03	3.29E-01	9.73E-05	1.29E-01	1.63E-02	1.38E+01	4.63E-03	1.10E-03	1.68E-02	1.24E+02	1.66E+02	7.25E-01	8.28E+00	1.01E+03

Table B7. *Source-receptor matrix of B(k)F deposition to EMEP countries in 2022. Columns and rows are sources and receptors, receptively.*

Code	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KY
AL	0.00E+00	2.92E-05	5.24E-02	1.24E-05	5.03E-01	5.19E-03	9.03E-01	1.98E-02	3.40E-03	7.57E-05	3.55E-01	2.07E-01	2.15E-03	3.33E-04	2.95E-03	6.71E-04	2.48E-02	8.78E-03	3.04E-04	4.96E+00	2.50E-01	6.05E-01	8.88E-04	4.02E-06	2.07E+00	7.05E-07
AM	0.00E+00	5.31E+01	1.42E-04	5.71E-01	3.25E-04	2.23E-05	3.29E-03	6.66E-03	3.91E-05	4.29E-04	1.82E-03	9.36E-04	9.08E-05	2.67E-04	1.39E-05	5.85E-04	1.33E-04	5.26E-05	1.02E+01	1.05E-03	3.60E-04	1.16E-03	8.18E-06	2.14E-07	1.79E-03	1.13E-05
AT	0.00E+00	7.83E-06	2.17E+02	3.21E-06	1.00E+00	6.50E-01	6.52E-02	8.73E-02	5.94E+00	4.15E-07	9.80E+01	1.28E+02	3.86E-02	7.86E-03	3.99E-02	5.43E-03	4.15E+00	9.16E-01	5.53E-05	1.02E-02	9.06E+00	2.27E+01	7.92E-02	1.27E-04	3.06E+01	2.17E-07
AZ	0.00E+00	8.66E+00	3.69E-04	3.82E+01	6.61E-04	7.43E-05	6.68E-03	1.41E-02	7.41E-05	4.36E-04	5.31E-03	2.87E-03	2.45E-04	5.34E-04	2.82E-05	1.22E-03	2.97E-04	1.74E-04	1.74E+01	2.40E-03	6.54E-04	2.69E-03	2.28E-05	4.65E-07	2.17E-03	3.23E-04
BA	0.00E+00	1.23E-05	1.58E+00	1.06E-05	4.37E+02	6.85E-02	4.13E-01	1.79E-01	4.34E-02	8.20E-06	9.37E+00	2.98E+00	1.80E-02	2.40E-03	7.02E-03	2.26E-03	2.33E-01	9.90E-02	1.01E-04	1.29E-01	6.10E+01	1.47E+01	9.21E-03	2.95E-05	6.72E+00	2.72E-07
BE	0.00E+00	1.64E-06	6.71E-02	5.82E-07	1.49E-03	2.38E+02	3.20E-04	2.14E-02	3.17E-01	6.46E-09	6.96E-01	3.44E+01	7.85E-02	1.00E-03	3.64E-01	1.64E-03	6.67E+01	1.00E+01	1.50E-05	1.54E-05	3.43E-03	4.42E-02	3.75E-01	2.11E-04	8.30E-02	1.35E-07
BG	0.00E+00	1.12E-03	4.36E-01	3.79E-04	1.97E+00	3.21E-02	4.27E+02	4.41E-01	2.83E-02	5.46E-04	3.13E+00	1.54E+00	2.76E-02	4.35E-03	2.14E-03	8.60E-03	1.21E-01	5.57E-02	1.49E-02	1.48E+01	1.48E+00	3.75E+00	5.57E-03	2.19E-05	5.16E-01	8.13E-05
BY	0.00E+00	4.79E-04	1.37E+00	1.25E-03	7.16E-01	7.04E-01	3.51E-01	1.85E+03	2.07E-01	9.58E-05	3.38E+01	2.22E+01	1.81E+00	3.32E+00	4.62E-02	4.02E+00	1.43E+00	1.59E+00	1.70E-02	1.12E-01	1.31E+00	8.83E+00	1.55E-01	4.43E-04	6.28E-01	4.10E-05
CH	0.00E+00	1.49E-07	2.06E+00	1.02E-07	3.64E-03	1.35E-01	4.92E-05	1.28E-03	9.61E+01	1.10E-08	3.40E-01	3.85E+01	9.36E-04	3.14E-04	9.21E-02	1.26E-04	3.12E+01	3.82E-01	6.96E-07	2.29E-04	2.34E-02	6.55E-03	4.06E-02	2.36E-05	3.24E+01	4.50E-09
CY	0.00E+00	2.30E-05	4.64E-04	5.72E-06	1.25E-03	5.16E-05	9.29E-03	1.76E-03	3.96E-05	3.33E+01	4.02E-03	2.46E-03	1.55E-04	2.90E-05	3.76E-05	6.34E-05	2.56E-04	8.69E-05	1.03E-04	2.33E-02	1.18E-03	2.87E-03	9.53E-06	2.32E-07	3.49E-03	1.13E-09
CZ	0.00E+00	1.27E-05	3.04E+01	3.85E-06	1.54E+00	1.26E+00	1.63E-01	6.37E-01	1.92E+00	1.29E-07	2.22E+03	2.25E+02	3.40E-01	2.92E-02	1.10E-01	2.60E-02	6.69E+00	1.26E+00	1.44E-04	1.90E-02	5.37E+00	2.70E+01	9.74E-02	2.81E-04	2.36E+00	1.26E-06
DE	0.00E+00	5.44E-05	3.12E+01	2.38E-05	1.21E-01	6.39E+01	3.61E-02	1.49E+00	4.35E+01	2.47E-07	2.89E+02	4.93E+03	9.87E+00	1.00E-01	1.36E+00	1.82E-01	1.66E+02	3.39E+01	5.52E-04	3.97E-03	6.62E-01	3.43E+00	2.16E+00	2.19E-03	1.39E+01	3.73E-06
DK	0.00E+00	7.69E-06	1.90E-01	9.95E-06	1.15E-02	2.76E+00	2.79E-04	2.12E-01	1.20E-01	1.72E-08	5.32E+00	4.14E+01	1.98E+02	1.16E-01	1.04E-01	2.77E-01	3.28E+00	8.42E+00	7.76E-05	5.45E-05	4.00E-02	2.05E-01	7.76E-01	1.76E-03	6.25E-02	6.10E-07
EE	0.00E+00	5.45E-05	1.61E-01	4.61E-04	3.23E-02	2.13E-01	1.47E-02	5.45E+00	4.47E-02	3.58E-06	3.87E+00	5.26E+00	9.95E-01	2.34E+02	1.11E-02	2.42E+01	3.71E-01	6.04E-01	2.14E-03	3.96E-03	7.09E-02	4.01E-01	6.30E-02	2.55E-04	4.94E-02	2.70E-06
ES	0.00E+00	5.21E-07	2.42E-03	2.02E-07	3.16E-03	4.79E-02	7.95E-05	7.79E-05	1.21E-02	8.89E-09	4.45E-03	1.54E-01	4.41E-04	1.45E-05	1.73E+03	8.05E-05	2.37E+01	2.44E-01	1.52E-06	4.15E-04	5.13E-03	4.82E-04	9.40E-02	1.63E-04	4.09E-01	4.70E-10
FI	0.00E+00	1.77E-04	2.68E-01	2.26E-03	6.33E-02	6.97E-01	4.38E-02	5.35E+00	7.99E-02	1.30E-05	6.16E+00	1.04E+01	2.34E+00	3.20E+01	5.89E-02	1.99E+03	1.02E+00	2.17E+00	4.88E-03	1.33E-02	1.36E-01	7.45E-01	2.79E-01	3.58E-03	9.08E-02	6.75E-05
FR	0.00E+00	6.32E-06	7.26E-01	2.69E-06	8.90E-02	3.89E+01	2.37E-03	3.85E-02	2.75E+01	1.35E-07	3.41E+00	1.54E+02	1.62E-01	2.37E-03	4.11E+01	3.75E-03	2.84E+03	2.72E+01	4.14E-05	1.35E-03	3.10E-01	1.68E-01	1.76E+00	1.21E-03	2.89E+01	2.21E-07
GB	0.00E+00	2.25E-05	3.55E-02	1.33E-05	2.21E-03	5.06E+00	2.49E-04	1.43E-01	7.97E-02	3.70E-08	7.84E-01	9.11E+00	1.69E+00	7.02E-02	1.99E+00	1.66E-01	3.01E+01	1.85E+03	1.49E-04	3.90E-05	3.67E-03	2.49E-02	1.05E+02	2.25E-02	2.00E-02	1.98E-06
GE	0.00E+00	4.28E+00	6.30E-03	3.34E-01	1.08E-02	1.63E-03	1.32E-01	2.58E-01	9.25E-04	1.01E-03	7.41E-02	4.51E-02	3.31E-03	8.17E-03	3.75E-04	1.70E-02	5.26E-03	2.75E-03	3.18E+02	2.60E-02	1.13E-02	4.59E-02	2.61E-04	4.44E-06	1.55E-02	3.62E-06
GR	0.00E+00	4.77E-04	1.51E-01	1.19E-04	4.93E-01	1.60E-02	2.12E+01	1.65E-01	1.00E-02	3.69E-03	1.18E+00	6.40E-01	1.10E-02	2.40E-03	3.89E-03	4.39E-03	6.16E-02	2.88E-02	7.65E-03	7.11E+02	4.35E-01	1.18E+00	2.94E-03	1.61E-05	1.61E+00	2.33E-05
HR	0.00E+00	1.18E-05	5.58E+00	7.87E-06	7.49E+01	7.38E-02	2.40E-01	1.53E-01	7.56E-02	2.76E-06	1.49E+01	4.25E+00	1.92E-02	2.93E-03	1.18E-02	2.54E-03	2.92E-01	1.02E-01	1.03E-04	6.44E-02	4.00E+02	3.53E+01	9.23E-03	3.11E-05	1.79E+01	3.14E-07
HU	0.00E+00	1.14E-05	1.72E+01	4.31E-06	1.37E+01	1.42E-01	8.38E-01	9.59E-01	1.79E-01	2.99E-07	4.98E+01	1.00E+01	6.71E-02	1.17E-02	1.02E-02	1.01E-02	5.56E-01	2.03E-01	1.68E-04	2.57E-01	5.32E+01	6.49E+02	1.80E-02	6.42E-05	3.60E+00	7.98E-07
IE	0.00E+00	4.77E-06	7.02E-04	2.52E-06	7.27E-05	1.27E-01	3.61E-05	1.43E-02	1.43E-03	7.83E-09	1.40E-02	3.51E-01	1.55E-01	9.33E-03	3.02E-01	2.53E-02	1.60E+00	2.39E+01	2.90E-05	6.65E-06	6.64E-05	1.03E-03	8.61E+02	8.15E-03	5.36E-04	2.59E-07
IS	0.00E+00	9.38E-07	1.99E-02	4.68E-06	3.08E-03	1.70E-01	1.31E-04	2.18E-02	9.89E-03	6.49E-08	3.71E-01	1.08E+00	3.31E-01	2.26E-02	2.46E-02	1.22E-01	3.54E-01	1.39E+00	2.13E-05	7.78E-05	7.43E-03	1.25E-02	1.08E+00	7.64E+00	1.27E-02	2.00E-06
IT	0.00E+00	2.01E-05	9.60E+00	1.34E-05	8.13E+00	1.22E-01	2.37E-01	7.77E-02	7.72E+00	4.62E-05	5.78E+00	1.25E+01	6.94E-03	1.46E-03	6.85E-01	1.55E-03	1.59E+01	2.94E-01	1.02E-04	7.29E-01	1.78E+01	3.22E+00	3.25E-02	3.42E-05	2.60E+03	1.38E-07
KY	0.00E+00	1.78E-03	9.42E-06	3.10E-03	2.48E-05	2.60E-06	3.52E-04	8.05E-05	1.43E-05	2.74E-06	5.69E-05	5.23E-05	2.79E-06	7.53E-06	1.15E-05	2.65E-05	6.76E-05	8.70E-06	3.08E-03	3.84E-04	1.67E-05	2.67E-05	4.08E-06	6.54E-08	4.65E-04	5.20E+02
KZ	0.00E+00	1.08E-01	1.57E-02	1.13E+00	2.51E-02	1.16E-02	2.09E-01	1.23E+00	2.94E-03	4.03E-04	3.16E-01	2.40E-01	3.50E-02	9.74E-02	2.24E-03	3.62E-01	2.21E-02	4.06E-02	3.67E-01	7.47E-02	2.62E-02	1.47E-01	8.26E-03	6.74E-05	3.63E-02	1.57E+02
LI	0.00E+00	3.72E-10	4.54E-02	5.49E-10	1.94E-05	6.73E-04	3.31E-07	9.82E-06	3.45E-01	2.90E-11	3.13E-03	1.51E-01	2.70E-06	2.98E-06	2.26E-04	1.05E-06	2.33E-02	1.91E-03	2.05E-09	1.12E-06	1.61E-04	5.20E-05	2.04E-04	1.27E-07	1.30E-01	3.40E-11
LT	0.00E+00	6.17E-05	4.85E-01	1.73E-04	1.04E-01	5.21E-01	3.21E-02	6.64E+01	9.90E-02	1.29E-05	1.26E+01	1.34E+01	2.95E+00	1.96E+00	2.33E-02	2.50E+00	8.71E-01	1.41E+00	2.84E-03	1.24E-02	2.78E-01	1.50E+00	1.35E-01	2.58E-04	1.37E-01	2.97E-06
LU	0.00E+00	6.91E-08	1.63E-02	2.40E-08	2.06E-04	3.58E+00	2.58E-05	9.13E-04	9.19E-02	1.00E-09	1.38E-01	8.77E+00	2.55E-03	3.94E-05	3.06E-02	6.86E-05	9.20E+00	3.21E-01	7.56E-07	1.39E-06	5.18E-04	6.96E-03	1.94E-02	1.31E-05	1.85E-02	7.60E-09
LV	0.00E+00	9.82E-05	3.61E-01	4.20E-04	7.15E-02	4.54E-01	2.65E-02	2.83E+01	9.60E-02	9.01E-06	8.96E+00	1.16E+01	2.52E+00	2.48E+01	2.04E-02	7.97E+00	8.13E-01	1.21E+00	4.33E-03	8.84E-03	1.77E-01	9.67E-01	1.22E-01	3.32E-04	1.19E-01	3.65E-06
MC	0.00E+00	2.73E-10	9.32E-06	1.12E-10	6.88E-06	1.79E-06	4.17E-08	1.17E-07	1.10E-04	1.05E-11	6.83E-06	4.75E-05	3.66E-08	3.50E-09	3.28E-05	9.08E-09	3.12E-02	8.90E-06	9.91E-10	1.67E-08	3.91E-05	4.37E-06	1.06E-06	7.38E-10	2.74E-02	1.70E-12
MD	0.00E+00	1.12E-04	5.25E-02	1.33E-04	8.78E-02	7.71E-03	1.15E+00	1.29E+00	6.45E-03	1.94E-05	8.67E-01	3.71E-01	3.48E-02	1.20E-02	6.32E-04	1.80E-02	2.79E-02	1.95E-02	1.35E-03	7.10E-02	1.01E-01	6.03E-01	2.59E-03	6.65E-06	6.67E-02	8.94E-06
ME	0.00E+00	7.30E-06	7.47E-02	4.90E-06	5.75E+00	6.75E-03	4.52E-01	2.19E-02	4.21E-03	8.38E-06	4.65E-01	2.62E-01	2.17E-03	2.85E-04	1.64E-03	4.33E-04	2.58E-02	1.03E-02	5.84E-05	1.89E-01	7.88E-01	9.36E-01	1.01E-03	3.75E-06	1.86E+00	1.86E-07
MK	0.00E+00	3.42E-05	8.28E-02	9.55E-06	3.92E-01	7.80E-03	6.05E+00	2.22E-02	4.93E-03	1.37E-04	6.28E-01	3.30E-01	4.93E-03	3.57E-04	7.85E-04	7.64E-04	2.51E-02	1.34E-02	4.46E-04	9.76E+00	2.60E-01	8.21E-01	1.36E-03	6.95E-06	3.13E-01	2.31E-06
MT	0.00E+00	1.15E-08	4.14E-05	2.89E-09	2.44E-04	5.81E-06	5.45E-05	8.85E-06	8.65E-06	2.02E-08	1.42E-04	1.25E-04	5.86E-07	1.80E-07	7.34E-05	3.11E-07	2.57E-04	1.15E-05	1.67E-07	5.19E-04	2.85E-04	1.29E-04	1.35E-06	1.93E-09	3.25E-02	1.67E-12
NL	0.00E+00	3.45E-06	5.66E-02	1.12E-06	9.26E-04	7.54E+01	2.47E-04	4.79E-02	2.08E-01	4.16E-09	7.71E-01	7.16E+01	3.76E-01	4.87E-03	2.83E-01	7.46E-03	1.92E+01	1.56E+01	3.05E-05	1.45E-05	3.81E-03	3.45E-02	5.72E-01	3.29E-04	5.49E-02	2.89E-07
NO	0.00E+00	4.27E-05	1.65E-01	3.81E-04	1.75E-02	2.57E+00	2.24E-03	4.30E-01	1.03E-01	1.57E-06	3.84E+00	1.73E+01	1.21E+01	5.96E-01	2.83E-01	7.41E+00	4.30E+00	1.70E+01	5.77E-04	1.09E-03	4.80E-02	1.71E-01	2.49E+00	3.44E-02	6.93E-02	6.52E-05
PL	0.00E+00	2.17E-04	1.28E+01	1.08E-04	3.16E+00	4.47E+00	4.04E-01	6.38E+01	1.67E+00	3.28E-06	7.50E+02	2.79E+02	1.17E+01	7.76E-01	2.45E-01	1.11E+00	9.97E+00	7.27E+00	3.15E-03	6.96E-02	7.96E+00	4.95E+01	6.70E-01	1.16E-03	3.22E+00	1.52E-05
PT	0.00E+00	2.66E-09	3.98E-05	2.04E-09	3.27E-06	1.19E-03	4.26E-07	1.07E-05	1.57E-04	3.05E-10	5.02E-05	3.37E-03	1.15E-04	1.87E-05	3.07E+01	1.54E-04	4.58E-02	1.28E-02	3.16E-08	8.36E-07	6.44E-06	3.80E-06	5.56E-03	2.60E-05	7.20E-04	3.40E-11
RO	0.00E+00	6.54E-04	2.88E+00	3.32E-04	9.18E+00	1.47E-01	4.33E+01	3.14E+00	1.87E-01	2.80E-05	2.02E+01	8.53E+00	2.08E-01	3.22E-02	1.23E-02	5.79E-02	6.25E-01	2.34E-01	7.77E-03	1.55E+00	9.19E+00	6.98E+01	2.22E-02	8.20E-05	2.20E+00	5.34E-05
RS	0.00E+00	6.47E-05	1.26E+00	3.22E-05	3.78E+01	6.61E-02	1.68E+01	2.88E-01	5.12E-02	7.95E-05	8.86E+00	3.36E+00	4.07E-02	3.24E-03	3.52E-03	4.52E-03	2.25E-01	9.66E-02	7.58E-04	2.54E+00	1.89E+01	3.27E+01	9.02E-03	4.88E-05	1.63E+00	3.18E-06
RU	0.00E+00	5.74E-01	1.50E+00	1.80E+00	1.06E+00	1.38E+00	4.44E+00	2.87E+02	3.18E-01	6.46E-03	3.15E+01	3.10E+01	5.15E+00	5.94E+01	1.42E-01	1.52E+02	2.62E+00	3.92E+00	1.63E+01	1.12E+00	1.57E+00	8.17E+00	5.21E-01	5.33E-03	1.20E+00	2.00E+00
SE	0.00E+00	7.79E-05	3.53E-01	4.67E-04	1.74E-02	4.66E+00	6.26E-03	3.29E+00	3.15E-01	1.64E-06	8.25E+00	6.79E+01	7.23E+01	4.22E+00	2.64E-01	5.82E+01	6.24E+00	1.55E+01	1.35E-03	2.06E-03	5.13E-02	3.20E-01	1.68E+00	1.26E-02	1.94E-01	1.16E-05
SI	0.00E+00	3.29E-06	1.29E+01	2.03E-06	1.26E+00	2.12E-02	3.11E-02	2.12E-02	5.35E-02	3.33E-07	4.21E+00	2.20E+00	3.46E-03	8.77E-04	5.39E-03	9.23E-04	1.27E-01	3.23E-02	2.38E-05	5.67E-03	6.02E+01	4.80E+00	3.06E-03	6.98E-06	1.94E+01	7.19E-08
SK	0.00E+00	9.62E-06	9.26E+00	4.30E-06	2.85E+00	2.05E-01	3.13E-01	1.61E+00	2.40E-01	1.38E-07	1.80E+02	1.55E+01	2.38E-01	2.02E-02	1.86E-02	2.31E-02	8.82E-01	2.80E-01	1.50E-04	7.38E-02	5.39E+00	9.64E+01	2.39E-02	9.22E-05	1.78E+00	1.15E-06
TJ	0.00E+00	8.50E-04	4.02E-06	1.66E-03	6.47E-06	1.05E-06	3.10E-05	1.55E-05	7.86E-06	1.49E-06	1.63E-05	2.15E-05	7.34E-07	7.71E-07	2.42E-06	2.29E-06	2.94E-05	2.21E-06	1.12E-03	4.57E-05	7.61E-06	7.35E-06	1.60E-06	1.90E-08	2.36E-04	1.16E+01
TM	0.00E+00	6.41E-02	4.10E-04	6.49E-01	4.14E-04	2.05E-04	5.74E-03	1.89E-02	1.13E-04	1.02E-04	6.63E-03	4.46E-03	3.40E-04	7.41E-04	6.11E-05	2.09E-03	7.00E-04	4.80E-04	1.16E-01	7.08E-04	5.82E-04	2.87E-03	6.18E-05	6.12E-07	2.22E-03	6.06E-02
TR	0.00E+00	6.98E+00	1.97E-01	6.45E-02	5.08E-01	2.35E-02	1.75E+01	1.63E+00	1.86E-02	9.08E-01	1.93E+00	1.07E+00	7.88E-02	2.92E-02	3.65E-03	6.34E-02	9.46E-02	4.64E-02	6.39E+00	8.91E+00	5.03E-01	1.58E+00	5.96E-03	4.22E-05	3.87E-01	1.87E-05
UA	0.00E+00	2.04E-02	2.68E+00	5.52E-02	4.04E+00	4.87E-01	6.07E+00	1.37E+02	3.01E-01	1.94E-03	5.02E+01	2.15E+01	1.23E+00	8.01E-01	6.68E-02	1.43E+00	1.56E+00	9.81E-01	6.34E-01	9.64E-01	4.80E+00	4.45E+01	1.04E-01	3.66E-04	2.25E+00	9.20E-04
UZ	0.00E+00	2.16E-02	3.55E-04	1.17E-01	3.60E-04	4.58E-04	4.35E-03	3.26E-02	8.69E-05	4.93E-05	6.62E-03	7.06E-03	9.05E-04	2.74E-03	5.02E-05	8.51E-03	7.72E-04	1.79E-03	4.46E-02	5.67E-04	5.07E-04	2.57E-03	2.80E-04	2.15E-06	1.34E-03	5.49E+01

***Table B7** (continued)*

Code	KZ	LI	LT	LU	LV	MC	MD	ME	MK	MT	NL	NO	PL	PT	RO	RS	RU	SE	SI	SK	TJ	TM	TR	UA	UZ
AL	1.38E-03	2.57E-05	3.59E-03	1.09E-03	1.02E-03	1.02E-06	1.02E-01	2.25E+00	1.33E+01	6.07E-03	5.72E-03	3.35E-04	5.56E-01	2.67E-05	9.74E-01	4.99E+01	4.64E-02	8.14E-04	2.67E-02	3.92E-01	1.35E-07	5.91E-06	3.07E-01	2.42E-01	3.75E-06
AM	4.32E-02	1.97E-07	1.23E-03	3.26E-06	6.09E-04	1.75E-08	1.54E-02	8.51E-06	4.47E-04	1.39E-06	3.24E-05	1.95E-05	2.66E-02	1.11E-06	1.88E-02	2.51E-03	1.94E-01	1.70E-04	1.18E-04	1.87E-03	8.46E-07	3.97E-03	1.21E+01	1.48E-01	7.90E-04
AT	3.67E-04	1.31E-01	5.60E-02	1.85E-01	2.00E-02	2.54E-05	1.35E-02	5.12E-03	2.85E-02	8.70E-05	5.17E-01	5.15E-03	2.91E+01	3.77E-03	1.16E+00	2.85E+00	4.90E-02	7.16E-03	2.63E+01	3.53E+01	3.05E-08	1.60E-06	2.09E-03	3.22E-01	9.33E-07
AZ	1.61E+00	4.60E-07	2.43E-03	1.12E-05	1.13E-03	1.96E-08	2.17E-02	1.53E-05	6.54E-04	2.05E-06	9.71E-05	5.48E-05	5.27E-02	2.59E-06	3.23E-02	5.18E-03	1.63E+01	3.24E-04	1.89E-04	4.68E-03	1.58E-04	1.76E-01	3.16E+00	5.94E-01	3.16E-02
BA	1.20E-03	3.58E-04	4.78E-02	1.54E-02	9.20E-03	9.26E-06	1.70E-01	1.50E+00	1.90E-01	5.34E-03	6.49E-02	2.20E-03	1.55E+01	2.93E-04	4.31E+00	4.86E+01	5.92E-02	4.10E-03	1.14E+00	9.71E+00	1.17E-07	7.81E-06	1.94E-02	1.10E+00	4.85E-06
BE	1.64E-04	9.72E-04	1.17E-02	9.61E+00	2.70E-03	6.62E-06	1.55E-03	2.39E-05	1.78E-04	1.47E-06	2.02E+01	3.96E-03	1.84E+00	1.77E-02	1.18E-02	1.17E-02	1.58E-02	7.67E-03	2.82E-03	1.14E-01	1.47E-08	1.22E-07	5.17E-05	9.82E-02	9.39E-08
BG	1.27E-01	2.25E-04	3.77E-02	6.49E-03	1.22E-02	2.52E-06	9.97E+00	5.59E-02	5.10E+00	6.80E-04	3.75E-02	3.09E-03	6.26E+00	1.28E-04	9.15E+01	4.87E+01	2.35E+00	8.52E-03	2.44E-01	3.07E+00	6.66E-06	3.02E-04	1.79E+01	1.65E+01	1.89E-04
BY	3.87E-01	1.82E-03	9.20E+01	9.28E-02	2.12E+01	2.69E-06	8.33E+00	5.11E-03	4.29E-02	7.10E-05	8.85E-01	1.68E-01	7.88E+02	1.27E-02	1.20E+01	2.91E+00	1.18E+02	1.38E+00	5.14E-01	2.52E+01	1.66E-05	8.89E-04	2.45E+00	1.13E+03	4.69E-04
CH	3.70E-06	5.53E-01	3.49E-03	7.35E-02	1.33E-03	5.86E-05	7.94E-05	1.02E-04	5.78E-05	1.40E-05	3.54E-02	4.19E-04	1.56E-01	4.06E-03	1.27E-03	3.58E-03	1.89E-03	2.01E-04	2.81E-02	1.16E-02	1.33E-09	5.40E-08	1.55E-05	1.47E-03	3.57E-08
CY	7.15E-05	3.05E-07	4.50E-04	8.89E-06	1.10E-04	1.01E-08	1.09E-02	4.55E-05	7.74E-04	7.18E-05	6.90E-05	2.17E-05	2.92E-02	8.98E-07	3.85E-02	6.36E-03	9.89E-03	1.08E-04	2.45E-04	3.71E-03	1.80E-09	6.57E-07	4.29E+00	4.31E-02	1.58E-07
CZ	1.96E-03	1.84E-02	3.10E-01	4.70E-01	8.21E-02	6.39E-06	3.77E-02	7.63E-03	5.75E-02	2.35E-05	1.26E+00	2.93E-02	4.58E+02	7.16E-03	2.64E+00	5.73E+00	3.01E-01	6.62E-02	2.62E+00	1.20E+02	9.71E-08	2.62E-06	2.90E-03	2.05E+00	1.40E-06
DE	7.01E-03	3.49E-01	9.07E-01	2.72E+01	2.45E-01	4.28E-05	1.29E-01	1.08E-03	1.77E-02	1.85E-05	8.76E+01	2.93E-01	3.09E+02	8.58E-02	7.43E-01	7.20E-01	1.12E+00	5.96E-01	6.32E-01	9.29E+00	3.81E-07	1.34E-05	2.04E-03	3.38E+00	7.99E-06
DK	1.59E-03	7.19E-04	5.01E-01	1.51E-01	2.00E-01	1.43E-06	1.21E-02	9.68E-06	6.78E-05	5.54E-08	5.32E+00	1.24E+00	3.20E+01	9.61E-03	3.13E-02	1.47E-02	6.98E-01	2.16E+00	2.50E-02	9.86E-01	1.31E-07	2.14E-05	5.53E-04	3.74E-01	1.43E-05
EE	3.14E-02	3.76E-04	1.36E+01	1.99E-02	3.71E+01	1.69E-07	1.89E-01	3.88E-04	4.35E-03	3.53E-06	3.19E-01	1.58E-01	4.76E+01	1.29E-03	3.99E-01	1.43E-01	3.05E+01	2.15E+00	3.12E-02	1.39E+00	2.06E-06	4.55E-04	7.72E-02	4.09E+00	2.62E-04
ES	2.13E-06	3.20E-05	6.15E-05	9.19E-03	2.14E-05	2.32E-05	3.47E-05	3.81E-05	1.77E-04	6.86E-04	9.73E-03	3.28E-04	6.09E-03	4.34E+01	2.45E-04	1.64E-03	1.15E-04	7.32E-05	1.72E-03	6.26E-04	1.20E-10	1.50E-08	5.10E-05	4.87E-04	3.10E-09
FI	8.17E-02	6.48E-04	8.43E+00	4.87E-02	9.87E+00	8.24E-07	2.88E-01	7.82E-04	8.52E-03	8.58E-06	1.03E+00	2.54E+00	6.30E+01	2.07E-02	6.85E-01	2.76E-01	1.53E+02	2.21E+01	5.82E-02	2.25E+00	2.53E-05	1.05E-03	2.05E-01	5.69E+00	5.23E-04
FR	3.69E-04	2.18E-02	2.49E-02	1.82E+01	6.71E-03	3.29E-02	4.91E-03	6.97E-04	1.45E-03	1.34E-03	4.90E+00	1.51E-02	4.14E+00	6.27E-01	4.73E-02	8.07E-02	2.83E-02	1.57E-02	1.89E-01	3.79E-01	2.03E-08	6.76E-07	2.88E-04	2.16E-01	3.60E-07
GB	1.59E-03	4.01E-04	3.12E-01	2.21E-01	1.21E-01	9.79E-07	2.16E-03	2.32E-05	9.44E-05	1.45E-06	4.83E+00	4.24E-01	5.61E+00	2.80E-01	1.10E-02	6.88E-03	4.18E-01	2.92E-01	2.87E-03	1.04E-01	3.62E-07	1.20E-05	4.43E-04	1.68E-01	8.52E-06
GE	1.23E-01	5.98E-06	4.55E-02	2.05E-04	2.12E-02	1.01E-07	3.95E-01	2.26E-04	7.30E-03	1.07E-05	1.78E-03	7.09E-04	8.37E-01	3.54E-05	6.03E-01	9.84E-02	1.85E+01	5.84E-03	3.30E-03	7.25E-02	8.66E-07	1.04E-03	1.95E+01	5.11E+00	3.82E-04
GR	2.82E-02	7.47E-05	1.56E-02	3.14E-03	6.06E-03	1.71E-06	1.70E+00	2.67E-02	1.56E+01	2.06E-02	1.94E-02	1.39E-03	1.78E+00	5.86E-05	6.43E+00	1.24E+01	7.33E-01	3.27E-03	7.96E-02	9.83E-01	1.43E-06	5.75E-05	4.86E+01	4.48E+00	3.60E-05
HR	1.00E-03	6.89E-04	5.02E-02	1.68E-02	1.00E-02	1.93E-05	7.69E-02	4.06E-01	1.41E-01	2.80E-03	7.28E-02	2.21E-03	2.09E+01	4.41E-04	3.99E+00	3.34E+01	5.36E-02	4.55E-03	3.97E+01	1.25E+01	8.00E-08	5.56E-06	7.49E-03	9.12E-01	3.38E-06
HU	3.94E-03	1.58E-03	2.39E-01	3.32E-02	3.88E-02	8.92E-06	4.03E-01	1.14E-01	6.81E-01	1.11E-03	1.59E-01	6.88E-03	8.91E+01	6.60E-04	5.38E+01	7.21E+01	2.32E-01	1.72E-02	1.13E+01	2.48E+02	8.87E-08	4.04E-06	1.64E-02	7.45E+00	2.69E-06
IE	2.55E-04	7.63E-06	2.97E-02	6.46E-03	1.25E-02	4.18E-08	3.18E-04	1.32E-06	1.14E-05	4.68E-08	1.35E-01	4.49E-02	2.72E-01	4.48E-02	1.27E-03	3.34E-04	5.10E-02	3.79E-02	3.88E-05	4.15E-03	3.13E-08	1.23E-06	6.59E-05	1.94E-02	8.01E-07
IS	6.49E-04	6.46E-05	5.34E-02	1.12E-02	2.56E-02	6.68E-08	7.28E-04	2.91E-06	2.97E-05	1.06E-08	2.20E-01	6.60E-01	1.85E+00	5.45E-03	2.67E-03	1.45E-03	1.31E-01	1.14E-01	3.92E-03	8.53E-02	7.10E-07	2.60E-05	9.75E-04	3.70E-02	1.82E-05
IT	6.79E-04	4.37E-02	2.38E-02	4.06E-02	5.27E-03	1.12E-02	6.79E-02	3.17E-01	5.74E-01	3.24E-01	6.69E-02	1.75E-03	7.73E+00	5.01E-03	1.31E+00	5.39E+00	3.56E-02	2.19E-03	1.71E+01	3.63E+00	9.43E-08	6.27E-06	9.72E-02	5.14E-01	3.65E-06
KY	1.95E+02	6.84E-08	1.27E-05	2.90E-07	6.27E-06	1.23E-08	1.36E-04	1.69E-06	1.27E-04	9.30E-08	2.70E-06	3.09E-06	3.37E-04	1.12E-06	3.95E-04	2.45E-04	3.97E-02	3.21E-06	9.94E-06	5.40E-05	4.05E+01	1.20E-01	7.39E-03	4.91E-03	7.51E+01
KZ	1.67E+04	2.08E-05	2.19E-01	8.71E-04	1.18E-01	5.23E-07	7.05E-01	5.57E-04	1.54E-02	2.64E-05	1.61E-02	1.37E-02	3.83E+00	5.76E-04	1.24E+00	1.83E-01	4.52E+02	4.53E-02	8.17E-03	2.80E-01	1.28E+01	1.35E+01	2.73E+00	4.72E+01	1.23E+02
LI	1.86E-08	3.33E-02	2.49E-05	2.25E-04	1.08E-05	1.90E-07	4.06E-07	4.69E-07	2.58E-07	3.72E-08	1.87E-04	2.91E-06	1.18E-03	1.38E-05	8.07E-06	2.54E-05	1.35E-05	1.18E-06	2.15E-04	7.79E-05	1.01E-11	3.92E-10	6.02E-08	7.48E-06	2.73E-10
LT	4.22E-02	8.63E-04	4.41E+02	5.09E-02	2.55E+01	3.34E-07	4.72E-01	8.72E-04	8.06E-03	5.81E-06	7.82E-01	1.13E-01	3.22E+02	4.67E-03	1.03E+00	4.38E-01	4.44E+01	1.54E+00	1.26E-01	5.46E+00	9.92E-07	1.30E-04	2.42E-01	1.63E+01	6.45E-05
LU	9.03E-06	2.46E-04	5.32E-04	1.61E+01	1.20E-04	9.86E-07	8.33E-05	2.98E-06	1.12E-05	2.75E-07	2.19E-01	1.38E-04	1.35E-01	1.52E-03	1.15E-03	1.44E-03	6.18E-04	2.60E-04	5.65E-04	1.27E-02	8.71E-10	1.14E-08	5.60E-06	4.68E-03	7.97E-09
LV	5.19E-02	8.19E-04	9.43E+01	4.44E-02	3.24E+02	3.04E-07	3.56E-01	7.01E-04	7.22E-03	6.54E-06	6.67E-01	1.57E-01	1.41E+02	2.06E-03	7.92E-01	3.14E-01	2.70E+01	2.54E+00	7.87E-02	3.34E+00	2.10E-06	4.18E-04	1.85E-01	1.03E+01	2.37E-04
MC	1.62E-09	2.39E-07	5.95E-08	7.12E-07	1.32E-08	3.52E-04	7.21E-08	3.17E-08	4.00E-08	4.67E-08	5.48E-07	2.30E-08	1.04E-05	2.72E-07	1.40E-06	3.68E-06	7.71E-08	1.42E-08	2.79E-05	4.25E-06	5.89E-13	2.84E-11	1.62E-08	8.51E-07	1.77E-11
MD	5.74E-02	5.11E-05	1.91E-01	1.31E-03	4.40E-02	5.37E-07	4.27E+02	1.01E-03	1.66E-02	2.44E-05	1.14E-02	3.33E-03	1.11E+01	4.25E-05	6.49E+01	4.03E-01	1.78E+00	1.89E-02	2.83E-02	1.19E+00	3.06E-06	1.41E-04	1.51E+00	6.50E+01	1.05E-04
ME	5.23E-04	3.24E-05	4.44E-03	1.46E-03	1.04E-03	1.15E-06	5.26E-02	1.09E+01	5.93E-01	2.61E-03	7.01E-03	2.88E-04	8.02E-01	4.48E-05	8.26E-01	2.33E+01	1.73E-02	6.45E-04	3.90E-02	5.95E-01	6.30E-08	3.13E-06	2.77E-02	1.81E-01	1.93E-06
MK	2.01E-03	3.87E-05	3.61E-03	1.55E-03	1.07E-03	5.25E-07	1.80E-01	4.14E-02	1.06E+02	1.02E-03	9.08E-03	7.07E-04	7.18E-01	2.19E-05	1.57E+00	4.71E+01	5.69E-02	1.37E-03	3.87E-02	5.84E-01	1.48E-07	4.15E-06	4.65E-01	3.67E-01	2.90E-06
MT	8.14E-08	6.87E-08	1.69E-06	8.97E-07	5.29E-07	1.40E-08	7.59E-06	2.46E-05	1.04E-04	1.40E-01	4.85E-06	1.07E-07	2.77E-04	3.31E-07	1.47E-04	5.70E-04	8.87E-06	2.65E-07	8.28E-05	1.23E-04	1.08E-12	7.10E-10	7.82E-05	7.04E-05	3.10E-10
NL	3.31E-04	9.55E-04	3.72E-02	9.52E-01	1.07E-02	3.31E-06	3.38E-03	1.18E-05	1.31E-04	1.01E-06	1.99E+02	1.41E-02	2.97E+00	2.11E-02	1.32E-02	7.79E-03	4.75E-02	3.16E-02	3.47E-03	1.27E-01	3.95E-08	2.17E-07	5.55E-05	1.63E-01	2.06E-07
NO	1.65E-02	6.18E-04	1.11E+00	1.37E-01	6.11E-01	2.35E-06	1.12E-02	2.49E-05	2.76E-04	7.08E-07	3.73E+00	3.69E+02	2.56E+01	8.91E-02	3.27E-02	1.46E-02	6.75E+00	1.06E+01	2.72E-02	9.46E-01	2.19E-05	1.99E-04	1.63E-02	4.56E-01	1.44E-04
PL	6.79E-02	1.46E-02	2.44E+01	6.93E-01	3.10E+00	1.04E-05	2.85E+00	2.30E-02	1.89E-01	8.76E-05	6.19E+00	6.41E-01	1.50E+04	2.21E-02	1.97E+01	1.23E+01	5.37E+01	3.77E+00	3.54E+00	3.42E+02	1.80E-06	7.00E-05	1.27E-01	7.87E+01	3.60E-05
PT	4.58E-07	7.49E-07	1.43E-05	1.25E-04	1.58E-05	2.11E-08	1.16E-06	1.33E-07	5.60E-07	1.26E-06	4.56E-04	2.42E-04	1.91E-04	5.17E+02	4.43E-06	3.61E-06	8.16E-05	3.66E-05	5.18E-06	1.02E-05	6.77E-12	3.26E-10	4.18E-07	2.43E-05	1.55E-10
RO	2.54E-01	1.54E-03	4.64E-01	3.09E-02	1.10E-01	1.05E-05	8.08E+01	1.08E-01	1.57E+00	1.15E-03	1.68E-01	2.28E-02	7.28E+01	9.18E-04	1.99E+03	1.04E+02	4.26E+00	7.86E-02	1.60E+00	3.80E+01	6.15E-06	3.59E-04	4.92E+00	7.51E+01	2.55E-04
RS	1.49E-02	4.12E-04	5.80E-02	1.37E-02	1.17E-02	5.87E-06	8.89E-01	2.41E+00	3.22E+01	2.28E-03	8.01E-02	5.34E-03	1.69E+01	2.18E-04	4.23E+01	1.10E+03	2.09E-01	1.06E-02	7.39E-01	1.36E+01	4.75E-07	2.21E-05	3.09E-01	2.33E+00	1.39E-05
RU	3.89E+03	2.61E-03	5.76E+01	1.35E-01	5.06E+01	9.13E-06	2.49E+01	1.27E-02	2.04E-01	4.71E-04	1.90E+00	2.01E+00	5.17E+02	5.55E-02	3.57E+01	5.18E+00	3.27E+04	7.73E+00	5.58E-01	1.99E+01	3.85E-01	1.59E+00	6.20E+01	1.77E+03	2.10E+00
SE	3.99E-02	2.09E-03	7.35E+00	3.19E-01	4.36E+00	2.68E-06	7.06E-02	8.57E-05	1.02E-03	1.01E-06	7.72E+00	2.74E+01	1.13E+02	4.44E-02	1.56E-01	3.88E-02	1.57E+01	4.44E+02	3.40E-02	1.74E+00	5.09E-06	5.46E-04	2.91E-02	3.07E+00	3.30E-04
SI	1.46E-04	5.17E-04	1.02E-02	5.12E-03	2.53E-03	1.25E-05	9.32E-03	5.05E-03	1.68E-02	2.20E-04	1.93E-02	4.76E-04	4.78E+00	1.97E-04	6.27E-01	1.85E+00	1.06E-02	1.06E-03	1.44E+02	2.36E+00	1.65E-08	1.21E-06	1.04E-03	1.27E-01	6.98E-07
SK	3.80E-03	2.17E-03	4.83E-01	5.19E-02	7.29E-02	5.31E-06	2.96E-01	3.16E-02	2.07E-01	1.31E-04	2.42E-01	2.31E-02	4.78E+02	1.34E-03	1.32E+01	1.17E+01	3.98E-01	6.64E-02	1.97E+00	9.24E+02	1.20E-07	4.06E-06	9.79E-03	8.03E+00	2.30E-06
TJ	6.18E+00	3.91E-08	2.63E-06	1.29E-07	1.10E-06	6.10E-09	3.44E-05	3.19E-07	2.37E-05	3.49E-08	1.07E-06	5.80E-07	9.08E-05	3.66E-07	5.82E-05	3.73E-05	1.17E-02	4.92E-07	4.89E-06	1.27E-05	4.44E+02	8.26E-01	2.31E-03	9.15E-04	3.91E+01
TM	1.74E+01	6.70E-07	2.39E-03	2.50E-05	1.11E-03	1.58E-08	1.19E-02	6.40E-06	4.19E-04	2.53E-07	2.12E-04	9.78E-05	5.54E-02	1.08E-05	2.23E-02	4.39E-03	3.48E+00	3.39E-04	2.37E-04	5.37E-03	6.98E+00	4.20E+02	2.02E-01	9.59E-01	9.06E+01
TR	2.00E-01	1.42E-04	2.91E-01	4.24E-03	8.37E-02	2.22E-06	1.33E+01	7.99E-03	2.17E-01	3.85E-03	3.07E-02	9.30E-03	1.51E+01	2.43E-04	3.28E+01	3.90E+00	1.35E+01	4.60E-02	1.01E-01	1.93E+00	2.37E-06	2.24E-03	5.63E+03	5.20E+01	5.02E-04
UA	4.28E+00	2.55E-03	9.45E+00	8.76E-02	2.41E+00	1.32E-05	2.19E+02	3.89E-02	3.20E-01	4.93E-04	5.86E-01	1.73E-01	8.40E+02	8.19E-03	1.91E+02	1.70E+01	4.03E+02	9.37E-01	1.29E+00	9.42E+01	2.66E-04	2.40E-02	4.54E+01	1.12E+04	1.02E-02
UZ	2.53E+02	5.53E-07	5.97E-03	2.54E-05	3.30E-03	1.27E-08	1.75E-02	5.25E-06	2.34E-04	1.96E-07	5.91E-04	3.57E-04	9.15E-02	1.18E-05	2.32E-02	3.05E-03	4.45E+00	1.13E-03	1.92E-04	5.32E-03	7.74E+01	7.82E+01	1.04E-01	1.73E+00	6.92E+02

Table B8. *Source-receptor matrix of IP deposition to EMEP countries in 2022. Columns and rows are sources and receptors, receptively.*

Code	AL	AM	AT	AZ	BA	BE	BG	BY	CH	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GE	GR	HR	HU	IE	IS	IT	KY
AL	2.62E+01	4.57E-05	6.34E-02	4.00E-06	9.84E-01	5.08E-03	1.56E+00	2.00E-02	4.38E-03	1.10E-04	3.26E-01	2.80E-01	1.66E-03	4.80E-04	4.53E-02	6.60E-04	6.05E-02	7.51E-03	4.86E-04	6.82E+00	4.70E-01	8.29E-01	9.58E-04	5.04E-07	4.20E+00	8.89E-07
AM	5.36E-05	4.36E+01	1.70E-04	7.14E-01	5.80E-04	3.48E-05	5.27E-03	5.97E-03	2.74E-05	1.03E-03	2.13E-03	1.65E-03	9.62E-05	3.06E-04	7.23E-05	5.28E-04	1.34E-04	6.19E-05	1.04E+01	1.53E-03	4.74E-04	1.65E-03	7.38E-06	4.68E-08	1.66E-03	1.01E-05
AT	1.13E-02	2.33E-05	1.71E+02	1.87E-06	2.43E+00	9.63E-01	1.42E-01	1.41E-01	5.27E+00	3.34E-06	1.04E+02	1.98E+02	5.20E-02	2.28E-02	4.03E-01	1.41E-02	5.19E+00	1.13E+00	1.28E-04	3.48E-02	1.46E+01	3.02E+01	1.23E-01	2.69E-05	4.18E+01	2.49E-07
AZ	8.62E-05	7.75E+00	4.04E-04	1.03E+01	1.00E-03	1.36E-04	9.66E-03	1.96E-02	5.97E-05	9.83E-04	5.72E-03	5.19E-03	3.21E-04	1.03E-03	1.41E-04	2.17E-03	3.55E-04	2.34E-04	1.25E+01	2.73E-03	8.41E-04	3.54E-03	2.37E-05	1.20E-07	2.34E-03	2.17E-04
BA	4.71E-01	2.62E-05	2.34E+00	3.58E-06	4.73E+02	8.42E-02	1.05E+00	2.22E-01	5.73E-02	1.45E-05	1.26E+01	5.38E+00	2.10E-02	6.99E-03	1.06E-01	5.68E-03	3.32E-01	9.86E-02	1.89E-04	5.16E-01	7.61E+01	2.47E+01	1.04E-02	5.50E-06	1.35E+01	3.60E-07
BE	4.03E-05	2.86E-06	9.65E-02	4.61E-07	4.96E-03	1.45E+02	8.68E-04	3.25E-02	3.74E-01	4.83E-08	8.37E-01	4.89E+01	1.16E-01	2.16E-03	2.54E+00	3.04E-03	5.22E+01	1.00E+01	1.99E-05	7.30E-05	8.58E-03	7.21E-02	5.04E-01	5.58E-05	2.35E-01	8.06E-08
BG	4.13E-01	2.25E-03	5.60E-01	1.71E-04	3.77E+00	4.17E-02	3.95E+02	6.12E-01	3.17E-02	1.54E-03	3.54E+00	2.58E+00	2.98E-02	8.63E-03	2.59E-02	1.32E-02	1.51E-01	6.30E-02	2.37E-02	1.60E+01	2.31E+00	5.90E+00	7.97E-03	4.15E-06	1.23E+00	8.14E-05
BY	1.19E-02	1.12E-03	2.40E+00	5.72E-04	1.82E+00	1.33E+00	8.41E-01	1.35E+03	3.19E-01	5.85E-04	4.86E+01	5.04E+01	2.28E+00	6.04E+00	4.08E-01	6.24E+00	2.34E+00	2.13E+00	3.38E-02	1.59E-01	2.74E+00	1.65E+01	2.28E-01	1.07E-04	1.35E+00	3.60E-05
CH	1.07E-03	4.96E-07	1.85E+00	5.53E-08	1.67E-02	2.30E-01	3.00E-04	6.54E-03	5.13E+01	6.87E-08	5.89E-01	5.06E+01	5.22E-03	1.37E-03	1.05E+00	4.43E-04	2.42E+01	4.22E-01	1.89E-06	1.67E-03	7.46E-02	2.36E-02	5.59E-02	4.85E-06	3.87E+01	2.00E-09
CY	6.28E-04	5.64E-05	8.89E-04	3.35E-06	4.40E-03	1.09E-04	1.96E-02	1.60E-03	7.27E-05	1.52E+01	5.76E-03	5.83E-03	1.79E-04	3.84E-05	5.79E-04	7.59E-05	7.15E-04	1.61E-04	1.45E-04	5.34E-02	3.25E-03	5.49E-03	2.02E-05	5.42E-08	1.39E-02	2.20E-09
CZ	9.95E-03	2.80E-05	3.44E+01	2.35E-06	3.30E+00	2.00E+00	3.22E-01	8.56E-01	2.28E+00	1.07E-06	1.75E+03	3.75E+02	4.64E-01	6.42E-02	9.17E-01	5.48E-02	8.54E+00	1.71E+00	2.39E-04	4.81E-02	8.96E+00	4.27E+01	1.56E-01	5.81E-05	4.61E+00	9.51E-07
DE	3.14E-03	1.00E-04	3.09E+01	1.91E-05	3.04E-01	7.92E+01	9.61E-02	1.98E+00	3.64E+01	2.29E-06	3.01E+02	5.46E+03	8.88E+00	2.06E-01	1.12E+01	3.25E-01	1.72E+02	3.94E+01	7.81E-04	1.67E-02	1.19E+00	6.18E+00	3.02E+00	4.21E-04	2.13E+01	2.17E-06
DK	2.72E-05	1.02E-05	2.26E-01	3.34E-06	1.64E-02	3.58E+00	5.98E-04	1.76E-01	1.50E-01	5.79E-08	5.23E+00	5.64E+01	1.04E+02	1.25E-01	8.52E-01	2.79E-01	4.20E+00	7.23E+00	8.07E-05	1.25E-04	4.73E-02	2.59E-01	7.58E-01	3.66E-04	1.39E-01	1.52E-07
EE	7.24E-04	1.11E-04	3.01E-01	1.01E-04	7.75E-02	4.48E-01	2.59E-02	6.76E+00	7.24E-02	1.23E-05	6.01E+00	1.27E+01	1.43E+00	2.41E+02	1.13E-01	2.72E+01	6.80E-01	8.97E-01	3.58E-03	4.43E-03	1.50E-01	7.86E-01	9.93E-02	5.99E-05	1.08E-01	1.46E-06
ES	3.08E-03	1.15E-05	8.88E-03	9.32E-07	5.49E-02	1.11E-01	4.49E-03	3.54E-04	2.58E-02	2.08E-07	1.81E-02	5.19E-01	4.29E-03	5.18E-05	3.45E+03	7.93E-05	2.26E+01	4.77E-01	2.76E-05	1.46E-02	6.28E-02	1.02E-02	1.29E-01	1.24E-05	1.91E+00	8.00E-10
FI	1.64E-03	2.89E-04	4.96E-01	3.80E-04	1.31E-01	1.41E+00	6.13E-02	7.07E+00	1.28E-01	2.50E-05	9.87E+00	2.65E+01	3.44E+00	4.95E+01	4.60E-01	1.70E+03	1.80E+00	3.05E+00	6.54E-03	8.85E-03	2.47E-01	1.39E+00	3.38E-01	7.41E-04	1.93E-01	2.34E-05
FR	6.15E-03	2.25E-05	1.02E+00	2.29E-06	4.41E-01	3.46E+01	1.22E-02	5.48E-02	1.81E+01	1.04E-06	4.79E+00	2.06E+02	3.49E-01	5.07E-03	1.81E+02	6.01E-03	1.60E+03	2.56E+01	8.26E-05	1.13E-02	8.87E-01	3.65E-01	2.01E+00	1.71E-04	4.20E+01	1.36E-07
GB	1.38E-04	1.94E-05	6.97E-02	3.87E-06	8.20E-03	5.90E+00	6.43E-04	1.84E-01	1.30E-01	1.00E-07	1.23E+00	1.89E+01	1.48E+00	1.05E-01	1.26E+01	2.06E-01	2.88E+01	9.19E+02	1.03E-04	2.50E-04	9.83E-03	4.69E-02	8.06E+01	3.51E-03	9.12E-02	4.53E-07
GE	6.61E-04	4.16E+00	9.30E-03	3.33E-01	2.42E-02	2.59E-03	2.45E-01	2.82E-01	1.07E-03	2.32E-03	1.03E-01	9.58E-02	4.15E-03	1.19E-02	2.41E-03	1.98E-02	7.19E-03	3.48E-03	1.84E+02	2.93E-02	2.07E-02	7.72E-02	3.51E-04	1.58E-06	1.88E-02	3.06E-06
GR	1.28E+00	1.13E-03	1.96E-01	5.85E-05	9.95E-01	1.95E-02	2.90E+01	2.20E-01	1.43E-02	7.83E-03	1.19E+00	1.04E+00	1.08E-02	3.58E-03	7.63E-02	5.15E-03	1.29E-01	3.25E-02	1.54E-02	3.42E+02	7.31E-01	1.73E+00	4.39E-03	2.52E-06	3.53E+00	3.18E-05
HR	2.04E-01	2.58E-05	7.24E+00	2.77E-06	9.48E+01	9.02E-02	5.94E-01	1.74E-01	9.27E-02	6.56E-06	1.81E+01	7.57E+00	2.19E-02	7.80E-03	1.90E-01	6.26E-03	4.70E-01	9.98E-02	2.01E-04	2.84E-01	3.54E+02	4.71E+01	9.87E-03	5.63E-06	2.96E+01	4.30E-07
HU	2.51E-01	2.70E-05	1.85E+01	3.13E-06	2.63E+01	1.81E-01	2.23E+00	1.17E+00	1.97E-01	1.91E-06	5.75E+01	1.71E+01	7.49E-02	3.26E-02	1.15E-01	2.47E-02	6.68E-01	2.08E-01	3.24E-04	8.63E-01	6.28E+01	6.08E+02	2.28E-02	1.18E-05	7.42E+00	6.17E-07
IE	1.66E-05	4.94E-06	1.41E-03	9.09E-07	6.70E-04	2.03E-01	5.56E-05	1.56E-02	1.82E-03	2.33E-08	2.25E-02	7.35E-01	1.40E-01	1.44E-02	2.78E+00	3.34E-02	1.99E+00	1.84E+01	2.37E-05	8.34E-05	5.35E-04	1.40E-03	4.60E+02	9.67E-04	1.36E-02	1.00E-07
IS	1.35E-05	8.04E-07	2.91E-02	4.62E-07	7.05E-03	1.86E-01	1.52E-04	1.86E-02	1.33E-02	5.89E-08	3.94E-01	1.81E+00	2.35E-01	3.15E-02	2.30E-01	1.14E-01	3.80E-01	9.45E-01	1.16E-05	7.78E-05	1.31E-02	2.35E-02	5.60E-01	3.01E+00	2.99E-02	1.56E-07
IT	9.99E-01	6.39E-05	1.08E+01	8.33E-06	1.73E+01	1.75E-01	8.00E-01	8.71E-02	5.79E+00	1.50E-04	7.51E+00	2.60E+01	1.19E-02	4.18E-03	4.14E+00	3.09E-03	1.58E+01	3.23E-01	2.83E-04	1.61E+00	2.69E+01	5.55E+00	4.15E-02	5.40E-06	2.01E+03	2.62E-07
KY	3.34E-05	7.82E-03	2.16E-05	2.08E-03	8.98E-05	7.17E-06	8.91E-04	7.59E-04	1.86E-05	1.33E-05	1.89E-04	2.14E-04	1.37E-05	7.79E-05	1.21E-04	2.44E-04	1.22E-04	1.48E-05	1.10E-02	5.03E-04	5.11E-05	1.31E-04	2.48E-06	2.25E-08	9.44E-04	3.36E+02
KZ	4.40E-03	3.13E-01	3.39E-02	2.24E-01	6.63E-02	2.24E-02	4.33E-01	1.91E+00	5.31E-03	1.16E-03	5.99E-01	6.70E-01	5.12E-02	2.06E-01	1.81E-02	6.57E-01	4.19E-02	4.90E-02	7.82E-01	1.12E-01	6.35E-02	3.07E-01	4.80E-03	9.73E-06	7.96E-02	1.07E+02
LI	5.10E-06	1.65E-09	3.81E-02	4.05E-10	9.05E-05	1.01E-03	1.75E-06	5.46E-05	2.17E-01	2.00E-10	5.58E-03	2.76E-01	1.01E-05	1.19E-05	2.63E-03	3.69E-06	3.05E-02	2.10E-03	6.66E-09	8.44E-06	4.97E-04	1.80E-04	2.84E-04	2.61E-08	1.84E-01	9.87E-12
LT	1.48E-03	1.54E-04	8.46E-01	6.21E-05	2.43E-01	9.53E-01	6.72E-02	5.91E+01	1.49E-01	5.31E-05	1.83E+01	2.89E+01	3.34E+00	3.25E+00	1.99E-01	3.63E+00	1.40E+00	1.80E+00	5.55E-03	1.22E-02	5.38E-01	2.80E+00	1.96E-01	5.91E-05	2.79E-01	1.20E-06
LU	7.20E-06	1.41E-07	2.28E-02	1.79E-08	7.79E-04	2.97E+00	7.08E-05	1.65E-03	1.13E-01	7.98E-09	1.73E-01	1.14E+01	5.43E-03	1.13E-04	2.57E-01	1.63E-04	6.88E+00	3.90E-01	1.15E-06	8.54E-06	1.59E-03	1.25E-02	2.95E-02	3.27E-06	5.20E-02	5.24E-09
LV	1.43E-03	2.01E-04	6.75E-01	1.03E-04	1.75E-01	8.91E-01	5.14E-02	2.99E+01	1.50E-01	3.49E-05	1.37E+01	2.65E+01	3.25E+00	3.06E+01	1.90E-01	1.08E+01	1.40E+00	1.65E+00	7.58E-03	9.48E-03	3.82E-01	1.93E+00	1.91E-01	8.02E-05	2.54E-01	1.61E-06
MC	2.54E-07	9.49E-10	1.99E-05	8.82E-11	3.46E-05	3.08E-06	3.91E-07	4.08E-07	1.01E-04	7.57E-11	2.07E-05	1.21E-04	6.03E-07	4.30E-08	2.40E-04	1.63E-08	1.52E-02	9.47E-06	2.89E-09	1.62E-07	1.19E-04	1.99E-05	1.12E-06	1.02E-10	2.35E-02	7.24E-13
MD	7.44E-03	1.54E-04	7.67E-02	4.62E-05	2.61E-01	1.15E-02	1.78E+00	1.42E+00	8.09E-03	1.05E-04	1.14E+00	7.08E-01	3.52E-02	2.25E-02	7.10E-03	2.62E-02	4.06E-02	2.20E-02	1.77E-03	1.49E-01	2.13E-01	1.09E+00	2.99E-03	1.31E-06	1.86E-01	4.52E-06
ME	1.01E+00	1.22E-05	1.12E-01	1.44E-06	8.87E+00	8.64E-03	8.98E-01	2.75E-02	5.77E-03	1.57E-05	6.16E-01	4.68E-01	2.55E-03	7.49E-04	2.68E-02	7.73E-04	4.54E-02	1.11E-02	8.75E-05	6.29E-01	1.35E+00	1.58E+00	1.30E-03	7.22E-07	3.74E+00	2.02E-07
MK	4.19E+00	6.34E-05	9.38E-02	3.76E-06	7.39E-01	8.23E-03	7.67E+00	2.86E-02	5.00E-03	2.87E-04	5.84E-01	4.60E-01	4.30E-03	6.54E-04	1.06E-02	9.38E-04	3.16E-02	1.21E-02	8.06E-04	1.13E+01	4.06E-01	1.17E+00	1.56E-03	1.02E-06	7.71E-01	2.78E-06
MT	3.57E-04	7.42E-08	1.44E-04	2.72E-09	1.54E-03	1.29E-05	5.49E-04	4.66E-05	3.41E-05	1.56E-07	4.49E-04	4.03E-04	1.13E-06	5.56E-07	1.18E-03	5.25E-07	1.06E-03	4.29E-05	1.02E-06	2.06E-03	1.28E-03	7.40E-04	8.09E-06	1.01E-09	4.84E-02	1.75E-12
NL	2.67E-05	4.30E-06	8.48E-02	7.88E-07	2.86E-03	5.83E+01	6.27E-04	5.76E-02	2.74E-01	1.98E-08	8.79E-01	8.30E+01	3.67E-01	8.50E-03	1.99E+00	1.11E-02	1.90E+01	1.31E+01	3.03E-05	7.69E-05	8.27E-03	5.21E-02	6.48E-01	5.82E-05	1.59E-01	9.76E-08
NO	4.80E-05	3.03E-05	2.76E-01	2.75E-05	4.23E-02	4.28E+00	1.85E-03	4.86E-01	1.73E-01	1.37E-06	5.45E+00	4.16E+01	1.40E+01	9.55E-01	1.71E+00	8.52E+00	6.44E+00	1.82E+01	3.84E-04	4.18E-04	9.57E-02	3.48E-01	2.66E+00	6.33E-03	2.24E-01	1.32E-05
PL	4.34E-02	3.76E-04	1.79E+01	9.64E-05	6.79E+00	7.97E+00	8.67E-01	5.75E+01	2.25E+00	1.60E-05	7.91E+02	5.14E+02	1.33E+01	1.41E+00	2.03E+00	1.73E+00	1.49E+01	9.96E+00	4.97E-03	1.80E-01	1.30E+01	7.72E+01	1.02E+00	2.24E-04	5.95E+00	7.42E-06
PT	5.94E-05	3.13E-07	1.95E-04	2.52E-08	5.54E-04	2.71E-03	7.89E-05	5.77E-06	5.64E-04	7.09E-09	2.59E-04	1.31E-02	7.26E-05	4.79E-06	5.66E+01	3.62E-05	1.11E-01	2.10E-02	7.47E-07	1.97E-04	5.51E-04	8.55E-05	5.28E-03	1.34E-06	1.70E-02	1.68E-11
RO	4.09E-01	1.02E-03	4.46E+00	1.57E-04	1.90E+01	2.32E-01	5.13E+01	3.88E+00	2.35E-01	1.42E-04	2.70E+01	1.67E+01	2.41E-01	7.59E-02	1.23E-01	9.49E-02	8.76E-01	3.12E-01	1.02E-02	3.51E+00	1.62E+01	1.08E+02	3.25E-02	1.76E-05	5.08E+00	2.77E-05
RS	1.93E+00	1.13E-04	1.83E+00	1.34E-05	5.38E+01	9.00E-02	2.46E+01	3.75E-01	6.33E-02	2.38E-04	1.16E+01	6.11E+00	4.72E-02	9.18E-03	5.26E-02	9.01E-03	2.99E-01	1.08E-01	1.16E-03	5.08E+00	2.42E+01	4.73E+01	1.26E-02	1.03E-05	4.10E+00	3.27E-06
RU	4.53E-02	1.10E+00	2.86E+00	7.85E-01	2.70E+00	2.73E+00	9.17E+00	3.26E+02	5.08E-01	1.77E-02	5.02E+01	7.67E+01	7.10E+00	9.61E+01	9.88E-01	2.11E+02	4.50E+00	5.18E+00	1.89E+01	1.57E+00	3.42E+00	1.66E+01	5.85E-01	1.11E-03	2.42E+00	2.51E+00
SE	2.18E-04	1.04E-04	5.52E-01	6.56E-05	4.03E-02	8.50E+00	7.98E-03	4.01E+00	5.04E-01	2.41E-06	1.07E+01	1.45E+02	7.12E+01	7.27E+00	2.33E+00	7.84E+01	1.05E+01	1.83E+01	1.35E-03	1.26E-03	9.39E-02	5.15E-01	2.01E+00	2.35E-03	5.25E-01	3.87E-06
SI	1.55E-02	7.10E-06	1.26E+01	7.33E-07	2.84E+00	2.85E-02	7.49E-02	2.93E-02	6.33E-02	1.85E-06	5.86E+00	4.44E+00	4.45E-03	2.48E-03	7.46E-02	2.19E-03	2.19E-01	3.37E-02	4.88E-05	3.17E-02	5.92E+01	7.68E+00	3.40E-03	1.15E-06	2.29E+01	1.03E-07
SK	6.33E-02	2.37E-05	1.04E+01	2.98E-06	6.70E+00	3.29E-01	7.14E-01	1.89E+00	3.13E-01	5.35E-07	1.99E+02	3.11E+01	3.06E-01	4.50E-02	1.74E-01	4.47E-02	1.23E+00	3.82E-01	2.82E-04	2.06E-01	9.44E+00	1.27E+02	3.70E-02	1.98E-05	3.77E+00	6.98E-07
TJ	5.24E-06	3.35E-03	8.73E-06	9.01E-04	2.23E-05	2.06E-06	9.78E-05	9.20E-05	1.07E-05	4.47E-06	4.47E-05	6.72E-05	2.01E-06	6.34E-06	5.67E-05	1.60E-05	5.13E-05	2.85E-06	3.40E-03	6.47E-05	2.09E-05	4.27E-05	3.88E-07	5.97E-09	4.97E-04	6.63E+00
TM	2.79E-05	1.39E-01	4.40E-04	1.01E-01	7.08E-04	2.38E-04	7.10E-03	2.50E-02	9.85E-05	2.56E-04	6.62E-03	6.96E-03	3.62E-04	1.38E-03	4.25E-04	3.29E-03	7.46E-04	3.71E-04	1.74E-01	9.17E-04	8.03E-04	3.45E-03	3.08E-05	7.14E-08	2.29E-03	2.59E-02
TR	7.29E-02	9.39E+00	3.12E-01	9.97E-02	1.25E+00	3.78E-02	2.63E+01	1.86E+00	2.58E-02	1.21E+00	2.51E+00	2.12E+00	9.68E-02	4.73E-02	6.63E-02	8.24E-02	1.50E-01	6.25E-02	7.76E+00	1.05E+01	1.00E+00	2.67E+00	8.08E-03	1.14E-05	1.12E+00	1.72E-05
UA	1.18E-01	4.01E-02	4.49E+00	1.33E-02	1.01E+01	8.83E-01	1.23E+01	1.45E+02	4.53E-01	6.71E-03	7.06E+01	4.79E+01	1.47E+00	1.51E+00	5.70E-01	2.19E+00	2.52E+00	1.32E+00	1.02E+00	2.04E+00	9.88E+00	7.50E+01	1.46E-01	8.40E-05	5.33E+00	7.81E-04
UZ	4.20E-05	7.06E-02	6.33E-04	3.04E-02	1.05E-03	6.31E-04	8.17E-03	6.07E-02	1.24E-04	1.50E-04	1.32E-02	1.56E-02	1.09E-03	5.78E-03	4.19E-04	1.72E-02	1.11E-03	1.42E-03	9.87E-02	9.16E-04	1.13E-03	5.09E-03	1.31E-04	1.80E-07	2.15E-03	3.48E+01

Table B8 *(continued)*

Code	KZ	LI	LT	LU	LV	MC	MD	ME	MK	MT	NL	NO	PL	PT	RO	RS	RU	SE	SI	SK	TJ	TM	TR	UA	UZ
AL	3.20E-03	3.36E-05	3.98E-03	6.38E-04	1.52E-03	3.33E-06	1.42E-01	1.02E+00	1.35E+01	1.14E-02	4.29E-03	2.66E-04	4.23E-01	3.49E-04	1.46E+00	5.06E+01	8.13E-02	9.30E-04	5.66E-02	3.09E-01	1.03E-07	2.59E-06	1.06E+00	3.39E-01	1.30E-06
AM	6.55E-02	1.80E-07	1.12E-03	2.26E-06	7.32E-04	1.75E-08	2.07E-02	9.04E-06	4.86E-04	2.92E-06	3.91E-05	2.52E-05	2.04E-02	1.59E-06	2.86E-02	3.27E-03	3.68E-01	2.15E-04	1.30E-04	1.71E-03	6.21E-07	1.82E-03	1.59E+01	1.94E-01	7.62E-04
AT	8.16E-04	1.13E-01	9.24E-02	1.51E-01	5.47E-02	6.15E-05	2.98E-02	6.67E-03	6.07E-02	2.24E-04	5.92E-01	6.00E-03	2.77E+01	1.01E-02	2.29E+00	4.68E+00	9.32E-02	1.66E-02	3.32E+01	2.07E+01	1.71E-08	6.94E-07	1.91E-02	5.00E-01	3.43E-07
AZ	1.42E+00	4.32E-07	3.10E-03	8.37E-06	1.99E-03	2.08E-08	3.02E-02	1.32E-05	7.43E-04	4.17E-06	1.41E-04	8.18E-05	4.69E-02	4.76E-06	4.67E-02	6.32E-03	1.42E+01	5.71E-04	2.26E-04	3.86E-03	9.97E-05	5.27E-02	5.75E+00	8.97E-01	1.76E-02
BA	2.60E-03	5.27E-04	6.62E-02	1.04E-02	2.12E-02	2.00E-05	2.75E-01	8.95E-01	5.39E-01	1.01E-02	6.42E-02	2.45E-03	1.55E+01	2.64E-03	8.03E+00	6.36E+01	1.01E-01	8.00E-03	1.92E+00	9.05E+00	8.72E-08	3.38E-06	1.23E-01	1.39E+00	1.65E-06
BE	2.29E-04	1.12E-03	1.91E-02	3.76E+00	6.37E-03	1.59E-05	2.15E-03	3.66E-05	4.93E-04	8.21E-06	1.32E+01	5.52E-03	1.85E+00	6.54E-02	2.28E-02	2.04E-02	2.68E-02	2.13E-02	6.95E-03	1.11E-01	3.52E-09	4.52E-08	2.78E-04	1.43E-01	2.68E-08
BG	1.90E-01	2.74E-04	5.31E-02	4.39E-03	2.51E-02	4.30E-06	1.31E+01	5.62E-02	6.09E+00	2.23E-03	3.94E-02	3.49E-03	5.77E+00	3.93E-04	1.21E+02	6.13E+01	3.85E+00	1.38E-02	4.04E-01	2.84E+00	4.33E-06	1.37E-04	2.95E+01	2.14E+01	6.43E-05
BY	4.16E-01	2.96E-03	8.67E+01	9.49E-02	3.02E+01	6.20E-06	1.28E+01	6.32E-03	9.00E-02	1.03E-04	1.25E+00	2.53E-01	6.81E+02	2.25E-02	2.44E+01	5.00E+00	1.47E+02	2.38E+00	1.16E+00	2.72E+01	9.57E-06	3.19E-04	7.10E+00	1.06E+03	2.32E-04
CH	6.80E-06	3.27E-01	1.46E-02	7.08E-02	7.75E-03	1.31E-04	4.50E-04	2.19E-04	4.30E-04	3.25E-05	6.51E-02	3.75E-04	3.84E-01	2.06E-02	5.49E-03	1.37E-02	8.27E-03	1.34E-03	8.74E-02	2.16E-02	3.70E-10	2.77E-08	2.59E-04	4.91E-03	2.05E-08
CY	8.57E-05	6.22E-07	3.15E-04	9.48E-06	1.18E-04	3.30E-08	1.37E-02	9.87E-05	3.12E-03	1.17E-04	1.09E-04	2.43E-05	1.97E-02	4.52E-06	5.53E-02	1.62E-02	1.23E-02	1.17E-04	7.39E-04	3.65E-03	2.88E-09	3.22E-07	6.54E+00	4.18E-02	1.42E-07
CZ	3.18E-03	2.32E-02	4.25E-01	3.84E-01	1.79E-01	1.63E-05	6.23E-02	7.86E-03	1.03E-01	5.31E-05	1.58E+00	4.06E-02	3.33E+02	2.69E-02	4.85E+00	8.57E+00	4.84E-01	1.35E-01	4.81E+00	8.93E+01	3.58E-08	7.16E-07	1.89E-02	2.66E+00	3.09E-07
DE	9.31E-03	2.84E-01	1.18E+00	1.48E+01	5.11E-01	1.09E-04	1.86E-01	1.58E-03	4.41E-02	6.76E-05	7.55E+01	3.69E-01	2.50E+02	3.30E-01	1.59E+00	1.29E+00	1.58E+00	9.60E-01	1.23E+00	8.67E+00	9.27E-08	4.86E-06	1.51E-02	4.78E+00	2.87E-06
DK	1.26E-03	9.17E-04	3.58E-01	1.19E-01	2.04E-01	4.45E-06	1.47E-02	1.23E-05	1.85E-04	2.48E-07	4.72E+00	9.45E-01	2.04E+01	2.96E-02	4.73E-02	1.88E-02	5.50E-01	2.09E+00	3.41E-02	6.50E-01	1.21E-08	4.08E-06	1.10E-03	3.46E-01	3.58E-06
EE	3.32E-02	6.34E-04	1.60E+01	2.29E-02	5.34E+01	4.80E-07	2.31E-01	4.13E-04	7.97E-03	2.91E-06	4.86E-01	2.55E-01	4.73E+01	3.66E-03	6.91E-01	2.47E-01	3.30E+01	3.59E+00	7.16E-02	1.59E+00	5.50E-07	1.78E-04	1.40E-01	4.72E+00	1.59E-04
ES	1.28E-05	7.50E-05	2.79E-04	1.02E-02	1.42E-04	5.96E-05	1.19E-03	4.97E-04	4.94E-03	3.80E-03	2.49E-02	9.89E-04	2.39E-02	7.56E+01	8.16E-03	3.92E-02	6.15E-04	1.22E-03	2.04E-02	4.94E-03	1.12E-10	4.29E-08	7.14E-03	2.81E-03	8.09E-09
FI	7.26E-02	1.09E-03	1.08E+01	5.56E-02	1.82E+01	2.44E-06	3.59E-01	7.30E-04	1.42E-02	7.23E-06	1.54E+00	3.28E+00	6.45E+01	2.63E-02	1.11E+00	4.33E-01	1.74E+02	3.31E+01	1.18E-01	2.57E+00	5.46E-06	4.29E-04	2.71E-01	6.75E+00	3.66E-04
FR	4.91E-04	2.05E-02	5.31E-02	7.13E+00	2.12E-02	1.57E-02	7.95E-03	2.12E-03	9.26E-03	3.66E-03	5.83E+00	2.88E-02	4.44E+00	2.57E+00	1.28E-01	2.95E-01	5.33E-02	6.70E-02	4.98E-01	3.94E-01	8.09E-09	3.72E-07	3.97E-03	2.84E-01	1.98E-07
GB	8.01E-04	6.61E-04	3.49E-01	1.67E-01	2.05E-01	5.02E-06	1.80E-03	5.06E-05	3.26E-04	1.15E-05	4.13E+00	3.38E-01	5.59E+00	5.52E-01	1.64E-02	1.49E-02	4.44E-01	3.94E-01	8.07E-03	9.34E-02	2.51E-08	1.51E-06	8.22E-04	1.54E-01	1.33E-06
GE	1.94E-01	8.34E-06	5.07E-02	1.72E-04	3.22E-02	1.30E-07	5.89E-01	2.47E-04	1.21E-02	1.54E-05	2.32E-03	1.20E-03	7.78E-01	1.14E-04	1.03E+00	1.64E-01	2.23E+01	9.57E-03	5.84E-03	7.24E-02	7.89E-07	4.51E-04	3.05E+01	6.43E+00	2.20E-04
GR	5.95E-02	1.11E-04	1.65E-02	2.09E-03	9.35E-03	4.94E-06	2.77E+00	2.47E-02	1.48E+01	2.61E-02	1.82E-02	1.39E-03	1.42E+00	5.63E-04	1.10E+01	1.66E+01	1.57E+00	4.35E-03	1.45E-01	7.99E-01	1.28E-06	2.96E-05	8.43E+01	7.11E+00	1.55E-05
HR	1.93E-03	9.50E-04	6.38E-02	1.16E-02	2.24E-02	4.52E-05	1.21E-01	2.47E-01	4.12E-01	6.52E-03	6.95E-02	2.21E-03	1.82E+01	3.54E-03	7.28E+00	4.13E+01	8.62E-02	8.29E-03	4.17E+01	1.01E+01	5.41E-08	2.27E-06	6.03E-02	1.02E+00	1.06E-06
HU	5.93E-03	1.96E-03	3.23E-01	2.34E-02	9.15E-02	2.05E-05	6.41E-01	1.30E-01	1.60E+00	2.76E-03	1.61E-01	7.75E-03	8.58E+01	2.40E-03	7.28E+01	8.81E+01	3.82E-01	3.01E-02	1.47E+01	1.76E+02	4.20E-08	9.76E-07	8.35E-02	8.33E+00	5.80E-07
IE	1.52E-04	8.78E-06	3.16E-02	5.71E-03	1.97E-02	9.66E-07	1.72E-04	4.52E-06	3.46E-05	1.43E-06	1.55E-01	1.98E-02	2.43E-01	1.14E-01	1.13E-03	7.06E-04	5.54E-02	5.50E-02	1.98E-04	2.88E-03	2.54E-09	4.46E-08	1.00E-04	1.64E-02	2.82E-08
IS	2.82E-04	9.02E-05	3.99E-02	7.79E-03	3.42E-02	3.84E-07	5.36E-04	4.33E-06	4.36E-05	5.40E-08	1.58E-01	3.51E-01	1.24E+00	1.09E-02	3.19E-03	2.76E-03	9.69E-02	1.47E-01	8.44E-03	6.94E-02	3.71E-08	2.87E-06	9.37E-04	2.96E-02	2.67E-06
IT	3.11E-03	4.36E-02	3.72E-02	3.64E-02	1.51E-02	6.88E-03	1.66E-01	2.65E-01	1.33E+00	2.31E-01	7.42E-02	1.52E-03	6.99E+00	2.91E-02	2.86E+00	1.10E+01	1.08E-01	4.73E-03	2.28E+01	3.11E+00	1.40E-07	6.49E-06	6.96E-01	6.95E-01	2.92E-06
KY	1.30E+02	1.07E-07	1.13E-04	4.09E-07	8.33E-05	2.15E-08	7.33E-04	2.62E-06	2.30E-04	4.97E-07	7.16E-06	4.72E-06	1.55E-03	3.17E-06	1.36E-03	5.67E-04	1.16E-01	2.61E-05	2.43E-05	1.59E-04	1.82E+01	7.89E-02	3.61E-02	2.58E-02	2.51E+01
KZ	5.35E+03	4.60E-05	3.31E-01	1.12E-03	2.50E-01	9.75E-07	1.25E+00	8.15E-04	3.52E-02	7.62E-05	2.36E-02	1.76E-02	4.79E+00	8.21E-04	2.55E+00	3.68E-01	4.31E+02	9.68E-02	2.13E-02	3.68E-01	8.04E+00	3.20E+00	7.93E+00	7.45E+01	3.70E+01
LI	2.82E-08	1.98E-02	1.03E-04	2.20E-04	5.72E-05	4.49E-07	2.56E-06	1.02E-06	2.05E-06	9.48E-08	2.64E-04	1.77E-06	3.19E-03	5.54E-05	3.41E-05	8.64E-05	6.04E-05	5.83E-06	6.27E-04	1.61E-04	2.91E-12	3.67E-10	1.09E-06	3.29E-05	3.27E-10
LT	4.42E-02	1.36E-03	3.13E+02	5.11E-02	2.99E+01	9.14E-07	6.48E-01	9.19E-04	1.59E-02	7.49E-06	1.03E+00	1.70E-01	2.73E+02	8.75E-03	1.94E+00	7.46E-01	4.50E+01	2.42E+00	2.64E-01	5.87E+00	2.97E-07	5.64E-05	4.96E-01	1.90E+01	4.91E-05
LU	1.48E-05	2.91E-04	1.13E-03	4.87E+00	4.10E-04	2.59E-06	1.24E-04	5.06E-06	3.10E-05	1.48E-06	2.69E-01	2.29E-04	1.61E-01	7.05E-03	2.43E-03	2.68E-03	1.21E-03	1.12E-03	1.52E-03	1.36E-02	2.69E-10	5.46E-09	3.43E-05	7.79E-03	3.23E-09
LV	5.52E-02	1.34E-03	9.17E+01	4.75E-02	3.24E+02	8.38E-07	4.67E-01	7.83E-04	1.46E-02	6.52E-06	9.46E-01	2.58E-01	1.36E+02	5.60E-03	1.45E+00	5.67E-01	3.21E+01	4.19E+00	1.85E-01	3.80E+00	5.91E-07	1.62E-04	3.59E-01	1.19E+01	1.43E-04
MC	4.67E-09	2.34E-07	5.27E-07	5.75E-07	2.65E-07	1.33E-04	3.51E-07	9.74E-08	2.98E-07	1.23E-07	1.12E-06	5.31E-08	2.73E-05	1.93E-06	7.38E-06	2.19E-05	4.63E-07	1.01E-07	7.96E-05	8.40E-06	2.52E-13	2.20E-11	1.98E-07	2.08E-06	1.50E-11
MD	5.66E-02	6.91E-05	1.91E-01	1.16E-03	7.38E-02	1.28E-06	2.77E+02	1.73E-03	4.99E-02	7.83E-05	1.32E-02	3.91E-03	9.66E+00	1.42E-04	6.71E+01	8.10E-01	2.09E+00	2.66E-02	6.18E-02	1.31E+00	3.09E-06	4.14E-05	3.75E+00	4.11E+01	3.32E-05
ME	1.05E-03	4.90E-05	6.67E-03	1.02E-03	2.35E-03	2.85E-06	8.79E-02	4.62E+00	9.78E-01	6.18E-03	7.23E-03	3.65E-04	8.18E-01	7.16E-04	1.47E+00	2.84E+01	2.85E-02	1.21E-03	7.98E-02	5.97E-01	4.11E-08	1.24E-06	1.30E-01	2.45E-01	6.07E-07
MK	4.78E-03	4.23E-05	4.75E-03	8.63E-04	1.92E-03	1.22E-06	2.75E-01	3.05E-02	8.36E+01	2.58E-03	7.74E-03	6.22E-04	6.00E-01	9.70E-05	2.65E+00	4.97E+01	1.08E-01	1.80E-03	6.16E-02	4.75E-01	1.15E-07	1.85E-06	1.63E+00	5.46E-01	1.08E-06
MT	3.48E-07	2.63E-07	6.36E-06	1.17E-06	2.32E-06	4.60E-08	6.28E-05	6.26E-05	7.20E-04	6.99E-02	7.67E-06	1.92E-07	7.91E-04	1.23E-05	1.05E-03	3.56E-03	4.04E-05	5.77E-07	3.52E-04	4.01E-04	1.20E-12	8.35E-10	8.13E-04	3.32E-04	6.67E-10
NL	3.09E-04	1.21E-03	4.81E-02	5.35E-01	1.94E-02	8.28E-06	4.37E-03	1.78E-05	3.50E-04	6.46E-06	9.93E+01	1.91E-02	2.67E+00	7.00E-02	2.25E-02	1.17E-02	6.32E-02	5.37E-02	8.63E-03	1.03E-01	4.83E-09	4.94E-08	2.12E-04	1.72E-01	3.17E-08
NO	7.67E-03	1.05E-03	1.18E+00	1.50E-01	1.04E+00	7.20E-06	1.22E-02	2.33E-05	3.23E-04	1.78E-06	4.60E+00	2.08E+02	2.43E+01	7.34E-02	5.04E-02	2.50E-02	6.45E+00	1.70E+01	6.30E-02	1.03E+00	2.83E-06	3.28E-05	1.43E-02	5.14E-01	2.96E-05
PL	7.17E-02	2.07E-02	2.27E+01	6.37E-01	5.06E+00	2.39E-05	3.90E+00	2.61E-02	3.77E-01	1.89E-04	8.38E+00	8.81E-01	8.63E+03	7.22E-02	3.47E+01	1.87E+01	4.73E+01	6.00E+00	6.23E+00	2.93E+02	4.98E-07	1.82E-05	3.70E-01	8.58E+01	1.36E-05
PT	3.19E-07	2.56E-06	4.77E-06	1.72E-04	5.05E-06	2.70E-07	1.67E-05	1.03E-05	9.81E-05	4.59E-05	7.35E-04	3.64E-05	2.77E-04	5.27E+02	9.68E-05	5.28E-04	2.21E-05	2.63E-05	1.85E-04	5.76E-05	1.24E-12	1.09E-09	1.54E-04	3.68E-05	1.79E-10
RO	2.48E-01	2.18E-03	6.33E-01	2.54E-02	2.40E-01	2.06E-05	7.82E+01	1.28E-01	3.25E+00	2.85E-03	2.10E-01	3.07E-02	7.28E+01	3.27E-03	1.98E+03	1.33E+02	5.39E+00	1.36E-01	3.17E+00	3.96E+01	3.76E-06	9.51E-05	1.07E+01	7.27E+01	7.58E-05
RS	2.11E-02	5.68E-04	8.67E-02	9.86E-03	2.81E-02	1.11E-05	1.36E+00	1.35E+00	3.16E+01	5.65E-03	8.87E-02	6.52E-03	1.76E+01	1.13E-03	5.99E+01	9.13E+02	3.47E-01	1.93E-02	1.31E+00	1.35E+01	2.87E-07	8.39E-06	1.32E+00	3.18E+00	4.17E-06
RU	1.28E+03	4.47E-03	6.62E+01	1.48E-01	8.78E+01	1.58E-05	3.62E+01	1.52E-02	4.15E-01	8.59E-04	2.78E+00	2.66E+00	4.85E+02	4.88E-02	6.77E+01	9.56E+00	2.61E+04	1.53E+01	1.30E+00	2.38E+01	3.01E-01	5.49E-01	1.52E+02	1.92E+03	1.03E+00
SE	3.46E-02	3.44E-03	8.01E+00	3.40E-01	7.46E+00	9.94E-06	8.39E-02	9.90E-05	1.96E-03	1.30E-06	1.00E+01	2.93E+01	9.07E+01	7.58E-02	2.48E-01	6.97E-02	1.89E+01	4.30E+02	6.42E-02	1.55E+00	1.32E-06	1.31E-04	3.68E-02	3.55E+00	1.13E-04
SI	3.42E-04	7.12E-04	1.53E-02	4.25E-03	6.75E-03	2.51E-05	1.85E-02	8.26E-03	4.39E-02	6.96E-04	2.02E-02	4.71E-04	4.50E+00	9.79E-04	1.26E+00	3.14E+00	1.92E-02	2.24E-03	1.35E+02	2.04E+00	1.16E-08	5.91E-07	1.10E-02	1.51E-01	2.55E-07
SK	5.54E-03	3.08E-03	6.00E-01	4.38E-02	1.45E-01	1.27E-05	4.19E-01	3.73E-02	4.37E-01	3.16E-04	3.05E-01	3.25E-02	3.78E+02	5.01E-03	2.42E+01	1.93E+01	5.84E-01	1.27E-01	3.73E+00	6.59E+02	4.10E-08	7.90E-07	3.83E-02	8.61E+00	4.05E-07
TJ	4.16E+00	6.27E-08	1.41E-05	1.45E-07	9.11E-06	1.07E-08	1.28E-04	5.08E-07	3.83E-05	1.02E-07	1.63E-06	7.09E-07	3.04E-04	8.57E-07	2.45E-04	8.84E-05	2.63E-02	2.61E-06	1.08E-05	4.58E-05	1.41E+02	3.11E-01	1.42E-02	3.51E-03	1.06E+01
TM	9.51E+00	6.88E-07	3.70E-03	1.61E-05	2.24E-03	1.86E-08	1.68E-02	4.80E-06	5.25E-04	5.24E-07	1.99E-04	8.31E-05	4.71E-02	1.54E-05	2.93E-02	5.27E-03	3.49E+00	5.63E-04	3.09E-04	4.00E-03	2.95E+00	5.15E+01	6.05E-01	9.76E-01	1.58E+01
TR	2.48E-01	2.19E-04	3.21E-01	3.41E-03	1.36E-01	4.23E-06	1.72E+01	1.26E-02	5.27E-01	8.63E-03	3.84E-02	1.39E-02	1.32E+01	1.49E-03	5.13E+01	6.88E+00	2.19E+01	7.98E-02	2.17E-01	1.83E+00	2.30E-06	1.33E-03	6.13E+03	6.15E+01	6.73E-04
UA	3.75E+00	4.18E-03	1.06E+01	8.62E-02	4.25E+00	2.84E-05	1.94E+02	5.35E-02	8.04E-01	1.23E-03	8.01E-01	2.41E-01	7.23E+02	2.26E-02	2.81E+02	2.99E+01	3.87E+02	1.57E+00	2.89E+00	9.33E+01	2.03E-04	9.99E-03	1.07E+02	7.08E+03	7.09E-03
UZ	1.39E+02	9.52E-07	9.46E-03	2.77E-05	6.71E-03	2.44E-08	3.76E-02	7.36E-06	4.55E-04	6.38E-07	6.63E-04	3.30E-04	1.22E-01	1.55E-05	4.96E-02	5.64E-03	5.53E+00	2.10E-03	4.23E-04	7.19E-03	2.57E+01	8.42E+00	3.74E-01	2.62E+00	1.59E+02

Annex C. Evaluation of modelling results vs. observations

Results of heavy metal and POP modelling were evaluated against observations from the EMEP monitoring network. Observations for Pb, Cd, Hg, B(a)P, B(b)F, B(k)F, and IP were downloaded from the EBAS database (ebas-data.nilu.no) and pre-processed to perform quality control on the measurement data. The data were filtered for outliers using the standard three-sigma limit approach and checked for temporal coverage during the simulation period. Measurement sites with coverage below six months of the year were not included in the statistical summary. A summary of the statistical parameters from the evaluation is provided in Table C1. By-site evaluations of simulated air concentration and wet deposition for individual pollutants are presented in Tables C2-C15. Measurement sites that are not included in the statistical summary are marked in grey in the tables.

Table C1. *Summary of statistical parameters for evaluating modelling results against observations. Notations:* ***N*** *is the number of measurement sites;* R_{corr} *is the Pearson correlation coefficient of spatial variation;* ***Bias*** *is the mean relative bias of annual values;* ***F2*** *is the fraction of annual measurements that agree with the model within a factor of 2.*

Pollutant	Parameter	N	R_{corr}	Bias, %	F2, %
Pb	air concentration	50	0.73	12	82
	wet deposition	49	0.37	-36	45
Cd	air concentration	43	0.76	32	77
	wet deposition	47	0.40	-55	46
Hg	air concentration	17	0.27	-3	100
	wet deposition	23	0.25	33	61
B(a)P	air concentration	23	0.69	17	65
	wet deposition	18	0.74	-51	50
B(b)F	air concentration	16	0.99	4	94
	wet deposition	14	0.89	-48	50
B(k)F	air concentration	10	0.99	-8	80
	wet deposition	12	0.9	-45	50
IP	air concentration	26	0.63	-18	73
	wet deposition	20	0.78	-48	55

Table C2. *Statistical parameters for evaluating modelled Pb air concentration (ng m^{-3}) against measurements.*

Station name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias, %
Koksijde	BE0014R	2.66	51.12	3.52	6.36	0.59	80.84
Kosetice	CZ0003R	15.08	49.57	2.06	3.04	0.85	47.31
Churanov	CZ0005R	13.60	49.07	1.34	1.47	0.83	9.79
Westerland	DE0001R	8.31	54.93	1.54	2.17	0.69	40.79
Waldhof	DE0002R	10.76	52.80	2.27	2.54	0.67	11.81
Schauinsland	DE0003R	7.91	47.92	1.03	1.96	0.63	90.52
Neuglobsow	DE0007R	13.03	53.14	2.29	1.93	0.89	-15.78
Schmucke	DE0008R	10.77	50.65	1.39	1.79	0.21	28.92
Zingst	DE0009R	12.73	54.44	1.54	1.99	0.85	29.37
Anholt	DK0008R	11.52	56.72	1.02	1.70	0.63	67.49
Station Nord	DK0010G	-16.67	81.60	0.28	0.06	0.40	-79.00
Riscoe	DK0012R	12.09	55.69	1.02	3.82	0.76	274.98
San Pablo de los Montes	ES0001R	-4.35	39.55	1.51	1.15	0.41	-23.70
Viznar	ES0007R	-3.53	37.24	1.77	1.29	0.75	-26.77
Niembro	ES0008R	-4.85	43.44	2.88	2.34	0.07	-18.64
Campisabalos	ES0009R	-3.14	41.27	1.26	0.98	0.67	-22.29
ElTorms	ES0014R	0.74	41.39	1.12	1.94	0.03	73.01
Montseny	ES1778R	2.35	41.77	1.25	4.26	0.13	239.66
Virolahti III	FI0018R	27.67	60.53	1.45	0.60	-0.11	-58.96
Pallas (Ma torova)	FI0036R	24.24	68.00	0.29	0.17	-0.02	-40.47
Hyytiälä	FI0050R	24.28	61.85	0.72	0.27	0.47	-62.02
Donon	FR0008R	7.13	48.50	1.41	1.87	0.78	33.10
Revin	FR0009R	4.63	49.90	4.16	2.34	0.50	-43.84
Peyrusse Vieille	FR0013R	0.18	43.62	1.33	1.26	0.56	-5.60
Saint-Nazaire-le-Desert	FR0023R	5.28	44.57	1.30	1.33	0.07	2.41
Verneuil	FR0025R	2.61	46.82	1.40	1.54	0.78	9.46
Kergoff	FR0028R	-2.94	48.26	1.06	1.58	0.68	49.92
Yarner Wood	GB0013R	-3.71	50.60	1.42	2.06	0.60	44.46
Heigham Holmes	GB0017R	1.62	52.72	2.90	4.17	0.62	43.89
Auchencorth Moss	GB0048R	-3.24	55.79	0.81	2.12	0.72	162.00
Chilbolton Observa tory	GB1055R	-1.44	51.15	2.89	3.53	0.67	22.22
K-puszta	HU0002R	19.55	46.97	4.69	4.19	-0.33	-10.59
Ves tmannaeyjar	IS0091R	-20.29	63.40	0.12	0.64	0.16	424.86
Ruca va	LV0010R	21.17	56.16	3.14	1.21	0.16	-61.60
Bil thoven	NL0008R	5.20	52.12	5.06	4.15	0.61	-17.93
Cabauw Wielsekade	NL0644R	4.92	51.97	6.29	4.55	0.54	-27.72
Birkenes II	NO0002R	8.25	58.39	0.56	0.61	0.42	9.67
Zeppelin mountain (Ny-Alesund)	NO0042G	11.89	78.91	0.29	0.23	-0.22	-22.48
Svanvik	NO0047R	30.03	69.45	0.47	0.29	0.56	-38.89
Diabla Gora	PL0005R	22.07	54.15	1.64	1.63	0.56	-0.65
Zielonka	PL0009R	17.93	53.66	1.06	2.28	0.13	115.34
Bredkälen	SE0005R	15.33	63.85	0.18	0.14	0.67	-19.68
Råö	SE0014R	11.91	57.39	0.71	1.26	0.48	77.01
Hallahus	SE0020R	13.15	56.04	1.03	1.79	0.45	74.28
Norunda Stenen	SE0022R	17.51	60.09	0.59	0.32	0.45	-46.22
Iskrba	SI0008R	14.87	45.57	1.66	1.50	0.51	-10.13
Chopok	SK0002R	19.58	48.93	1.31	1.57	0.39	19.54
Stara Lesna	SK0004R	20.28	49.15	2.75	2.07	0.57	-24.49
Starina	SK0006R	22.27	49.05	2.10	1.83	0.51	-12.74
Topolniky	SK0007R	17.86	47.96	3.93	4.33	0.68	10.30

Table C3. *Statistical parameters for evaluating modelled Pb wet deposition (g km^{-2}y^{-1}) against measurements.*

Station name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias, %
Koksijde	BE0014R	2.66	51.12	238.8	350.6	0.27	46.82
Kosetice [a]	CZ0003R	15.08	49.57	1847.9	417.1	0.39	-77.43
Westerland	DE0001R	8.31	54.93	171.6	288.7	0.14	68.26
Waldhof	DE0002R	10.76	52.80	290.9	188.5	-0.03	-35.20
Schauinsland	DE0003R	7.91	47.92	477.7	369.6	0.26	-22.63
Neuglobsow	DE0007R	13.03	53.14	249.7	224.3	-0.14	-10.15
Schmucke	DE0008R	10.77	50.65	534.1	397.8	0.89	-25.52
Zingst	DE0009R	12.73	54.44	157.4	130.7	0.34	-16.95
Anholt	DK0008R	10.74	54.75	644.4	131.7	-0.13	-79.56
Station Nord	DK0010G	11.52	56.72	465.6	154.8	-0.10	-66.75
Riscoe	DK0012R	12.09	55.69	304.4	206.9	0.47	-32.03
Sepstrup Sande	DK0022R	9.42	56.08	781.4	192.8	0.12	-75.32
Lahemaa	EE0009R	25.90	59.50	178.9	88.9	-0.04	-50.32
Vilsandi	EE0011R	21.82	58.38	128.8	126.2	0.51	-2.00
San Pablo de los Montes [a]	ES0001R	-4.35	39.55	167.4	196.6	0.90	17.44
Viznar [a]	ES0007R	-3.53	37.24	193.6	528.8	-0.31	173.11
Niembro [a]	ES0008R	-4.85	43.44	120.5	191.6	0.99	59.07
Zarra [a]	ES0012R	-1.10	39.08	237.0	433.5	0.49	82.93
ElTorms [a]	ES0014R	0.74	41.39	148.0	283.3	-0.41	91.42
Virolahti III	FI0018R	27.67	60.53	424.4	143.9	0.64	-66.10
Pallas (Ma torova)	FI0036R	24.24	68.00	107.5	34.9	0.18	-67.58
Hyytiälä	FI0050R	24.28	61.85	241.7	75.8	0.36	-68.64
Hailuoto II	FI0053R	24.69	65.00	97.7	51.9	0.19	-46.87
Hietajärvi	FI0092R	30.72	63.17	169.3	62.3	0.43	-63.19
Kotinen	FI0093R	25.07	61.23	159.6	106.2	0.39	-33.46
Donon	FR0008R	7.13	48.50	599.9	189.2	0.65	-68.46
Revin	FR0009R	4.63	49.90	734.4	277.9	0.16	-62.16
Peyrusse Vieille	FR0013R	0.18	43.62	346.3	148.3	0.87	-57.18
Saint-Nazaire-le-Desert	FR0023R	5.28	44.57	470.9	244.7	-0.16	-48.04
Verneuil	FR0025R	2.61	46.82	452.6	180.9	0.05	-60.03
Kergoff	FR0028R	-2.94	48.26	299.7	188.2	0.45	-37.22
Porspoder	FR0090R	-4.75	48.52	239.7	203.3	0.77	-15.19
Yarner Wood	GB0013R	-3.71	50.60	45.7	190.2	-0.19	315.83
Heigham Holmes	GB0017R	1.62	52.72	178.1	160.8	0.57	-9.74
Auchencorth Moss	GB0048R	-3.24	55.79	26.4	152.1	-0.57	476.33
Chilbolton Observa tory	GB1055R	-1.44	51.15	64.1	243.6	0.52	280.11
K-puszta	HU0002R	19.55	46.97	1054.5	264.0	0.20	-74.97
Valentia Observatory [a]	IE0001R	-10.24	51.94	10079.6	326.1	-0.26	-96.76
Ves tmannaeyjar	IS0091R	-20.29	63.40	423.0	234.3	0.36	-44.61
Monte Martano [a]	IT0019R	12.57	42.81	2085.8	291.1	0.16	-86.04
Vredepeel	NL0010R	5.85	51.54	698.3	295.1	-0.09	-57.74
De Zilk	NL0091R	4.50	52.30	328.1	282.2	-0.18	-13.97
Birkenes	NO0001R	8.25	58.38	575.2	281.2	0.86	-51.12
Kårva tn	NO0039R	8.88	62.78	287.2	185.5	0.83	-35.43
Svanvik	NO0047R	30.03	69.45	195.4	54.6	0.88	-72.07
Hurdal	NO0056R	11.08	60.37	325.4	133.8	0.63	-58.89
Leba	PL0004R	17.53	54.75	96.2	197.6	0.41	105.38
Diabla Gora	PL0005R	22.07	54.15	221.0	257.4	0.11	16.47
Bredkälen	SE0005R	15.33	63.85	112.2	48.5	0.10	-56.74
Råö	SE0014R	11.91	57.39	242.0	261.1	-0.26	7.92
Hallahus	SE0020R	13.15	56.04	527.4	250.0	0.06	-52.60
Norunda Stenen	SE0022R	17.51	60.09	323.6	62.1	0.07	-80.82
Iskrba	SI0008R	14.87	45.57	668.2	445.5	0.34	-33.33
Chopok	SK0002R	19.58	48.93	1057.6	355.0	0.14	-66.44
Stara Lesna	SK0004R	20.28	49.15	508.9	409.1	0.55	-19.62
Starina	SK0006R	22.27	49.05	101.6	611.2	0.43	501.73
Topolniky	SK0007R	17.86	47.96	534.3	262.3	0.15	-50.91

[a] The measurement site is not included in the overall statistics due to insufficient temporal coverage for the year.

Table C4. *Statistical parameters for evaluating modelled Cd air concentration (ng m^{-3}) against measurements.*

Station name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias, %
Koksijde	BE0014R	2.66	51.12	0.093	0.205	0.84	119.10
Kosetice	CZ0003R	15.08	49.57	0.072	0.094	0.83	29.79
Churanov	CZ0005R	13.60	49.07	0.041	0.054	0.73	30.09
Westerland	DE0001R	8.31	54.93	0.046	0.079	0.64	69.32
Waldhof	DE0002R	10.76	52.80	0.071	0.090	0.63	27.96
Schauinsland	DE0003R	7.91	47.92	0.023	0.072	0.66	209.75
Neuglobsow	DE0007R	13.03	53.14	0.073	0.062	0.83	-15.19
Schmucke	DE0008R	10.77	50.65	0.037	0.072	0.27	95.13
Zingst	DE0009R	12.73	54.44	0.049	0.070	0.75	42.99
Anholt	DK0008R	11.52	56.72	0.045	0.059	0.47	33.21
Station Nord	DK0010G	-16.67	81.60	0.012	0.003	0.89	-70.01
Riscoe	DK0012R	12.09	55.69	0.045	0.114	0.55	156.95
Niembro	ES0008R	-4.85	43.44	0.072	0.060	0.56	-16.44
Virolahti III	FI0018R	27.67	60.53	0.044	0.027	0.54	-39.70
Pallas (Ma torova)	FI0036R	24.24	68.00	0.012	0.009	-0.06	-26.21
Hyytiälä	FI0050R	24.28	61.85	0.030	0.013	0.69	-55.80
Donon	FR0008R	7.13	48.50	0.032	0.057	0.77	79.36
Revin	FR0009R	4.63	49.90	0.074	0.079	0.74	6.51
Peyrusse Vieille	FR0013R	0.18	43.62	0.037	0.038	0.69	3.83
Saint-Nazaire-le-Desert	FR0023R	5.28	44.57	0.023	0.033	0.18	44.90
Verneuil	FR0025R	2.61	46.82	0.044	0.037	0.80	-15.67
Kergoff	FR0028R	-2.94	48.26	0.032	0.042	0.62	31.04
Yarner Wood	GB0013R	-3.71	50.60	0.046	0.067	0.62	46.49
Heigham Holmes	GB0017R	1.62	52.72	0.074	0.129	0.74	74.35
Auchencorth Moss	GB0048R	-3.24	55.79	0.024	0.059	0.69	139.19
Chilbolton Observa tory	GB1055R	-1.44	51.15	0.082	0.115	0.65	40.89
K-puszta	HU0002R	19.55	46.97	0.105	0.153	0.44	45.87
Ves tmannaeyjar	IS0091R	-20.29	63.40	0.004	0.022	0.05	390.85
Ruca va	LV0010R	21.17	56.16	0.051	0.043	0.44	-15.82
Birkenes II	NO0002R	8.25	58.39	0.020	0.023	0.36	14.43
Zeppelin mountain (Ny-Alesund)	NO0042G	11.89	78.91	0.038	0.008	-0.37	-78.42
Svanvik	NO0047R	30.03	69.45	0.018	0.016	0.32	-10.97
Diabla Gora	PL0005R	22.07	54.15	0.087	0.058	0.01	-32.99
Zielonka	PL0009R	17.93	53.66	0.032	0.075	0.29	136.30
Bredkälen	SE0005R	15.33	63.85	0.007	0.006	0.52	-7.19
Råö	SE0014R	11.91	57.39	0.026	0.045	0.41	73.42
Hallahus	SE0020R	13.15	56.04	0.031	0.059	0.50	87.80
Norunda Stenen	SE0022R	17.51	60.09	0.022	0.013	0.38	-41.19
Iskrba	SI0008R	14.87	45.57	0.090	0.075	0.53	-16.61
Chopok	SK0002R	19.58	48.93	0.031	0.065	-0.14	106.48
Stara Lesna	SK0004R	20.28	49.15	0.068	0.083	0.52	21.53
Starina	SK0006R	22.27	49.05	0.082	0.071	0.48	-14.41
Topolniky	SK0007R	17.86	47.96	0.082	0.132	0.77	60.91

Table C5. *Statistical parameters for evaluating modelled Cd wet deposition (g km^{-2}y^{-1}) against measurements.*

Station name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias, %
Koksijde	BE0014R	2.66	51.12	10.5	11.3	0.33	8.56
Westerland	DE0001R	8.31	54.93	5.9	10.3	0.57	73.61
Waldhof	DE0002R	10.76	52.80	9.0	7.8	0.29	-13.20
Schauinsland	DE0003R	7.91	47.92	12.2	12.7	0.60	4.09
Neuglobsow	DE0007R	13.03	53.14	8.2	7.8	-0.02	-4.71
Schmucke	DE0008R	10.77	50.65	14.2	13.8	0.87	-2.59
Zingst	DE0009R	12.73	54.44	5.8	5.2	0.59	-9.64
Keldsnor	DK0005R	10.74	54.75	21.2	5.2	0.12	-75.20
Anholt	DK0008R	11.52	56.72	13.7	6.2	-0.03	-55.18
Riscoe	DK0012R	12.09	55.69	16.0	7.9	0.25	-51.00
Sepstrup Sande	DK0022R	9.42	56.08	13.3	7.2	0.14	-46.06
Lahemaa[(a)]	EE0009R	25.90	59.50	16.3	3.7	0.47	-77.51
Vilsandi [(a)]	EE0011R	21.82	58.38	25.6	4.7	0.03	-81.56
Viznar [(a)]	ES0007R	-3.53	37.24	5.4	15.4	-1.00	183.16
Niembro [(a)]	ES0008R	-4.85	43.44	32.6	5.4	-0.33	-83.56
Zarra [(a)]	ES0012R	-1.10	39.08	9.2	14.9	1.00	61.74
Virolahti III	FI0018R	27.67	60.53	13.2	5.5	0.89	-57.97
Pallas (Ma torova)	FI0036R	24.24	68.00	4.3	2.1	0.17	-51.64
Hyytiälä	FI0050R	24.28	61.85	9.0	3.0	0.20	-66.05
Hailuoto II	FI0053R	24.69	65.00	3.7	2.2	0.44	-39.95
Hietajärvi	FI0092R	30.72	63.17	6.4	3.0	0.56	-53.38
Kotinen	FI0093R	25.07	61.23	6.3	4.0	0.62	-37.27
Donon	FR0008R	7.13	48.50	41.8	6.2	-0.04	-85.09
Revin	FR0009R	4.63	49.90	25.9	7.1	-0.42	-72.39
Peyrusse Vieille	FR0013R	0.18	43.62	13.5	5.1	0.50	-62.45
Saint-Nazaire-le-Desert	FR0023R	5.28	44.57	17.7	7.0	-0.31	-60.49
Verneuil	FR0025R	2.61	46.82	26.2	5.7	0.15	-78.27
Kergoff	FR0028R	-2.94	48.26	17.3	6.0	0.76	-65.10
Porspoder	FR0090R	-4.75	48.52	9.0	7.8	0.08	-12.94
Lough Navar	GB0006R	-7.87	54.44	6.4	4.9	0.44	-23.36
Yarner Wood	GB0013R	-3.71	50.60	5.2	6.4	0.41	24.90
Heigham Holmes	GB0017R	1.62	52.72	5.3	5.3	0.67	-0.11
Auchencorth Moss	GB0048R	-3.24	55.79	3.1	5.0	0.47	61.94
Chilbolton Observa tory	GB1055R	-1.44	51.15	3.0	8.5	0.25	183.51
K-puszta	HU0002R	19.55	46.97	13.6	10.0	0.15	-26.81
Ves tmannaeyjar	IS0091R	-20.29	63.40	41.1	8.6	0.06	-79.19
Monte Martano [(a)]	IT0019R	12.57	42.81	182.6	6.9	-0.25	-96.22
Vredepeel	NL0010R	5.85	51.54	34.6	15.4	-0.29	-55.54
Birkenes	NO0001R	8.25	58.38	29.3	10.4	0.87	-64.58
Kårva tn	NO0039R	8.88	62.78	12.9	6.7	0.53	-47.91
Svanvik	NO0047R	30.03	69.45	12.6	2.7	0.68	-78.62
Hurdal	NO0056R	11.08	60.37	18.6	5.6	0.68	-69.86
Leba	PL0004R	17.53	54.75	4.6	6.9	0.38	49.89
Diabla Gora	PL0005R	22.07	54.15	10.4	8.0	0.20	-22.75
Bredkälen	SE0005R	15.33	63.85	5.6	2.0	0.08	-64.71
Råö	SE0014R	11.91	57.39	19.3	9.9	-0.34	-48.36
Hallahus	SE0020R	13.15	56.04	21.4	9.1	-0.28	-57.64
Norunda Stenen	SE0022R	17.51	60.09	9.5	2.5	0.57	-73.24
Iskrba	SI0008R	14.87	45.57	11.6	16.0	-0.04	37.26
Chopok	SK0002R	19.58	48.93	81.4	11.1	0.06	-86.37
Stara Lesna	SK0004R	20.28	49.15	86.8	14.4	0.25	-83.46
Starina	SK0006R	22.27	49.05	14.5	18.6	0.35	28.44
Topolniky	SK0007R	17.86	47.96	26.8	9.1	0.37	-65.86

[(a)] The measurement site is not included in the overall statistics due to insufficient temporal coverage for the year.

Table C6. *Statistical parameters for evaluating modelled Hg^0 air concentration (ng m^{-3}) against measurements. The concentrations are given at standard temperature and pressure (STP).*

Station name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias, %
Waldhof	DE0002R	10.76	52.80	1.59	1.32	-0.17	-17.03
Schauinsland	DE0003R	7.91	47.92	1.07	1.29	0.57	20.49
Schmucke	DE0008R	10.77	50.65	1.51	1.35	0.21	-10.71
Zingst	DE0009R	12.73	54.44	1.37	1.38	0.25	0.89
Station Nord	DK0010G	-16.67	81.60	1.20	1.21	0.67	1.15
Virolahti III	FI0018R	27.67	60.53	1.18	1.30	0.33	9.77
Pallas (Ma torova)	FI0036R	24.24	68.00	1.25	1.24	0.34	-1.01
Hyytiälä	FI0050R	24.28	61.85	1.21	1.27	0.10	5.37
Auchencorth Moss	GB0048R	-3.24	55.79	1.32	1.30	0.81	-1.03
Chilbolton Observa tory	GB1055R	-1.44	51.15	1.50	1.38	0.61	-7.96
Birkenes II	NO0002R	8.25	58.39	1.47	1.31	0.79	-10.29
Zeppelin mountain (Ny-Alesund)	NO0042G	11.89	78.91	1.49	1.24	0.66	-17.34
Sofienbergparken	NO0073U	10.77	59.92	1.58	1.28	0.69	-19.26
Diabla Gora	PL0005R	22.07	54.15	1.31	1.30	0.55	-1.15
Bredkälen	SE0005R	15.33	63.85	1.23	1.24	0.65	1.09
Råö	SE0014R	11.91	57.39	1.24	1.37	-0.08	10.92
Hallahus	SE0020R	13.15	56.04	1.24	1.34	-0.04	8.36

Table C7. *Statistical parameters for evaluating modelled Hg wet deposition (g $km^{-2}y^{-1}$) against measurements.*

Station name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias, %
Kosetice [(a)]	CZ0003R	15.08	49.57	1.05	9.70	-0.01	821.49
Westerland	DE0001R	8.31	54.93	2.72	5.22	0.32	92.13
Waldhof	DE0002R	10.76	52.80	3.14	4.26	0.50	35.65
Schauinsland	DE0003R	7.91	47.92	7.23	12.08	0.68	67.04
Schmucke	DE0008R	10.77	50.65	4.19	9.50	0.09	126.83
Zingst	DE0009R	12.73	54.44	2.12	3.00	0.58	41.58
Niembro	ES0008R	-4.85	43.44	10.60	3.88	0.29	-63.39
Virolahti III	FI0018R	27.67	60.53	2.34	4.20	0.32	79.16
Pallas (Ma torova)	FI0036R	24.24	68.00	1.35	2.73	0.58	102.06
Hyytiälä	FI0050R	24.28	61.85	1.97	3.61	0.80	83.54
Kotinen	FI0093R	25.07	61.23	2.33	4.20	0.57	80.62
Yarner Wood	GB0013R	-3.71	50.60	3.94	4.46	0.18	13.03
Heigham Holmes	GB0017R	1.62	52.72	2.93	2.67	0.04	-8.62
Auchencorth Moss	GB0048R	-3.24	55.79	3.17	3.46	-0.09	9.31
Chilbolton Observa tory	GB1055	-1.44	51.15	3.19	4.95	-0.05	55.35
Valentia Observatory [(a)]	IE0001R	-10.24	51.94	116.22	8.24	0.48	-92.91
De Zilk	NL0091R	4.50	52.30	10.77	4.43	0.21	-58.81
Birkenes	NO0001R	8.25	58.38	7.12	6.98	0.78	-2.03
Kårva tn	NO0039R	8.88	62.78	4.29	9.79	0.09	128.31
Hurdal	NO0056R	11.08	60.37	7.19	5.05	0.42	-29.78
Diabla Gora	PL0005R	22.07	54.15	2.03	6.83	0.36	236.23
Bredkälen	SE0005R	15.33	63.85	1.60	3.25	0.28	103.18
Råö	SE0014R	11.91	57.39	3.13	6.35	0.81	103.00
Hallahus	SE0020R	13.15	56.04	4.28	5.54	0.67	29.44
Iskrba	SI0008R	14.87	45.57	4.33	11.35	0.25	162.11

[(a)] The measurement site is not included in the overall statistics due to insufficient temporal coverage for the year.

Table C8. *Statistical parameters for evaluating modelled B(a)P air concentration (ng m^{-3}) against measurements.*

Station Name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias
Houtem	BE0013R	2.58	51.02	0.092	0.086	0.85	-0.06
Kosetice	CZ0003R	15.08	49.57	0.358	0.536	0.84	0.50
Westerland	DE0001R	8.31	54.93	0.036	0.027	0.7	-0.23
Waldhof	DE0002R	10.76	52.80	0.140	0.090	0.79	-0.36
Schauinsland	DE0003R	7.91	47.92	0.031	0.219	0.5	6.14
Schmücke	DE0008R	10.77	50.65	0.064	0.115	0.83	0.81
Zingst	DE0009R	12.73	54.44	0.136	0.057	0.89	-0.58
Virolahti III	FI0018R	27.67	60.53	0.130	0.066	0.79	-0.49
Pallas (Matorova)	FI0036R	24.24	68.00	0.005	0.011	0.81	1.26
Hyytiälä	FI0050R	24.28	61.85	0.093	0.060	0.91	-0.35
Revin	FR0009R	4.63	49.90	0.058	0.063	0.82	0.08
High Muffles	GB0014R	-0.81	54.33	0.033	0.033	0.71	-0.02
Chilbolton Observatory	GB1055R	-1.44	51.15	0.093	0.086	0.92	-0.07
Puntijarka	HR0002R	15.97	45.90	0.087	0.613	0.59	6.07
Rucava	LV0010R	21.17	56.16	0.187	0.086	0.73	-0.54
De Zilk	NL0091R	4.50	52.30	0.035	0.123	0.89	2.50
Birkenes II	NO0002R	8.25	58.39	0.025	0.010	0.27	-0.60
Diabla Gora	PL0005R	22.07	54.15	0.400	0.331	0.94	-0.17
Zielonka	PL0009R	17.93	53.66	0.611	0.546	0.99	-0.11
Råö	SE0014R	11.91	57.39	0.031	0.022	0.57	-0.28
Hallahus	SE0020R	13.15	56.04	0.009	0.047	0.58	4.48
Norunda Stenen	SE0022R	17.51	60.09	0.020	0.017	0.73	-0.14
Iskrba	SI0008R	14.87	45.57	0.224	0.149	0.84	-0.33

Table C9. *Statistical parameters for evaluating modelled B(a)P wet deposition (g $km^{-2}y^{-1}$) against measurements.*

Station Name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias, %
Houtem	BE0013R	2.58	51.02	5.20	0.79	-0.4	-0.85
Westerland	DE0001R	8.31	54.93	0.99	0.80	0.83	-0.19
Waldhof	DE0002R	10.76	52.80	2.17	1.21	0.78	-0.44
Schauinsland	DE0003R	7.91	47.92	2.89	5.12	0.39	0.77
Schmücke	DE0008R	10.77	50.65	5.72	3.10	0.85	-0.46
Zingst	DE0009R	12.73	54.44	0.97	0.69	0.45	-0.29
Virolahti III	FI0018R	27.67	60.53	5.64	1.79	0.88	-0.68
Pallas (Matorova)	FI0036R	24.24	68.00	0.32	0.38	0.92	0.20
Hyytiälä	FI0050R	24.28	61.85	2.36	1.34	0.84	-0.43
Donon	FR0008R	7.13	48.50	2.84	0.82	0.58	-0.71
Revin	FR0009R	4.63	49.90	3.44	0.95	0.39	-0.72
Saint-Nazai re-le-Désert	FR0023R	5.28	44.57	1.08	0.28	-0.09	-0.74
Verneuil	FR0025R	2.61	46.82	1.33	0.42	-0.72	-0.69
Kergoff	FR0028R	-2.94	48.26	0.93	0.37	0.57	-0.60
De Zilk	NL0091R	4.50	52.30	4.65	1.38	0.73	-0.70
Diabla Gora	PL0005R	22.07	54.15	11.72	5.56	0.84	-0.53
Råö	SE0014R	11.91	57.39	0.69	0.81	0.07	0.18
Iskrba	SI0008R	14.87	45.57	6.23	3.31	0.92	-0.47

Table C10. *Statistical parameters for evaluating modelled B(b)F air concentration (ng m^{-3}) against measurements.*

Station Name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias, %
Kosetice	CZ0003R	15.08	49.57	0.497	0.566	0.86	0.14
Pallas (Matorova)	FI0036R	24.24	68.00	0.012	0.014	0.81	0.14
Donon	FR0008R	7.13	48.50	0.090	0.176	0.76	0.95
Revin	FR0009R	4.63	49.90	0.083	0.128	0.9	0.55
Peyrusse Vieille	FR0013R	0.18	43.62	0.054	0.059	0.85	0.11
Saint-Nazai re-le-Désert	FR0023R	5.28	44.57	0.126	0.045	0.89	-0.64
Verneuil	FR0025R	2.61	46.82	0.142	0.076	0.73	-0.46
High Muffles	GB0014R	-0.81	54.33	0.072	0.067	0.47	-0.06
Auchencorth Moss	GB0048R	-3.24	55.79	0.053	0.044	0.82	-0.16
Chilbolton Observatory	GB1055R	-1.44	51.15	0.129	0.156	0.55	0.21
Birkenes II	NO0002R	8.25	58.39	0.062	0.034	0.22	-0.45
Diabla Gora	PL0005R	22.07	54.15	0.556	0.564	0.92	0.02
Zielonka	PL0009R	17.93	53.66	0.801	0.847	0.83	0.06
Råö	SE0014R	11.91	57.39	0.066	0.052	0.73	-0.21
Hallahus	SE0020R	13.15	56.04	0.056	0.097	0.31	0.74
Norunda Stenen	SE0022R	17.51	60.09	0.040	0.035	0.42	-0.13

Table C11. *Statistical parameters for evaluating modelled B(b)F wet deposition (g $km^{-2}y^{-1}$) against measurements.*

Station Name	**Code**	**Longitude**	**Latitude**	**Observed**	**Modelled**	**Rcorr**	**Bias, %**
Houtem	BE0013R	2.58	51.02	4.94	1.76	-0.03	-0.64
Virolahti III	FI0018R	27.67	60.53	10.11	5.39	0.85	-0.47
Pallas (Matorova)	FI0036R	24.24	68.00	0.91	0.76	0.93	-0.17
Hyytiälä	FI0050R	24.28	61.85	3.95	2.88	0.86	-0.27
Donon	FR0008R	7.13	48.50	5.60	2.03	0.84	-0.64
Revin	FR0009R	4.63	49.90	7.33	2.13	0.75	-0.71
Peyrusse Vieille	FR0013R	0.18	43.62	1.34	0.79	0.36	-0.41
Saint-Nazai re-le-Désert	FR0023R	5.28	44.57	1.74	0.73	0.66	-0.58
Verneuil	FR0025R	2.61	46.82	2.65	1.11	0.06	-0.58
Kergoff	FR0028R	-2.94	48.26	1.91	0.87	0.92	-0.54
Chilbolton Observatory	GB1055R	-1.44	51.15	10.40	2.87	0.51	-0.72
Diabla Gora	PL0005R	22.07	54.15	17.70	11.09	0.88	-0.37
Råö	SE0014R	11.91	57.39	1.59	2.52	0.43	0.59
Hallahus	SE0020R	13.15	56.04	2.44	2.94	0.73	0.21

Table C12. *Statistical parameters for evaluating modelled B(k)F air concentration (ng m^{-3}) against measurements.*

Station Name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias, %
Kosetice (NOAK)	CZ0003R	15.80	49.57	0.268	0.284	0.86	0.06
Pallas (Matorova)	FI0036R	24.24	68.00	0.005	0.008	0.86	0.74
High Muffles	GB0014R	-0.81	54.33	0.041	0.025	0.52	-0.40
Chilbolton Observatory	GB1055R	-1.44	51.15	0.064	0.061	0.58	-0.05
Birkenes II	NO0002R	8.25	58.39	0.023	0.010	0.29	-0.57
Diabla Gora	PL0005R	22.07	54.15	0.222	0.223	0.94	0.00
Zielonka	PL0009R	17.93	53.66	0.404	0.341	0.84	-0.15
Råö	SE0014R	11.91	57.39	0.040	0.018	0.71	-0.55
Hallahus	SE0020R	13.15	56.04	0.023	0.037	0.33	0.60
Norunda Stenen	SE0022R	17.51	60.09	0.016	0.010	0.39	-0.36

Table C13. *Statistical parameters for evaluating modelled B(k)F wet deposition (g $km^{-2}y^{-1}$) against measurements.*

Station Name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias, %
Houtem	BE0013R	2.58	51.02	2.50	0.67	0.24	-0.73
Virolahti III	FI0018R	27.67	60.53	4.38	2.25	0.91	-0.49
Pallas (Matorova)	FI0036R	24.24	68.00	0.32	0.38	0.91	0.19
Hyytiälä	FI0050R	24.28	61.85	1.77	1.35	0.85	-0.24
Donon	FR0008R	7.13	48.50	2.31	0.81	0.8	-0.65
Revin	FR0009R	4.63	49.90	2.81	0.89	0.69	-0.68
Saint-Nazai re-le-Désert	FR0023R	5.28	44.57	0.81	0.27	0.37	-0.67
Verneuil	FR0025R	2.61	46.82	1.12	0.41	0.11	-0.64
Kergoff	FR0028R	-2.94	48.26	0.86	0.31	0.73	-0.64
Diabla Gora	PL0005R	22.07	54.15	6.25	4.28	0.89	-0.31
Råö	SE0014R	11.91	57.39	0.59	0.85	0.33	0.44
Hallahus	SE0020R	13.15	56.04	1.11	1.09	0.72	-0.02

Table C14. *Statistical parameters for evaluating modelled IP air concentration (ng m^{-3}) against measurements.*

Station Name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias
Houtem	BE0013R	2.58	51.02	0.091	0.090	0.77	-0.02
Kosetice (NOAK)	CZ0003R	15.80	49.57	0.426	0.425	0.78	0.00
Westerland	DE0001R	8.31	54.93	0.061	0.050	0.83	-0.18
Waldhof	DE0002R	10.76	52.80	0.179	0.151	0.82	-0.16
Schauinsland	DE0003R	7.91	47.92	0.046	0.272	0.54	4.86
Schmücke	DE0008R	10.77	50.65	0.093	0.184	-0.08	0.97
Zingst	DE0009R	12.73	54.44	0.162	0.097	0.96	-0.40
Virolahti III	FI0018R	27.67	60.53	0.082	0.087	0.7	0.06
Pallas (Matorova)	FI0036R	24.24	68.00	0.008	0.014	0.82	0.78
Hyytiälä	FI0050R	24.28	61.85	0.058	0.072	0.83	0.24
Revin	FR0009R	4.63	49.90	0.062	0.074	0.87	0.19
Saint-Nazai re-le-Désert	FR0023R	5.28	44.57	0.105	0.025	0.91	-0.76
Verneuil	FR0025R	2.61	46.82	0.107	0.045	0.58	-0.58
High Muffles	GB0014R	-0.81	54.33	0.046	0.034	0.45	-0.26
Auchencorth Moss	GB0048R	-3.24	55.79	0.034	0.021	0.78	-0.37
Chilbolton Observatory	GB1055R	-1.44	51.15	0.097	0.075	0.52	-0.22
Puntijarka	HR0002R	15.97	45.90	0.157	0.466	0.27	1.98
Rucava	LV0010R	21.17	56.16	0.260	0.094	0.27	-0.64
De Zilk	NL0091R	4.50	52.30	0.054	0.105	0.33	0.94
Birkenes II	NO0002R	8.25	58.39	0.041	0.013	0.53	-0.68
Diabla Gora	PL0005R	22.07	54.15	0.482	0.242	0.92	-0.50
Zielonka	PL0009R	17.93	53.66	0.932	0.356	0.72	-0.62
Råö	SE0014R	11.91	57.39	0.046	0.029	0.63	-0.36
Hallahus	SE0020R	13.15	56.04	0.043	0.059	0.36	0.35
Norunda Stenen	SE0022R	17.51	60.09	0.027	0.021	0.38	-0.21
Iskrba	SI0008R	14.87	45.57	0.240	0.149	0.9	-0.38

Table C15. *Statistical parameters for evaluating modelled IP wet deposition (g $km^{-2}y^{-1}$) against measurements.*

Station Name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias, %
Houtem	BE0013R	2.58	51.02	2.52	0.90	0.11	-0.64
Westerland	DE0001R	8.31	54.93	1.70	1.48	0.93	-0.13
Waldhof	DE0002R	10.76	52.80	3.92	2.14	0.8	-0.45
Schauinsland	DE0003R	7.91	47.92	5.05	6.04	0.62	0.20
Schmücke	DE0008R	10.77	50.65	11.51	5.02	0.94	-0.56
Zingst	DE0009R	12.73	54.44	1.78	1.24	0.7	-0.30
Virolahti III	FI0018R	27.67	60.53	4.25	2.83	0.89	-0.33
Pallas (Matorova)	FI0036R	24.24	68.00	0.78	0.51	0.9	-0.35
Hyytiälä	FI0050R	24.28	61.85	2.10	1.80	0.86	-0.14
Donon	FR0008R	7.13	48.50	4.32	1.18	0.82	-0.73
Revin	FR0009R	4.63	49.90	5.29	1.20	0.75	-0.77
Peyrusse Vieille	FR0013R	0.18	43.62	1.03	0.69	0.26	-0.33
Saint-Nazai re-le-Désert	FR0023R	5.28	44.57	1.32	0.38	0.42	-0.71
Verneuil	FR0025R	2.61	46.82	1.95	0.68	0.22	-0.65
Kergoff	FR0028R	-2.94	48.26	1.39	0.63	0.89	-0.54
De Zilk	NL0091R	4.50	52.30	1.45	1.29	0.45	-0.12
Diabla Gora	PL0005R	22.07	54.15	13.99	4.52	0.87	-0.68
Råö	SE0014R	11.91	57.39	0.94	1.49	0.48	0.58
Hallahus	SE0020R	13.15	56.04	1.88	1.75	0.76	-0.07
Iskrba	SI0008R	14.87	45.57	9.49	4.39	0.95	-0.54

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